Sustainable Forestry within an Industry Context

Executive Summary

The forest products industry ranks as one of the world's most important industries—for the global economy and the environment. It represents close to 3% of the world's gross economic output. The forests upon which it depends are among the most critical ecosystems for the health of the planet and for human well-being. The size of the industry, its links to the rest of the world economy, and the importance of its resource base for environmental services make it the target of intense public scrutiny and government regulation. Understanding sustainable forestry requires understanding the evolving dynamics of the forest products industry—an evolution that is increasingly making the cost of wood a smaller fraction of the final value of a forest product.

Two frameworks are used here as prisms through which to view the industry. The first section describes how the major business and environmental trends sweeping the industry are transforming Sustainable Forest Management (SFM) into a major industry force. It then outlines the most critical nonenvironmental drivers that make or break all businesses within the industry, and explains how they will influence sustainability issues. The second section describes how all these forces play out within each of the three major industry segments: paper, solid wood, and engineered wood products, and maps out in which parts of the industry sustainable forestry is already a major issue, where it is not, and why.

This approach makes sense given the history of SFM. Most sustainable forestry businesses have started from the forest, then tried to move forward to the market. An analysis that assesses the industry and links market conditions back to sustainable forestry supply capabilities reveals where sustainable forestry is well integrated, where it may not have much current opportunity, and where opportunity for closer end-market integration remains untapped.

The forces transforming the industry include: tightening supplies, a shift in production regions, globalization, increased raw material efficiency, intensified product consistency, and heightened government regulation. Just as these forces are affected by environmental pressures, they also have environmental impacts of their own.

As population growth and burgeoning economies spur the consumption of forest products, wood supplies are tightening worldwide. While no crisis is imminent, the industry is turning to new regions, especially South America and South Asia, as a source for wood. It is also gradually shifting from a supply based largely on natural forests to one that depends on plantations, many located in the southern hemisphere. Just when environmental restrictions are curtailing wood production in many northern countries, heightened demand elsewhere is causing the industry to expand into delicate ecosystems in the Southern Hemisphere. Meanwhile, the industry is becoming increasingly globalized, with raw materials sourced throughout the world to create products for equally diverse markets.

Shifts in producing regions and globalization are creating new opportunities for value-added industries in the southern hemisphere. Primary and secondary processing industries will follow wood supplies for financial reasons, as timber producing nations try to capture a larger share of the production from forest products. These changes will draw significant investment to the Southern Hemisphere.

Globalization brings improvements in communications, shipping, and distribution that facilitate the transfer of knowledge about state-of-the-art forest management techniques. These same developments make the emergence of an international trade in certified forest products possible. As capital travels to formerly untapped forest reserves, for example those in eastern Russia, the forces unleashed by globalization will exert even greater pressures on forests worldwide in the next twenty years.

Evermore efficient raw material use and increasing product standardization are also contributing to the industry's transformation. Over the past several decades, the industry has created many technological silver bullets that enable it to create more product from less wood.

The industry-wide drive for standardization and consistency is moving down the value chain from final consumer products through to the forest. Instead of emphasizing efforts to use individual species such as oak and cherry, resources are now allocated to figure out how to make a vanilla feedstock such as rubber wood look and perform like oak or cherry. Eventually, this trend will lead to more investment in processing assets that can guarantee consistency, and a movement toward either tree plantations or homogenization during primary and secondary processing.

Environmental forces have flexed their political and market muscles, placing the forest products industry under intensifying public scrutiny and government regulation of its environmental performance. New regulations and market initiatives are curtailing access to government controlled forest resources, and influencing the management of private forests. While a number of international agreements designed to improve forest practices might eventually affect the industry, few now have the teeth to do so.

In the past five years "certification" has emerged as a nongovernmental initiative that may further transform the way the industry manages its forests. Certified forest products are defining the market for wood products grown in an environmentally sound fashion. While the full impact of certification is still unknown, if it focuses the concerns of consumers and purchasers on the quality of the forest from which a product is harvested, and if certification is widely adopted, it could dramatically improve forest management and change markets.

How the business and environmental forces affect the paper, panels, and sawnwood segments of the industry will determine, in large measure, the future of sustainable forest products. The paper industry, with its massive capital investments, huge pollution abatement costs, extreme business cycles, and susceptibility to buyer power, has long been beleaguered. The paper industry's recent shift to greater use of recycled paper demonstrates both its vulnerability to outside pressures and its ability to adapt rapidly to a new business environment.

Panels and engineered wood products may be a model for the future. Products in this segment, capitalizing on rapid-fire technological advances, are among the fastest growing in the industry. From an environmental perspective, these products' ability to use a variety of woods now makes them more attractive than plywood, the once dominant panel product. On the other hand, certified panel products will be much tougher to bring to market because it is so difficult to ensure that all the woods used in them come from sustainably managed forests.

Sawnwood products draw most of the attention from the certification community. The sawnwood segment is more fragmented, less capital intensive and adds relatively less value to its products than paper or panels. Sawnwood companies in temperate regions that produce hardwood will have opportunities to sell to markets opened up by a new resistance to tropical hardwoods. The forest management practices of softwood producers, however, are under heavy scrutiny, and they will find fewer opportunities to leverage superior forest management. Although tropical countries are under enormous international pressure to improve their forest management practices, most of the internal and Pacific Rim markets they serve, so far, remain relatively uninterested in the environmental qualities of forest products. Niche opportunities, though, are available in Europe to tropical producers that can produce certified forest products.

In the future, the successful forest products company will understand and embrace the forces that are transforming the industry. Environmental trends are

at the leading edge of these changes, and will be instrumental in determining the industry's winners and losers. Companies that understand the role of the environment will profit by doing so: Those that underestimate the force of environmental issues will do so at their peril.

Introduction

The forest products industry represents the best and the worst of today's global economy. It produces a diverse assortment of goods to match an ever-expanding array of wants and needs. Through technological advances, these products are created ever-more efficiently and reach consumers around the world through increasingly specialized and efficient marketing and distribution channels. The industry harnesses capital, technological, and human resources on a scale matched by few other human endeavors. It makes written communications cheaply available to citizens throughout the world, helps provide housing for hundreds of millions, and contributes in countless other ways to human well-being.

An Industry Beset by Crises

On the other hand, the forest products industry is beset by crises. The natural resource base it depends on is being rapidly consumed by the world's hunger for more forest products. Forests are being depleted by millions of the world's poor who use fuelwood for cooking and heating. Population and economic development are boosting the numbers of consumers of forest products worldwide, so that the consumption of roundwood soared from 1.5 billion cubic meters in 1950 to 3.65 billion cubic meters in 1995, according to a study by Pira International. Fortunately, the forest products industry has developed technologies that enable it to create more products using less wood. Yet, many of these processes generate harmful pollutants. To prevent them from doing environmental damage, the industry is forced to invest huge amounts of capital. Economic development, which has spurred such dramatic growth in the forest products industry, has also led people to value the forest in new ways. Formerly prized mainly for their timber production, forests are now coveted for the biodiversity they foster and shelter, for the scenic beauty they provide, and for the water resources they harbor and protect. These new claimants to forest values blame the destruction of the forests squarely on the industry. At the very time when the industry is faced with dwindling resources, powerful environmental forces are claiming those resources. Ironically, an industry that once prided itself upon its use of a renewable resource, is now under siege from environmentalists, groups it might once have considered its natural allies.

Nor has the forest products industry escaped the monumental currents that are buffeting other industries. Globalization, shifts in production locations to optimize costs, worldwide capital mobilization, rapid technological advances, and a constant pressure to innovate are all reshaping the forest products industry. Environmental forces will influence all of the restructuring underway. These forces are accelerating technology development, creating new market niches, shifting wood availability, and driving new capital investments. In short, environmental forces are propelling an industry already in a hurry to keep pace with a changing world.

Focus on Intersection of Structural Change and Environmental Forces

The intersection between structural change in the forest products industry and the environmental forces that are at once the causes and effects of those changes is the focal point of this study. It will describe the broad economic and market forces that are acting on the industry, then analyze how environmental trends are affecting the principal product segments. Risks and opportunities in the nascent "sustainable" and certified forest products

A Word on Forest Management

Forest management has changed dramatically over time and across countries.

- Initially, societies considered forests nearly unlimited resources. They were often even viewed as obstacles to the development of more profitable activities, such as agriculture. Wood prices were determined chiefly by extraction and transportation costs.
- Around the mid- 20th century, an "industrial paradigm" of forest management held sway. Under this system natural forests were managed to yield as much timber as possible. Pests, undergrowth, and fires were tightly controlled.
- Today, two new models are becoming influential. In the developed world, forest management is slowly adopting an approach that tries to maximize a range of values, including timber production, wildlife habitat, biodiversity, and scenic beauty. Under ecosystem management, most prevalent in temperate Northern Hemisphere countries, forests are managed as ecosystems with wood being just one of many desirable products from the system. Wood yields are only optimized to the extent that other "goods" produced by the forest are not diminished. The U.S. Forest Service has officially adopted this system as have several other industry players. It may well represent the future for the management of "natural" forests.
- In other temperate areas and throughout the Southern Hemisphere, however, the dominant forestry thinking holds that single-species plantations are the most efficient way to produce wood fiber. Genetics, maximum yield management, and rigorous integration with downstream processing facilities are the cornerstones.

industry created by the intersection of industry evolution and environmental forces over the next twenty years will be identified and analyzed.

The approach is designed to help sustainable forestry enterprises understand the changing industry dynamics and identify market opportunities. Most sustainable forestry efforts have begun at the forest by improving management practices. Only later have they analyzed the market dynamics of the products grown in a well-managed forest.

Unfortunately, there are a number of "stranded" sustainable forest enterprises—companies with excellent forest management practices but with products out of line with the market. Most sustainable forestry products are solid wood products, but they represent only a fraction of the overall industry. If sustainability is to enter the mainstream, and if certified forest products companies are to successfully continue to operate in niche markets, they and new entrants in the field need to fine-tune their strategies to accommodate the evolving industry, adapt to shifts in the niche markets, and react to the inevitable threats and opportunities these changes create. In the dynamic and competitive forest products industry, merely being a certified product entrepreneur is no longer sufficient.

By the same token, understanding the forces that are reshaping the industry is critical to preserving the health of forests. Fuelwood consumption, expansion of agriculture, and other issues are important factors in determining the long-term health of the world's forests. But the forest products industry remains the single most influential economic activity that will determine how forests are managed, whether SFM is widely implemented, and whether the health of the world's forests will be preserved.

The Forest and the Industry

The forest products industry is one of the most economically important in the world. Accounting for nearly three percent of worldwide GDP, the industry is the mainstay of key economic sectors, such as construction, publishing, and furniture on the output side, and chemical and machinery on the input side. The economies of numerous developed and developing countries, Finland and Indonesia respectively, for instance, depend heavily on the forest products industry. The forests of some developing countries hold potential not only to meet their own fiber needs, but also to earn foreign exchange, and to develop a platform for further economic growth. For the foreseeable future the forest products industry will remain the "anchor industry" in the forest because its monetized value is so much larger than that of any other industry, such as pharmaceuticals.

Forest products can be divided into two basic categories, softwoods, which come from coniferous forests, and hardwoods, which are harvested from nonconiferous trees. Both types of trees feed the principal forest products industries of pulp and paper, panels, and sawnwood.

A Snapshot of Global Fiber Supply and Demand - 1995

	Millions of Cubic Meters	Percent
Fuelwood Demand	1,971	54%
Industrial Roundwood	1,680	46%
Lumber and Sawnwood Products	949	26%
Plywood, Panels, Indus. Wood Products	329	9%
Pulp and Paper Products	402	11%
Total Demand	**3,651**	**100%**

Source: Robert W. Hagler, 1995

Table 1

Table 1 shows the use of fuelwood for cooking and heating, which accounts for the majority of the world roundwood harvest. The second leading category is lumber and sawnwood products, followed by pulp and paper products. In addition to the 402 million cubic meters of roundwood destined directly for the pulp and paper industries, an additional 205 million cubic meters of residuals, or scrap, flow from other wood processing industries into the pulp and paper industry. Panels of all types consume 9% of industrial roundwood.

Major Drivers of Industry Transformation

A number of forces are placing consistent, long-term pressure on the forests products industry. Each affects various segments of the industry differently, and will present significant opportunities and threats to the development of sustainable forestry business opportunities. This section addresses seven major trends: supply/demand, plantations development, globalization of trade, standardization of products, efficiency increases, demand for environmental sustainability, and increasing government regulations.

Forest Supplies Tightening

The forest products industry continuously gains greater efficiencies in fiber production and fiber processing. Even so, world fiber supplies are likely to become tighter over the next twenty years. Population growth and greater economic development caused worldwide consumption of industrial roundwood to rise at a rate of approximately 1.3% per year between 1983-1993, according to industry supply expert Robert W. Hagler. This relatively modest growth rate, however, cloaks wide regional variations. Most developed countries had little or no growth in their consumption of forest products; but countries of the Pacific Rim have experienced

huge spurts in demand. Furthermore, the growth in demand for individual sectors of the industry generally outstripped increases in roundwood consumption. The ability of the industry to more efficiently convert roundwood into forest products explains the difference.

Supply Side Pressures Reducing Forest Availability

A number of supply variables, most closely related to environmental pressures, are also constraining the availability of wood fiber. Some regions' forests, including those in West Africa and some countries in Latin America, have almost reached commercial extinction. But other factors are also important:

- Withdrawal of some forests from production for environmental reasons to create national parks or to protect certain species. Thousands of acres, for instance, were taken out of production in the Pacific Northwest to protect the spotted owl.
- Historical overcutting of forests, such as that taking place in Indonesia.
- Lack of investments to increase productivity, including required reforestation, which was the case until recently in British Columbia.
- Lack of infrastructure to cost-effectively harvest and transport timber, which has occurred in the Russian Far East.

No world wood crisis is imminent. But as wood supplies gradually tighten over the next 20 years, local, and even regional, supply shortfalls may become common. For primary and secondary processing facilities, which are generally located close to forests, supply issues will become critical when area forests are exhausted or are taken out of production and sources of wood supplies shift to other areas. Logistics and transportation have improved dramatically in recent years, which will help enable processors to buy wood from a wide variety of sources. Capital is more mobile, as well, so processing assets will continue to follow wood supplies. These shifts will define many of the opportunities in the medium and long term.

Industry Will Respond to Tighter Supplies

Few industry analysts are willing to commit themselves to hard predictions about future supply and demand for wood. Were it simply a question of projecting inelastic demand and a steady amount of supply, assumptions would be more readily available.

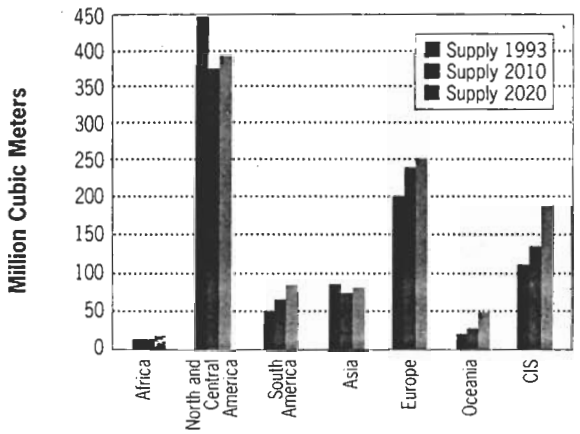
Historically, when faced with supply challenges, the forest products industry breeds new trees, develops new technologies, substitutes products, takes advantage of formerly "weed" or lesser known species, and in short overcomes fiber-related costs and supply problems. On the other hand, recent experience has demonstrated that as economies develop and individual incomes rise, most societies come to value their forest resources for services other than wood production. Newly enriched middle classes in some parts of the world may demand the curtailing of harvests. Moreover, analysts disagree about the future of logging in Russia, rates of afforestation in South America and Southeast Asia, and demand responses to price increases for forest products, which are critical variables in the supply and demand for wood. For these reasons, any projections of future supply need to be reviewed with an appropriate dose of skepticism. Although a full analysis of worldwide fiber supply and demand issues is beyond the scope of this discussion, a variety of views on world fiber supplies are available in analysis done by Sedjo, Reed, FAO, Jaakko Pöyry, and the U.N. Commission on Sustainable Development, among others.

Supply and Demand for Softwood

Softwood, or coniferous forests, is found largely in the temperate regions of the Northern Hemisphere. Most softwood is produced in Canada, Scandinavia, the United States, and Russia, and consumed mainly for construction lumber and long-fiber paper such as newsprint. Softwood production is typically double that of hardwood. Hardwood, or deciduous

forests, grow throughout the tropics and the world's temperate regions, and are traditionally used for solid wood, plywood, and paper.

Softwood Industrial Roundwood Supply Projections 1993 - 2010



Source: Apsey and Reed, Council of Forest Industries (Canada) 1995

Graph 1

Total softwood production is estimated to increase from 939 million cubic meters to a total of 1,085 million cubic meters, less than 15% total growth, over a 25-year period. Demand for softwood is concentrated in the Northern Hemisphere. If one makes the rather crude estimate of maximum growth in demand of 1.5% per year, a gap of some 315 million cubic meters would develop by the year 2020. The system clearly has little slack to absorb consumption increases, and the forest products industry will have to respond to fill the gap. The responses will help determine the opportunities for sustainable forestry in the future.

Environmental Forces Will Restrict Softwood Supplies

Several regional developments, many of them environmental, will hinder the expansion of softwood supplies over the next twenty years:

- Russia holds half of the world's coniferous forests, yet production is stagnant and well below cutting potential. Although production is projected to increase slowly, significant infrastructure problems, an uncertain investment and political climate, and corruption are expected to continue to hamper development of these huge resources. In 1994, Weyerhaeuser, for instance, canceled plans to invest in a joint venture in Siberia with Koppensky Kombinant, a Russian timber and forest products group, citing corruption and political instability. According to the industry magazine *Wood Technology,* Weyerhaeuser also cited opposition from U.S. environmentalists as a reason for its pullout.

- Continued environmental restrictions on logging in government-owned coniferous forests are expected to limit North American production. The southern United States will increase production marginally, but not enough to offset the drop in sales from U.S. public lands.

- Production will drop in Canada as provincial governments implement increasingly strict timber harvest controls in response to environmental concerns.

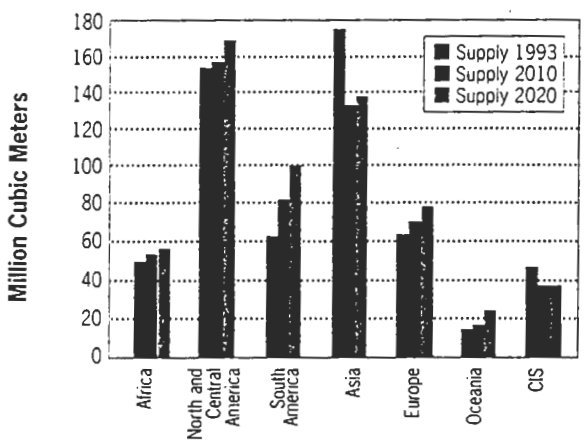
- Softwood production in South America and Oceania will increase as extensive plantations come on line over the next twenty-five years. Given the short rotation cycle for these plantations (as little as fifteen years), over the long term, supplies from these areas will be relatively more elastic than elsewhere in the world.

- Europe's harvests are expected to remain below the annual incremental growth, but production will increase nonetheless. Europe will continue to import much of the fiber it needs.

Hardwood Supplies Tightening

All trends point to a period of much tighter hardwood supplies, despite large stocks of hardwood in tropical and temperate regions. As indicated in Graph 2, total production of hardwood industrial roundwood is expected to grow from 565 million cubic meters in 1993 to 599 million in 2020, and most production will continue to be concentrated in the United States. Clearly, the availability of hardwood fiber will have a major effect on the forest products industry over the long term. Most tropical forests are hardwood, and the issues of rain forest conservation and the availability of tropical hardwoods are closely linked.

Hardwood Industrial Roundwood Supply Projections 1993 - 2020



Source: Apsey and Reed, 1995

Graph 2

The following developments will be instrumental in limiting the growth of hardwood supplies:

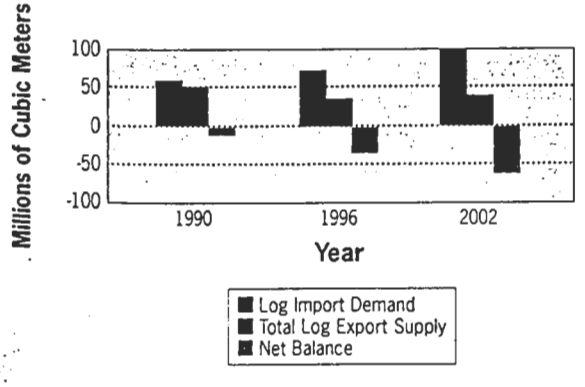
- Malaysia and Indonesia, Asia's top hardwood producers, rely almost exclusively upon their natural forests. Both governments are expected to slow down the liquidation of those forests over the next decade. Production out of Indonesia, Asia's second largest producer, is expected to drop significantly as natural forests are further harvested. Both countries are attempting to develop hardwood plantations that should produce harvests over the next twenty years, although the quality of statistics about the total area of these plantations is open to question. But neither country has planted plantations in most of the previously logged areas. Those areas will continue to supply local paper mills with mixed second growth, which produces low-quality pulp.
- North America has large hardwood reserves, most of them privately held, so production of U.S. hardwoods is less dependent than softwoods on government lands. Despite this insulation from direct government control, increased regulations of wetlands, biodiversity guidelines, and other government-mandated management practices will prevent hefty increases in supply from the private lands that produce most U.S. hardwood.
- Tree farms in South America and Asia, particularly intensely managed eucalyptus plantations in Brazil and acacia in Indonesia, will account for much of the growth in hardwood supplies. There is some debate as to the quality of these plantations, however. Reed and Apsey's estimates acknowledge the generally poor quality of the information on these plantations and heavily discount total planted areas and their expected performance.
- The Amazon basin, most analysts agree, will not be tapped for significant hardwood production or trade.

Under these circumstances, meaningful new sources of hardwood are unlikely to become available in the near future, which will place far greater demands on existing resources.

Asia Pacific Supply Situation Will Turn Negative in Near Future

Changing timber supply and demand will alter the competitive dynamics of forest products manufacturers around the world. Asia Pacific's growing population, rapid economic growth, and depletion of natural forests will compound the looming fiber deficit in the region. Japan continues to be an enormous consumer of forest products, and is by far the heaviest importer from other parts of Asia. According to a major study by Jaakko Pöyry commissioned by the American Forest and Paper Association, over the next twenty years Asia Pacific will reverse its status from being a major exporter of wood to importing much of the wood it needs, with Japan absorbing the bulk of the imports (see Graph 3). Major growth opportunities for wood producing countries will develop in this region. Despite the large volumes of plantation fiber expected from the southern Pacific, these plantations will only supplement fiber growth needs, and trade flows from North and South America are likely to continue to shift towards the Pacific Rim.

Pacific Rim Roundwood Balance



Source: Jaakko Pöyry, 1996

Graph 3

Environment and Sustainability Implications of Tightening Fiber Situation

Tighter worldwide fiber supplies have implications for increased or diminished industry sustainability, including:

- More of the world's wood fiber will be produced on plantations, often using exotic species. The environmental desirability and risks of such exotic plantations will continue to be a contentious issue.
- The quality of the world's fiber will continue to deteriorate. Old growth forests produce the best fiber. Evolution has designed such fiber to support large, heavy, dynamic, and resistant structures (trees) over very long stretches of time. The replacement of high-quality, old growth fiber by lower-quality plantation and secondary growth fiber has dictated many of the industry trends discussed in this study, such as the rise of engineered panels.
- As per capita incomes rise, people typically read more newspapers, purchase more packaged goods, and live in bigger houses. Ironically, they then begin to value more the nonwood products produced by forests. Competing claims on natural forests' resources will increase as fiber supplies diminish and other claimants to forest resources emerge. Over the very long term, the value of nonwood "products and services" may even determine how forest economics are structured in some areas, but otherwise the forest products industry's priorities will dominate.
- The forest products industry will be forced to become even more efficient and creative in its use of fiber resources, from the forest up the value chain to final distribution.
- In certain areas, such as Indonesia and Malaysia, the combination of still significant natural forest reserves, relatively effective governments, important biodiversity issues, and a mature national industry may eventually force all parties to balance

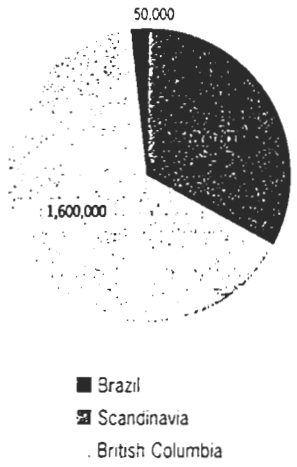
wood production with other values. If such a balance is achieved, new opportunities may be created for companies that lead such developments.

Shift in Production to Plantations and Southern Hemisphere

As indicated in Graphs 1 and 2, plantations in the Southern Hemisphere will become a major supplier of the world's future wood needs. Today less than 10% of the world's industrial roundwood is produced on plantations, but this number is growing at a double-digit rate. Indeed, plantations are the only wood supply growing this quickly. Several conditions are fueling the rise of plantations and the Southern Hemisphere as a center of fiber production.

- Growing conditions, labor, and land costs in the Southern Hemisphere are more favorable, making it less expensive to grow fiber in this region.
- Plantations are predictable, reliable, malleable, and flexible. They produce relatively standardized fiber, which makes them extremely attractive to the pulp and paper industry, whose expensive equipment runs better on the predictable wood of plantations. They offer faster financial returns than natural forest management and are less subject to the risk of environmental regulation or intervention by environmentalists.
- The sophistication of modern communications, transportation, and capital movement make the international expansion of fiber production much more feasible today than in the past.
- A worldwide trend towards plantation forestry, highly-developed genetics, and intensive planting, and harvesting make the southern hemisphere more attractive to the forest products industry. A great deal of degraded land is available, which is appropriate for plantation forestry. And as Graph 4 indicates, much less land is required for such farms in the Southern Hemisphere than in the Northern because trees grow faster and yields per hectare are higher.
- Over the long term, capital markets will be more comfortable with investments in plantations because they can be made to behave in a more predictable fashion and are less subject to government regulations.

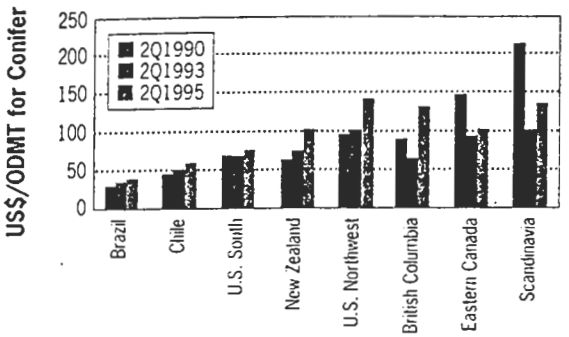
Forest Area Required for 500,000 ton/yr. Pulpmill (Hectares)



Graph 4

The areas receiving the largest infusions of investment capital for plantations are Chile, Brazil, and New Zealand. All these countries have had governments that at one point placed a great deal of importance on the development of a forest products industry. New Zealand's government-led promotion of the industry dates to the 1930s, and the Chilean and Brazilian governments have pushed plantation forestry since the 1960s.

Cost Advantage of Fiber Production in Southern Hemisphere



Source: Robert W. Hagler

Graph 5

Shifting Trade Flows, Plantation Fiber, and Southern Hemisphere Production: Implications for the Industry

The shift towards plantation forestry in the Southern Hemisphere has a number of implications for the forest products industry in general:

- The world may be moving towards a dual supply situation, in which a limited area of natural forest is preserved or minimally harvested while most of the world's fiber is produced on plantations or other "fiber farms." Some industry analysts, such as David Price of the U.K., suggest that all of the world's pulp needs could be met from a massive tree farm no larger than 2% of the land area of Brazil.
- As wood supplies shift, primary and secondary processing industries will follow the new sources, for financial reasons and because producer nations will exert pressure and offer incentives to do so (see box). The influx of capital investment and capital equipment will create a variety of new business opportunities.
- Producer nations may exercise more influence over market dynamics. Recently Indonesia and Malaysia have moved from merely banning the export of unprocessed logs to trying to set plywood prices. In late 1995, Malaysia and Indonesia agreed on minimum plywood prices for the Chinese, South Korean, and Japanese markets. Malaysia hopes to ban the export of sawn timber by the year 2000, in part to husband its forest resources, but also to capture value added locally.

Chile's Rio Iata - Processing Follows Fiber Supply

Over the past thirty years, Chile has successfully developed radiata pine plantations. Now, it is trying to leverage those plantations by building processing industries. The leading industry magazine, *Wood Technology*, reported that the Rio Iata group has added a sawmill and particleboard and veneer mills to its plantation operations. Rio Iata's radiata pine plantations are expected to supply 70% of the group's raw material needs in a few years. Since the company has moved into processing, half of the sawmill's output is remanufactured on site, the rest is sold to Japan. The company exports all of its finger-joint stock, moldings, edge-glued panels, and other value-added products.

Rio Iata has also developed a particleboard/veneer project to maximize the value of its plantation radiata pine in the face of worldwide shortages of wood products. The company is now "concentrating on improving the quality of their products and developing new overseas markets," according to *Wood Technology*.

Environmental Opportunities Created by Shifting Sources of Wood Supplies

The dramatic shift in the origins of wood supplies will create new, environmentally driven opportunities and threats:

- New producer countries may lack the institutional ability to respond to the pressures generated. *Tropical Timbers,* not a publication one would expect to be alarmist on environmental issues, recently opined, when "log exports from Gabon go from 75,000 to 700,000 cubic meters, it is less a matter for congratulation and more a reason for concern at the potential impact on...the country in the long term. Ghana was another country caught unawares by a massive increase in buying from Asia Pacific. Only by drastic measures and something of a confrontation between Government and parts of the industry has it managed to put things back on an even keel, principally by calling a halt to log exports... The situation will not get easier because demand for wood is rising and much of the increase is in markets where *environmental arguments carry little or no weight* (emphasis added)."

- The forest products industry in developed countries often argues that the net effect of environmental restrictions on wood production in their home countries accelerates the industry's migration into other countries and increases pressure on natural forests elsewhere. While undoubtedly self-serving, the argument that a window created by a drop in exports of U.S. product to Japan is quickly filled by highly unsustainable Asian producers is compelling.

- Natural forest management may attract less and less interest among major industry players. They may consider plantation forestry a more attractive investment on financial and technical grounds, to say nothing of the reduced exposure to environmental risks. This represents a significant threat to the development and expansion of a sustainable natural forest industry.

- Although plantations require less land for wood production than a natural forest, plantations also have a diminished capacity to supply the other valuable, though often nonmonetized services, of habitat, water supply, and recreation than do natural forests.

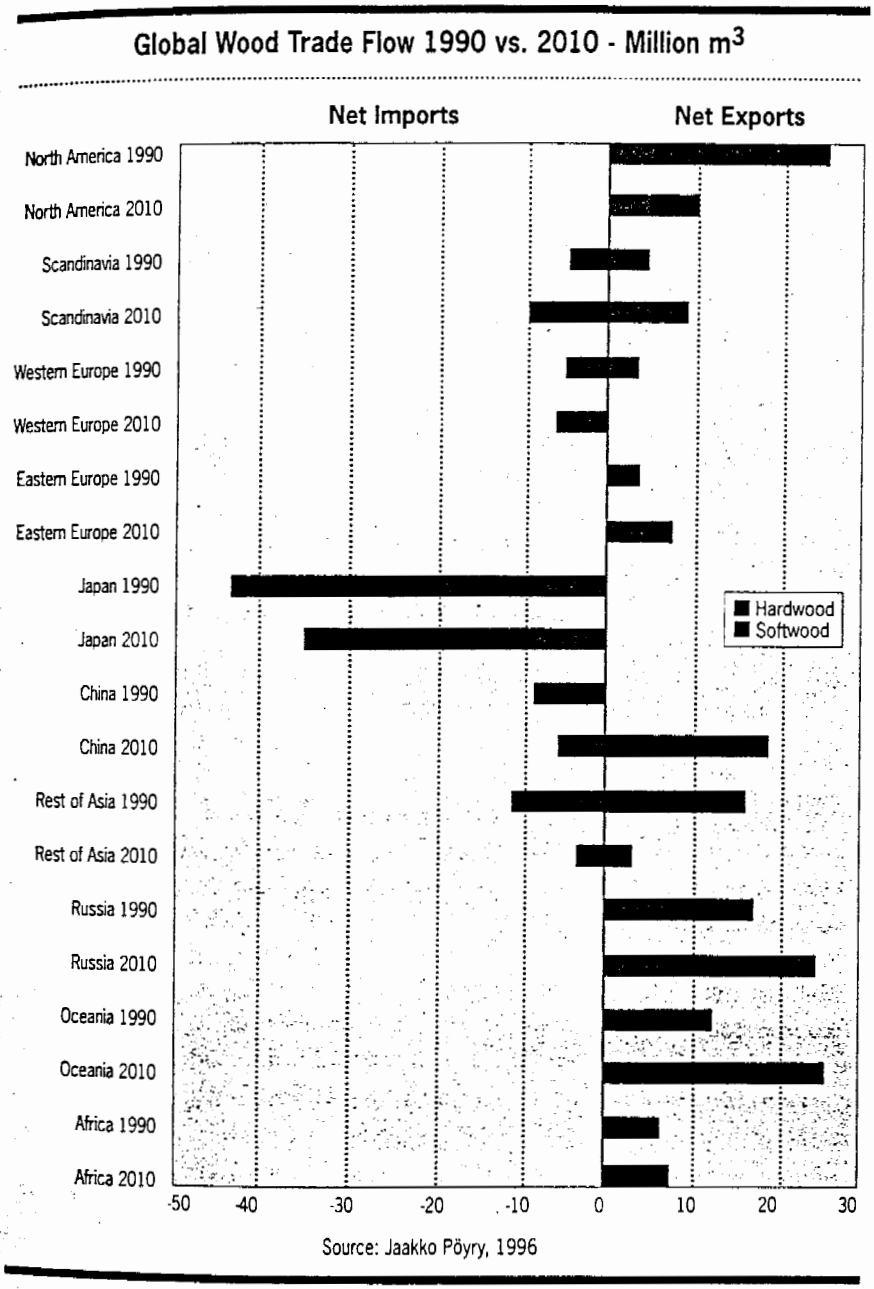
- Most economists disparage export bans and other such efforts to increase local value added industries because they are economically inefficient. But these measures have strong political appeal in most countries and are likely to increase over the short term. Export bans are also much easier to administer than forest management regulations, and in countries with underdeveloped administrative infrastructures they can be quite appealing.

- Long term, opportunities for companies that manage natural forests in an environmentally beneficial way may surface. Access to superior sites, greater cooperation from local governments, and better access to financial resources are among the possible rewards.

- Forward-looking countries with an ability to enforce regulations may be able to position themselves to take advantage of opportunities in the forest products industry. But they will need to prepare adequately—by investing in infrastructure, marketing, appropriate controls, and positioning themselves well with buyers of natural forests and investors in plantation forestry.

Changing Trade Flows and Globalization of the Industry

International trade flows of forest products have accelerated in recent years, and will continue to do so over the next twenty years. The combination of high economic growth rates in certain geographic areas, gradual exhaustion of traditional supply sources, shifting sources of fiber supply, and the relaxation of trade barriers under new trade agreements such as the General Agreement on Trades and Tariffs (GATT), the North American Free Trade Agreement (NAFTA), and other regional accords will further stimulate international trade of forest products.



Graph 6

As Graph 6 shows, North American and Asian exports are expected to drop considerably over the next fifteen years, with rising exports from Russia and Oceania making up for most of the decline in volume. Japan will continue to dominate trade of forest products, even though imports will drop slightly over the next decade and a half. Greater shipments will flow from Africa to Asia, as well as from South America to Europe.

Industry Increasingly Global

Rising international trade flows, dramatic shifts in sources of supply and centers of consumption, and a movement towards plantation forestry have all contributed to the increased globalization of the industry over the last twenty years. Today, it is not uncommon for an international paper company to sell its equity in Tokyo, grow its fiber in Brazil, purchase papermaking equipment in Europe, and sell its products worldwide. Similarly, companies that use sawnwood often source around the world to service equally dispersed markets. Over the next twenty years the globalization of the industry will accelerate.

As globalization continues and the industry optimizes production costs across borders, freight and logistics will play an increasingly important role in the search for international efficiencies. Leading companies have already developed sophisticated systems to handle these logistics, which helps lower costs and will open up opportunities for competitive advantage.

Implications and Opportunities of Heightened Trade Flows and Globalization

- As mentioned earlier, most of the growth in the forest products industry lies either in the non-developed world or other areas of the Pacific Rim. None of these markets has demonstrated any great interest in evaluating the environmental performance of the companies from which they purchase.

- As companies roam the globe seeking opportunities, pressures to harvest in more remote and fragile areas, or marginally profitable areas, will increase, as for example in Guyana, Suriname, areas of the Amazon, and in the Golden Triangle of Southeast Asia. Many of these regions lack the regulatory infrastructure to deal with these well-organized companies, and the potential for considerable long-term environmental damage is very real.

- If supply pressures force an increase in hardwood prices, enhanced margins might allow for more careful and more costly forest management in countries with sophisticated regulatory systems.

- Worldwide information systems, enhanced telecommunications, and much more efficient distribution mechanisms created by the globalization of the industry, help make niche markets possible. Much of the "certified" wood products industry to date has developed out of these niche markets, and further globalization will create similar opportunities.

- With information on markets and management techniques readily disseminated globally, new trends like certification and sustainability quickly reach the entire industry. Large trade flows will help spread sustainability ideas into other markets, and backwards into fiber supply.

- Improvements in information transmission, shipping, and distribution should make it more feasible to introduce species previously not used commercially, particularly from tropical areas. These developments should bode well for tropical producers that harvest sustainably and try to maximize the value of natural forest species, instead of simply harvesting the species with greatest commercial value.

Standardization and Engineering Consistency

Like other industries, the forest products industry is striving for greater standardization and consistency in its production. Just as consumers want consistent quality in the food they purchase and the cars they drive, they are also looking for paper and wood products with no surprises. This trend promises to have wide impact on forest management and the way the industry invests in forests, plants, and equipment.

The paper industry, for example, is increasingly using genetically engineered plantation species that yield fibers which will behave predictably inside a paper mill. New technologies allow Medium Density Fiberboard (MDF) to look like heavily dyed mahogany, even though the MDF's raw material may be a fast-growing secondary growth species. Oriented Strand Board (OSB) and other engineered wood products are successful because their performance qualities do not vary. Furniture designers are quite intolerant of blemishes, knots, and other natural wood features. However, when wood does contain such imperfections, designers like it to look alike in all identical products.

Environmental Implications of Standardization and Engineering Consistency

- In a world where consistency is king, with other considerations being equal, products that directly incorporate solid wood will be undervalued relative to their engineered peers. The former will always look less perfect than the latter.

- With downstream processing creating "wood" products out of a wide range of species, less and

less of the final value of forest products will be determined by the forest itself. As a result, processing will attract disproportionately more investment than forests in the future.

- The paper industry owns and manages huge tracts of forestland around the world. In the drive to lower costs and produce a more standardized, often specialized product, the paper industry will favor pulp made from genetically consistent trees. This trend is likely to accelerate the evolution towards a biologically less diverse source of fiber for the paper industry.

- In the past, the forest determined the quality of final output: Old and well managed was better than new and unmanaged. The emergence of OSB, MDF, and plantation-cloned eucalyptus means that the quality of the forest will dictate the quality of products in fewer and fewer segments of the industry. The separation of forest quality from final product quality will make generating the largest amount of raw fiber the priority instead of creating as natural a forest as possible.

The drive towards standardization and consistency is relentless and inevitable in all except small niche markets. Under the circumstances sustainable producers need to seek out opportunities that go beyond the traditional production of sawnwood products.

Increasing Resource Efficiency

Over the last several decades technological advances have enabled the industry to produce more forest products from the same amount of wood. This technological revolution helps explain why growth in industrial roundwood consumption has only risen by about 1.3% per year over the past decade, while consumption of many categories of forest products such as paper and panels has grown more rapidly. In the paper industry, alkaline pulping technologies and improved papermaking machinery have allowed the industry to post impressive efficiency gains. Similarly, the panel industry has flourished on its ability to use scrap materials that would otherwise be used as boiler fuel.

Environmental Implications of Improved Resource Efficiency

Industry managers quietly worry that the opportunities for dramatic efficiency improvements may be, for the most part, exhausted. Should this be the case, rising demand for final products will translate into higher demand for industrial roundwood. Such a scenario would exacerbate the already tight supplies predicted above. In any event, the industry's emphasis on efficiency could mean that in the future sustainable forestry may attract less attention from the industry.

As resource efficiencies become more important and natural forests scarcer, more efficient systems and technologies will probably take firmer root in the Southern Hemisphere's industry. Today harvesting and milling in these regions is enormously wasteful. At present these operations convert just 25-30% of the wood used to product, compared to rates of 45-50% in more developed regions. These figures do not include the salvage of residuals, such as bark and sawdust, which has not started in most of the Southern Hemisphere.

Industry under Pressure for Certification of Environmental Quality of Forest Products

The development of forest management certification constitutes an "early stage" driver of change in the forest products industry. The extent or speed of its impact is difficult to predict, and is likely to vary greatly among different countries and regions.

Industry Involvement in Certification

The concept of certification emerged from the nongovernmental sector as a voluntary, nonregulatory, market-based mechanism to improve forest management on the ground. Gradually, industry, mainly through its trade associations, has become engaged in the debate over certification programs,

with associations in Europe, Canada, and the United States leading the way. Few major companies, however, publicly endorse certification. Nevertheless, some experts expect certification to reshape the forest products trade over the next ten years. Proponents predict that forest product certification will become as widely accepted and essential for market access as the Underwriters' Laboratory (UL) seal of approval on electrical appliances. On the other side, trade associations, such as the U.S. International Hardwood Products Association, dispute both the need for and value of certification. They contend that certification will only apply to a niche market of particularly environmentally conscious consumers.

Despite the diversity of opinion, some in the industry have accepted that market pressures for sustainability of one kind or another are here to stay. They consider participation the best strategy to help shape certification to meet their needs. That reasoning led Sweden and Finland to initiate third-party certification programs in 1997.

Forest Management Certification Programs

Industry and environmentalists have different ideas about certification programs, however. Conservationists advocate independent auditing of the management practices of specific forest sites by third parties as represented by the Forest Stewardship Council (FSC) program. Industry prefers schemes that it develops, which take a "continual improvement" approach, and are not subject to independent scrutiny. Such schemes include the U.S. American Forest and Paper Association Sustainable Forestry Initiative (SFI), and the U.K. timber trade's "Woodmark" system. Other producing countries are developing their own systems. There is also significant industry support for development of an international environmental management systems (EMS) standard, modeled on and promoted within the ISO system, a global standards body.

Industry generally resists the certification program advocated by nongovernmental organizations (NGO) for several reasons. Many in industry contend that forests are already managed sustainably, and that certification is, therefore, unnecessary. The also maintain that it is too expensive, especially for small private landowners; that it sets unnecessarily high standards; and that there is no significant market demand for certified product. Nor does the industry want to submit itself to an assessment by outsiders, or make information on its performance publicly available.

Demand for Certified Forest Products

Certified forest products have given a name and a process to a market demand for wood produced in an environmentally sound fashion. At present demand for certified forest products exists mainly in western European and, to a lesser extent, North American markets. Buyers groups, made up of companies that want to buy certified products, are stimulating corporate demand. The creation of such groups is helping to educate major corporate and institutional forest products buyers, as well as end consumers about forest management and the role they can play through their buying decisions. Although final consumer demand is weak, buyers groups may kick-start greater demand for certified forest products.

Drivers of Certification

Clearly, producers in countries that supply the environmentally sensitive markets of Europe—such as Gabon, Cote D'Ivoire, Cameroon, Indonesia, Malaysia, Brazil, Sweden, Finland, and Norway—have the greatest incentive to pursue certification. Yet some companies, wood chips' producer Ston Forestal in Costa Rica, for one, appear to have pursued certification to demonstrate their environmental commitment to the government and the public.

Environmental Implications and Opportunities Created by Certification

- If large players in any major producing country "break from the pack" and seek FSC-type certification, the move is likely to induce competitors to follow suit to protect their market share. First movers stand the greatest chance of securing market share, and of potentially regaining any share previously lost to timber boycotts. Under this scenario, widespread changes in on-the-ground forest management practices could contribute significantly to the certification movement.

- In developing countries, companies that become certified could set a new standard for forest management at home. Such demonstrations of state-of-the-art forest management could help to redefine accepted practices over the long run and ensure access to concessions and other government incentives.

- If certification becomes a de facto requirement for access to European or other environmentally-conscious markets, as some experts predict, it could have a strong impact on improving forest management worldwide.

Increasing Government Regulations of the Industry's Forest Management Practices

Worldwide, national, provincial, and local forestry management regulations are increasingly defining the industry's access to raw material, the terms of international trade opportunities, and forest management practices. Forestry regulations are fairly well established in developed countries. In developing countries regulation ranges from practically nonexistent to significantly structuring trade and opportunity. Every country in the world is now engaged in a serious debate over how forest assets should be managed, and more regulations are sure to come. New rules generally increase harvesting costs, either by forbidding certain types of cuts, or prohibiting logging of certain areas, such as watersheds and habitats. They are also reducing the overall harvest of wood from natural forests.

No international agreements exist strong enough to materially affect forest management practices yet, but a number of developments may make such accords more plausible in the future:

- The near-certain failure of the International Tropical Timber Organization's attempt to achieve forest management sustainability by the year 2000 is quite certain to be the catalyst for some sort of international agreement on forest practice.

- The United Nations Commission for Sustainable Development's examination of forest practices will put modest pressure on countries to improve their management.

- The ability to use satellites to monitor forest management practices at a reasonable cost is arming NGOs and international bodies with much better information, which they will use to lobby for better forest practices.

- If governments take action on global warming, the forest products industry will be a target. Their actions would quite likely include greater restrictions on harvesting natural forests, which would diminish wood supplies in the short term; while incentives for reforestation to create "carbon sinks" would increase supplies long term.

The Pulp and Paper Industry

The following three sections analyze pulp and paper, panels, and sawnwood industries, identifying opportunities for and obstacles to the development of a more sustainable forest products industry. Even though sustainable forestry takes place in the forest, its success ultimately will depend on product end-use. These three industry segments represent the