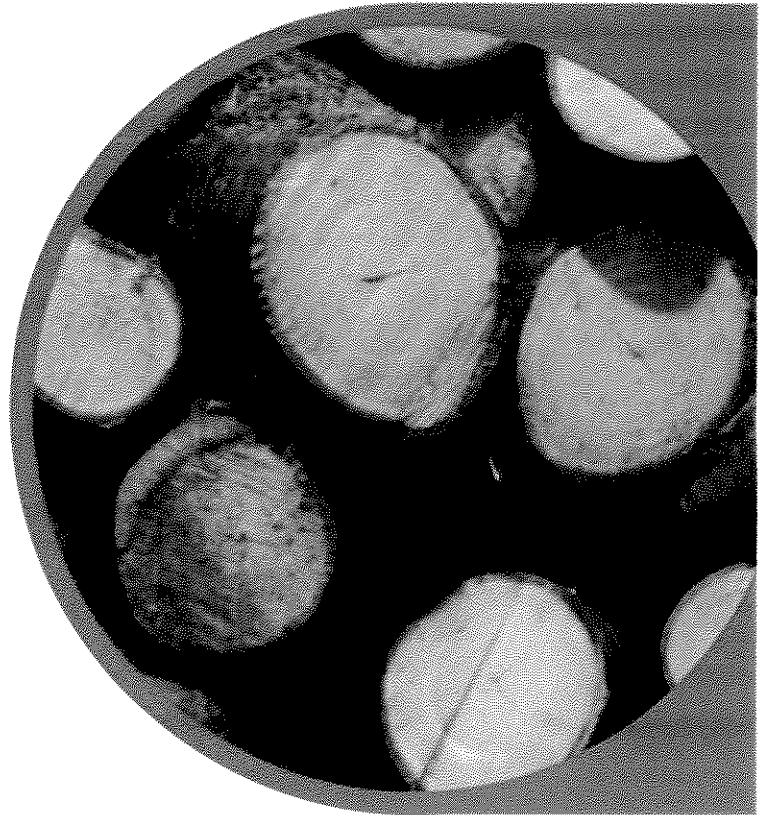




The BioBusiness Alliance
of Minnesota™

Minnesota's Forest Biomass Value Chain: A System Dynamics Analysis

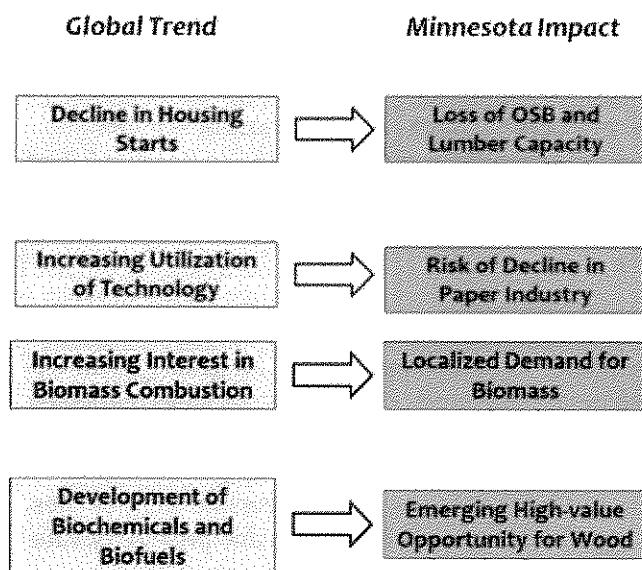


Executive Summary

Minnesota stands at a crossroads. The forest products industry of past decades is rapidly changing, creating both short-term challenges and short- and long-term opportunities for the state. Minnesota has the opportunity to excel in manufacturing sustainable, renewable forest-based products, including biochemicals, biofuels, and biomass heat and power. The challenge that lies ahead for Minnesota will be to capitalize on the promise of these new technologies, while supporting the continued health of more traditional forest products industries, including paper, lumber, and oriented strand board (OSB), which are critical to the state's economy. The following systems analysis will attempt to tackle this challenge.

Forest products remain big business in Minnesota. In 2009, it accounted for 40,400 jobs throughout the forest products industry value chain and 3.2 billion dollars in economic activity. The state's forest products industries, however, have not been immune to the global economic downturn. Traditional industries are being shaken to their core by the ongoing housing crisis, changes in the way information is consumed, and competition from growing worldwide manufacturing capability. Since 2007, three of the state's five OSB mills have shut down, and the state's consumption of wood for industrial processing has dropped by over 1 million green tons, representing a 20 percent drop. Meanwhile, the state's pulp and paper industry, which accounts for 60 percent of the wood consumed in Minnesota, has managed to avoid plant closures. Overall, there is a 3.2 million green ton surplus of wood as compared to historical supply data and economic price thresholds. As a result of the reduction in demand, chronic underutilization of the Minnesota forest resource has placed the state's logging infrastructure at risk of permanent decline. In the future, if demand for forest products increases, the greatest risk will not be a shortage of wood, but rather an inability to procure the wood due to the lack of loggers and equipment.

Figure 1: Impact of Global Trends on Minnesota's Forest Products Industries



The decline in forest utilization is also threatening Minnesota's ability to implement and improve forest management programs. These programs – which are designed not only for timber harvest, but also for fire risk management, wildlife habitat enhancement and ecological health – are critical for balancing the multiple uses of the forest in a sustainable manner. While managed wood harvests do not ensure all of these sustainable activities happen, they are an important component of the system that sustains forest health.

As these economic forces are challenging traditional forest product industries, other market forces are creating new opportunities for wood utilization. Interest in alternative energy has risen across the world in response to growing concerns over carbon emissions, energy trade balances, and higher fossil fuel costs. Wood is increasingly being

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turned to as a fuel source for heat and electricity in European countries and in some parts of the United States. This growing interest in renewable energy has also resulted in new technologies being developed for producing transportation fuels and biochemicals from organic cellulosic materials. Fortunately, Minnesota has been at the center of this development activity for years.

These emerging industries could help provide a stable market for wood in the long term, provided that these new uses can be balanced with the needs of the state's traditional forest products industries. Recognizing the need for careful analysis of these markets, The BioBusiness Alliance of Minnesota partnered with the Minnesota Department of Natural Resources and the Minnesota Forest Resources Council to identify issues and opportunities in the growth of biomass-based industries, particularly those relating to forest products. A one-year analysis engaging more than 100 experts from industry, academia and government, along with development of a System Dynamics (SD) computer simulation model, has culminated in four recommendations and related actionable tactics that are detailed in this report. These recommendations are summarized below.

Recommendation 1: Ensure long- term supply of raw materials through forest management and increasing utilization.

Why: Maintaining forest management capability and long-term supply is a prerequisite for successful long-term growth in any forest-based industry. Furthermore, underutilization of Minnesota's forests is threatening Minnesota's logging infrastructure.

Tactics: Minnesota must continue investing in programs that maintain and improve the ecological health of the forest in both the short and long term. These programs should encourage sustainable management techniques that ensure forests continue to play the aesthetic, recreational, and habitat roles that are important to Minnesotans. At the same time, programs must be implemented to ensure the health of the logging industries. Activities must be undertaken to ensure access to wood for the logging industry, develop forest-based markets, and support programs that ensure loggers have access to capital necessary to keep the industry competitive globally.

Recommendation 2: Support efficient utilization of wood for heat and power generation.

Why: With the slowdown in traditional forest products industries, biomass combined heat and power (CHP) generation presents an opportunity to develop markets for Minnesota's timber industry. Technological barriers are relatively low, and manufacturing capability can be established quickly. In addition to sustaining the industry infrastructure, ramping up biomass heat and electricity generation would help the state achieve its goals of greenhouse gas emissions and energy efficiency savings while reducing its reliance on fossil fuels.

Tactics: Existing policy tools should be expanded to create incentives for proper utilization of wood energy. This includes providing credit toward the Conservation Improvement Program goal of 1.5 percent energy savings for energy produced in biomass powered cogeneration facilities owned by regulated utilities. The long-term vision is to encourage outcome-based energy standards that focus on efficient renewable energy production. Additionally, tax credits for expenditures on wood energy equipment should be comparable to tax credits for other types of renewable technologies. These investments would be a significant step in getting loggers back to work and provide private landowners a return on their land that can keep "forests as forests."

The SD model produced for the current analysis predicts that 800,000 green tons of wood utilized for pellet manufacturing and an additional 400,000 green tons being consumed in CHP markets is sustainable without causing harm to existing industries. This growth in market demand would add a total of 570 direct jobs to Minnesota's economy. It is important to note, however, market growth beyond these levels could result in diminishing returns in employment as producer competition for feedstock would drive up prices and negatively affect market dynamics. This potential reinforces the need for careful analysis by policy makers and the private sector prior to making strategic investments.

Recommendation 3: Actively pursue emerging high-value opportunities.

Why: Long-term policies and action should focus on creating maximum value from the forests. This is because higher value emerging industries, such as advanced biofuels and biochemicals, can sustain themselves in the longer term, just as lumber and paper have stood the test of time for over a century.

Tactics: Integration of advanced biofuels and biochemicals with the forest biomass supply chain infrastructure needs to be supported, as these high-value industries are quickly developing technologies for commercial-scale manufacturing. Industries across Minnesota that produce and utilize biomass, including those in the agricultural and forestry communities, need to work together to explore and foster commercial manufacturing partnerships. Further, by helping set a strategic direction and providing assistance for capital expenditures, the state can play a critical role in diffusing risk for the razor-thin margins under which commodity processing industries operate. The SD model created in the current analysis suggests that these efforts would result in the recruitment of jobs at biochemical and biofuels production facilities. If 800,000 green tons of wood are consumed in these industries, the model shows 325 jobs created in northern Minnesota for logging and initial bioprocessing, with a total of 620 created across the value chain. Furthermore, these industries can support efforts to retain traditional industry in the state through stable, profitable partnerships.

Recommendation 4: Foster cooperation in the implementation of these recommendations.

Why: Enormous potential exists if Minnesota can manage its forest biomass supply chain in such a way that creates opportunity for both traditional and emerging forest-based industries. Yet, none of this will be possible without an unprecedented level of cooperation, where communities across greater Minnesota pursue opportunities for biomass processing as part of an integrated statewide strategy that marries old with new, higher value with lower value.

Tactics: Fostering collaboration among forest-based economic development groups is critical, given the pressing need to increase wood utilization in the short-term. Minnesota's strength in the diversity of biomass feedstock that grows here needs to be recognized and built upon by the agricultural and forestry communities.

As the state pursues these new opportunities in emerging forest products, it will be critical that these efforts be pursued in such a way that they do not negatively impact more traditional industries that compete for the same sources of biomass. This report provides a research-based, data-driven analysis that was designed to provide the foundation for a consolidated statewide strategy. It offers a strong vision with actionable implementation tactics for forest biomass utilization that maximize

the value of the state's forest resources from an economic, recreational, and ecological perspective for now and the future.

Economic Impact of Recommendations

Utilizing the SD model, it is predicted that implementation of these recommendations would result in a net gain of 700 direct jobs in the state of Minnesota; 1,400 jobs are created when including indirect and induced jobs. Furthermore, assurance of a long-term stable supply of wood could spur additional investments in the forest products industry. An estimated 1,500 direct jobs and 3,300 jobs when including indirect and induced impacts are likely to be created in the 'best case scenario,' which includes expansions in lumber, OSB, paper production, pellet manufacturing, heat and electricity production, and aggressive investment in biofuels and biochemicals.