



Global Forest-Products Markets and Canadian Wood Supply

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1. Introduction

Canadian forests and forestry are influenced by global drivers of forest products demand and domestic forest product demand and supply issues. Global demand for a range of products from forests, including fuelwood, sawnwood, pulp, and non-timber products, influences the profitability of the industrial sectors as well as land-use and silvicultural decisions. Canadian timber supply is affected by these global factors as well as domestic land-use factors, forest values, climate conditions and a range of other factors. This paper examines some of the major influences on forest products demand and supply / consumption in order to construct a set of scenarios that may arise from key combinations of social, economic and ecological factors. Net global forest demand for forest products is examined to assess demand factors and non-Canadian supply factors and the influence of the net effect on Canadian forests. Canadian supply is examined in the traditional sense of timber supply – that amount available for harvest (and typically allocated as annual allowable cut) after consideration of growing stock, growth and yield, and conservation requirements.

Global demand for forest products and Canadian timber supply have been remarkably stable over the past 50 years. There are signs, however, that some of the fundamental relationships underpinning global demand and Canadian supply may be changing resulting in significantly different outcomes for forests, forestry and land use in Canada. These changing fundamentals include the emerging market for bioenergy and the impact of this market on land use, and the changing social values around conservation, protected areas and Aboriginal traditional land uses. The factors that underpin forest-products markets and Canadian wood supply are briefly reviewed in the next section.

2. Global Forest Products Markets in the Context of Canada’s Forests and Forest Sector

Major factors affecting the demand for forest products include (global) income; population; prices of other goods (substitutes or complements); consumer expectations about the future; consumer tastes and preferences, including environmental preferences and preferences for wood and wood products; and technology. Some of the main driving forces expected to have a significant impact over the next 50 years are:

- **Income and Population Effects:** Global population is expected to continue to grow placing additional pressure on forest resources and increasing demand for forest products.



Incomes are also expected to grow, perhaps most rapidly in China, India, Brazil and other emerging economies, increasing demand for forest products as well as for land-use conversions. However, the composition of the demand for forest products may change significantly with increasing incomes. Per capita consumption of wood fuel tends to decline as incomes increase, because people switch to more convenient types of energy. Increasing global incomes may generate land conversions to agriculture to provide livestock products, resulting in reductions in areas of forest and global supply of forest products. Increasing incomes in Canada may increase pressure for forest conservation and protected areas, thereby affecting wood supply.

- **Bioenergy Technology and Policy:** A desire to address climate change through the increased use of bioenergy may have a significant effect on global forest products demand. Roberts (2007) suggested that there has been and will continue to be a merging of markets for food, fuel and fibre as land uses will support all of these product markets. Increasing bioenergy demand will affect forest-products markets by potentially removing lands from forests (converting to agricultural-based bioenergy) and/or by increasing the demand for forest fibre as a bioenergy product.
- **Social Values for Conservation:** Increasing environmental concerns, including concerns over old-growth forests, demand for non-timber forest products and ecological goods and services, more responsible uses of wood, alternative materials, and recycling, will result in changing patterns of wood consumption and timber supply.
- **Climate Change:** Changing climatic conditions may increase the scarcity of forest products on a global scale and reduce Canadian wood supply. Climate-change-related events, like the mountain pine beetle outbreak, will also have a significant effect on Canadian wood supply over the next 2-3 decades.
- **Technological Change:** Technology will generate efficiency improvements that can provide more fibre per unit land area in forest. However, technological improvements in food and bioenergy areas will generate competition for land and result in land use changes that may result in increase scarcity of forest products. Improvements in the development of structural materials and electronic media, including substitutes for wood and paper, may reduce net global demand. The net effect of technological change will depend on the rates of innovation and adoption across food, fibre and fuel production systems.

3. A Look Back: Global Forest Products Markets and Canadian Wood Supply over the Past 50 Years

Global forest-products markets have been characterized by relatively slow increases in consumption over the past 50 years, and nearly stagnant consumption over the past 15 years. This relatively slow growth in consumption has been coupled with increases in supply of fibre, especially in the southern hemisphere. Increases in plantation forests and faster growing varieties, technological change and cost efficiencies have resulted in a general decline in prices for forest products over time (Roberts et al. 2004). The emergence of new products (bioenergy), growing



economies, climate change, and conservation efforts may change this price trend.

Net Global Demand and Consumption

Global wood consumption has been increasing but at a relatively low pace (Figure 1). In the last 20 years the average global consumption of wood increased on average only 0.3% per year, and the estimated annual wood consumption is approximately 3.5 billion m³ (FAO 2007). Industrial logs comprise approximately 50% of this volume (FAO 2007). Growth in population and income that increase demand have been offset by the availability of substitute materials, technological change (utilization efficiency) and yield improvements.

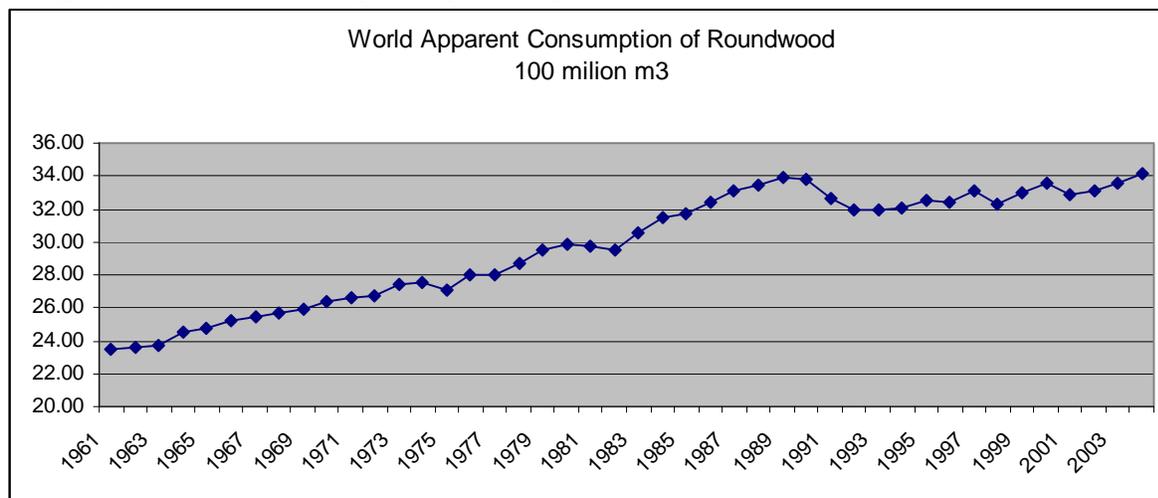


Figure 1. World apparent consumption of roundwood. Source: FAO Timber Database

Canadian Wood Supply

As measured by the annual allowable cut (AAC), wood supply in Canada has been remarkably stable over the past 30-40 years (Figure 2). AAC levels declined in the mid-1980s but rebounded in the 1990s and have been relatively constant for the past 15 years. There is little change in AAC as increased concerns over conservation that reduce the AAC have been offset by improvements in inventory, forest protection, and other factors that increase AAC.

While AAC levels have been relatively constant, AACs are regulatory tools and are not measures of wood supply directly. Annual wood supply may differ significantly from AAC depending on biological and economic factors. Estimates of the annual harvest/AAC ratio are highly variable. For example, the harvest/AAC ratio for British Columbia was recently reported as 95% while the ratio for Ontario, Quebec and Alberta was 58%, 66% and 76%, respectively (CCFM, 2005). Area of harvest has fluctuated modestly over the past few decades, varying between roughly 800,000 and 1,000,000 ha/yr for the past 30 years (CCFM, 2006). Total area of harvest peaked in the late 1990s, and has been declining since then. The changes in area of



harvest have arisen from land withdrawals from forests, changing practices arising largely from conservation concerns, and adjustments to periodic disturbances (fire and insects).

Potential Harvest / AAC for Canada 1957-2004
Source: National Forestry Database Program, Wood supply Introduction.
http://nfdp.ccfm.org/compendium/harvest/index_e.php

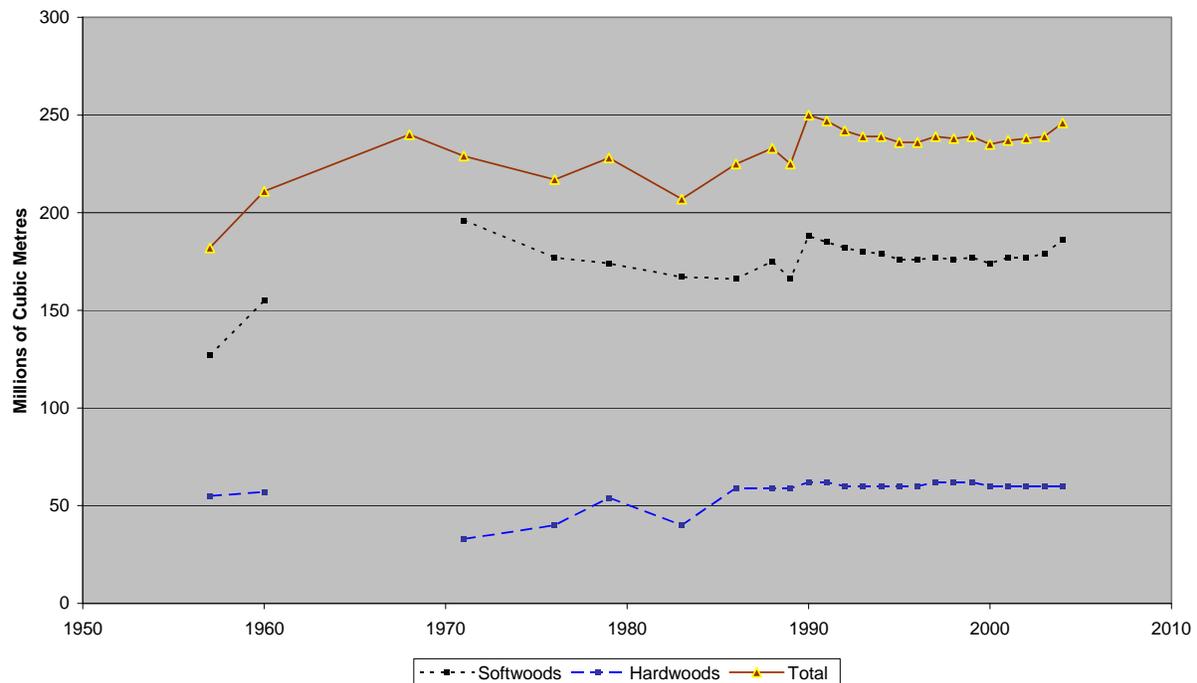


Figure 2. Total annual allowable cut of timber for Canada, 1957-2004.

4. A Look Ahead: Global Forest Products Markets and Canadian Wood Supply for the Next 50 Years

Net Global Demand and Consumption

Income and population increases will continue to generate modest increases in global demand for traditional forest products. These demands will arise largely from increases in population and income in Asia (China/India). However, supply increases in the southern hemisphere will likely be able to satisfy such demands if no other factors influence forest land use and area. The key uncertainties that generate alternative scenarios arise from changes in energy markets and policy and changes in land use.

Increasing demand for energy and the development of alternative energy sources, particularly biofuels, may be significant. Biofuel from forest products could increase the value of forested land and help promote sustainable management. However, biofuel can also be produced from annual plants, and this could increase competition with forests for land use. Biofuels production



will compete with food production. It is unclear whether forest area will be converted to farmland to provide bioenergy from annual crops, or whether forest cover will increase in response to bioenergy demands. If forests are converted to farms to provide bioenergy, global forest-product market prices may rise significantly as scarcity in traditional forest products increases. Even if land remains in forest but the end uses of wood fibre are increasingly bioenergy rather than lumber or pulp/paper, forest product prices will increase. The extent of land-use change and/or the shift to bioenergy as a forest product will depend on energy markets as well as policy processes. Current policies designed to achieve large percentages of energy supply from renewable fuels will result in shifting land uses and product mixes associated with forestry.

In addition to changes in land use because of bioenergy markets, agricultural markets will affect land use. Increases in the demand for meat, dairy and other farm products, arising from increasing incomes in the Asia and elsewhere, will generate increasing land-use conversions from forests to agriculture. This will increase forest-product scarcity and prices unless technological advances in agriculture and forestry (including biotechnology) can increase yields of food and forest crops.

Net global forest demand will also be affected by global environmental concerns. Pressures may include increases in protected areas and conservation for the provision of ecosystem goods and services. These concerns will likely result in reductions in areas available for timber harvest and increases in costs of production.

While most analysts have been predicting a continual increase in abundance of forest fibre because of forest developments in the southern hemisphere and relatively stagnant demand for fibre, Roberts (2007) suggested that five factors may generate scarcities in wood fibre – economic growth in Asia, changing Russian institutions, reductions in illegal logging, insect infestations (including mountain pine beetle) and bioenergy. The outcome in terms of future forest products demand will depend on the relative strength of these factors.

Canadian Wood Supply

The future of Canadian wood supply depends in part on global net demand for forest products and the extent to which Canadian timber production is profitable in the face of global conditions. It also depends on a series of key Canadian ecological, economic and social factors. These factors are outlined below.

The relative strength of demands for forest land to be used in conservation (including protected areas) and multiple uses (including carbon management) versus fibre or bioenergy production will directly affect the extent to which Canadian forests contribute to wood supply. Increases in Aboriginal rights to forest resources may increase the conservation and multiple-use components of this relationship.



The competition between bioenergy markets and fibre markets will influence area in forest (at the agriculture / forest margin) and the degree of use of forests for fibre supply. Similar to the interplay of fibre, fuel and food markets in global markets, the extensive / intensive margin in Canada will be affected by potentially high returns to bioenergy and agricultural use, rather than conventional timber production.

Climate change may significantly affect forest productivity and security of wood supply. Increased uncertainties arising from disturbances will reduce interest in investment. The mountain pine beetle, for example, will have an impact on wood supply decades into the future and other climate-change-related disturbances may also arise resulting in significant reductions in wood supply and wood quality.

Forest policy will influence area in forest and wood supply. Policies regarding the use of modified tree species or hybrid species and policies that reduce incentives for plantations and intensive management directly affect wood supply and forest area. These policies will be particularly important as pressures for the use of land for bioenergy production increase. The use of biotechnology may allow Canadian firms to benefit from increasing global scarcity of fibre, but conservation concerns may preclude the uses of such technologies.

Most models of Canadian wood supply project modest declines over the next 30-50 years (Daigneault, Sohngen, and Sedjo, 2007; Sohngen, Mendelsohn, and Sedjo, 1999; Sohngen, Mendelsohn, Sedjo, and Lyon, 1997; Haynes, 2003). Some of this decline is expected to arise from declines in area of northern natural forest harvest due to conservation concerns and increases in plantation forestry abroad. These models, however, have not captured the recent changes in bioenergy demands and technology.

5. Four Future Scenarios

Four possible states of the world in 2050 are presented below. They embody starkly different futures for total global demand for wood and wood-based products as well as for the supply of commercial timber from Canadian forests.

- I. *High net global forest products demand and low Canadian timber supply:* In this scenario, the net global demand for traditional forest products increases because of land use shifts to bioenergy and agriculture and because of increased climate-change impacts affecting other supply regions. Global incomes and populations have risen and demand for forest products has increased steadily. Canadian timber supply is similarly affected by climate change making forest management on extensive land bases challenging. Conservation programs including expansions of protected areas networks, conversion of land to agriculture, and more clearly established Aboriginal rights result in decreases of wood supply. Forests are managed for ecosystem goods and services to a much greater extent than they were in the past. Consolidation has continued within the Canadian forest-products industry and globally, but Canadian



- firms benefit from strong global markets and focus their resources on smaller areas of productive forest lands. A combination of intensive management and effective use of materials for bio-products results in a forest industry based on a relatively small area of land that is managed on a sustainable basis. Many rural communities that had traditional forest-products mills now rely on energy (non-renewable and bioenergy) for their economic base.
- II. *High net global demand and high Canadian supply:* As in scenario I, global demand for forest products is high because of land-use shifts, climate-change effects, and continuing growth of incomes and populations worldwide. Forests in other regions are increasingly used for bioenergy as climate-change considerations and impacts preclude their use for structural materials. Canadian timber supply, however, remains high as there have been few increases in protected areas, losses of forest land due to land use changes or changes in Aboriginal rights associated with reductions in timber supply. Forests are managed primarily for fibre in both intensive and extensive management regimes. Hybrids are used in intensive management as technological improvements have been incorporated into regeneration practices. Canadian forests play the role of meeting demands for fibre that have historically been filled by other supply regions. Commodity prices for forest products drive forest management and the employment base in rural Canada maintains forestry as a core component.
- III. *Low net global demand and high Canadian supply:* Potential timber supply from Canadian forests remains high as forests have not been adversely affected by climate change, annual allowable cuts remain high and land-use changes (from conservation or conversion) have not had a significant effect on fibre supply. However, net global demand is low because other parts of the world (Asia in particular) have become a competitor for Canadian wood supply and the growth in incomes and population has not been significant enough to generate substantial increases in global demand. The result is a timber economy with low margins and high fluctuations in margins based on economic cycles and climatic events. Firms in Canada are commonly on the margin. Trade disputes continue as Canadian firms attempt to provide fibre into markets where domestic firms are also struggling in weak markets.
- IV. *Low net global demand and low Canadian supply:*
- Global net demand declines and Canadian timber supply also decreases as conservation and land-use changes remove lands from consideration as forest producing regions. Consolidation of forest products firms occurs with a few highly specialized producers remaining in highly productivity areas. Communities in rural areas are no longer based on conventional industrial forestry. Some have changed to be centres for agriculture and bioenergy sectors while others have turned to recreation and tourism for their economic base.



6. Conclusions

The key issues influencing wood supply in Canada, in the face of changing global net demand for forest products, include:

- The relative strength of demands for forest land to be used in conservation (including rights to Aboriginal people for traditional uses and protected areas) and multiple uses (including carbon management) versus fibre or bioenergy production.
- The competition between bioenergy markets and fibre markets and the degree of use of forests for fibre supply.
- Climate change effects on forest productivity and security of wood supply and the resulting influence of these uncertainties on investment.
- Forest policy including policies regarding the use of modified tree species or hybrid species and policies that reduce incentives for plantations and intensive management.
- Global market changes including increasing demands for fibre, food and energy as a result of increased incomes and populations (the net effect of these demands will generate significant changes in land use and net forest products demand).
- Most current models of wood supply project modest declines over the next 30-50 years. These models, however, have not captured the recent changes in bioenergy demands and technology.

The four scenarios provided reflect potential outcomes of the interplay of economic and environmental factors. Most analysts have suggested that forest product prices will continue to decline and that Canadian timber supply will also decline in the face of conservation pressures and land use change. However, recent trends in energy markets, energy policy relating to climate change, global income and population, and climate change itself suggest that very different futures are possible if not likely.

7. Literature Cited

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Table 1. Global Forest Products Markets and Canadian Wood Supply influences on other forest drivers.

Driver	How Global Forest-Products Markets and Canadian Wood Supply Affects the Driver
Climate Change	Little direct influence except through releases of greenhouse gasses via land use conversion.
Geopolitics	Little direct influence except for governance
Global Energy	Forest land uses may increasingly become substitutes for fossil fuels.
Technology	Little direct influence
Aboriginal Empowerment	Depending on market conditions empowerment may be more easily achieved or more challenging. Strong product markets and a continuation of forest uses for fibre or bioenergy may adversely affect moves to increase traditional land uses.
Ecosystem Health	Strong product markets, including bioenergy markets, changing land uses, and wood supply may have adverse effects on ecosystem health.
Competition for Resources	Significant competition will arise if global market are strong. Competition between market goods (fibre, fuel and crops) as well as nonmarket goods (ecosystem services, traditional land uses) will occur.
Societal Values	Little direct influence although changes in land use may stimulate increase interest in conservation.
Demographics	

Table 2. Influence of other Drivers on Global Forest Products Markets and Canadian Wood Supply.

Driver	How the Driver affects Global Forest-Products Markets and Canadian Wood Supply
Climate Change	Climate change will affect forest productivity (growth, succession, disturbances) worldwide. Some forests will prosper, many others will decline. Increasing levels of disturbances will increase uncertainty in wood supply and affect market returns.
Geopolitics	May influence forest products market through land use and property right security.
Global Energy	Rising oil prices and greenhouse gas management policies will make the market for biofuels increasingly attractive. Alternative market opportunities for forest land may emerge. Conversely, conversion of forest to annual cropland may emerge as the response to bioenergy demand.



Technology	Biotechnological development: Increased productivity; Improved wood characteristics; Higher industrial yield. However, technology will also be improving in agricultural sectors potentially resulting in land use changes and in bioenergy resulting in changes in products produced from forest lands.
Aboriginal Empowerment	Aboriginal empowerment may lead to more secure forest land for multiple uses (wood supply, ecosystem services, and traditional uses).
Ecosystem Health	Changes in ecosystem health will directly affect wood supply by affecting forest productivity. Detrimental effects may include susceptibility to disturbance (insects), changes in carbon cycling (affecting forests ability to contribute to carbon management) and forest productivity reductions.
Competition for Resources	Competition for resources may be significant on the agriculture / forest margin with the convergence of markets for food, fuel and fibre. Changes in this margin may significantly affect wood supply.
Societal Values	Societal values may influence area in forest and the extent of uses of forest land. Increasing demand for conservation may result in reduced wood supply, while demand for bioenergy could generate increases in wood supply – although for energy rather than timber.
Demographics	Changing demographics may affect labour costs and influence wood supply via costs of production. Demographic trends may result in changes in the demand for environmental services that may reduce wood supply opportunities.