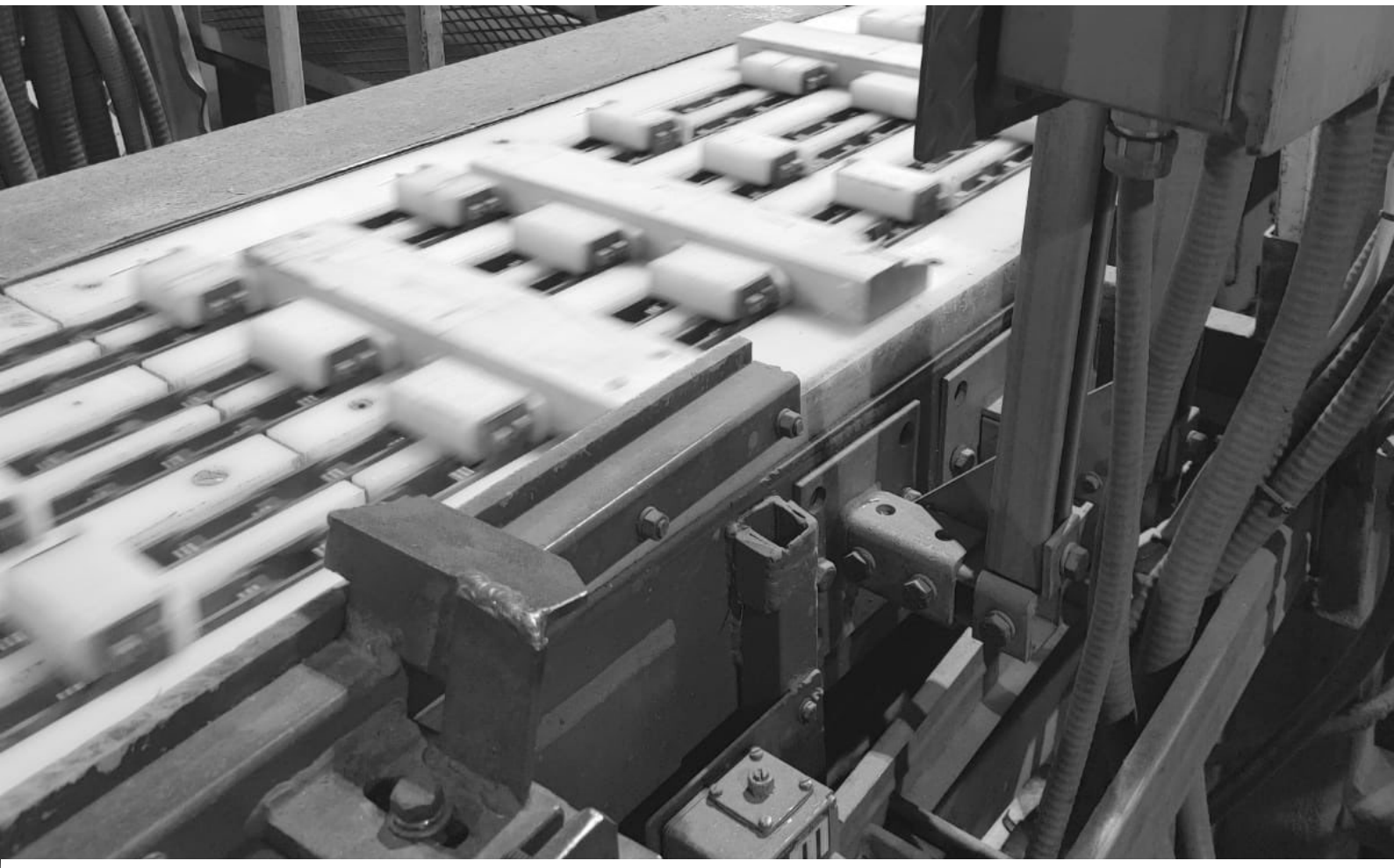
Toward a Sustainable and Resilient Forest Sector

Report

THE UNIVERSITY OF BRITISH COLUMBIA
Faculty of Forestry

Mitacs

CITY OF Quesnel



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Executive Summary

Building an inclusive forest sector that constitutes existing large and locally-driven small and medium businesses in the landscape involves creating conditions that foster networks of learning and innovation. The Vibrant Forest Landscapes Lab at the Faculty of Forestry, University of British Columbia, aims to uncover how interactions within the Quesnel forestry network can improve innovative opportunities for Quesnel. The research project involved in-depth interviews and a social network mapping exercise with 29 research participants representing municipal, provincial, and First Nations governments, universities, primary industries, secondary industries, supporting services, and non-governmental organizations in the Cariboo region. From this study, the recommendations to the Forestry Initiatives Program are:

1. Continue to foster relationships and trust with local actors and additionally build new connections with industry associations to gather industry-specific knowledge and resources for local small and medium enterprises that seek to enhance their business. Connecting with associations may help small and medium enterprises identify future business trajectories, learn about the incremental changes implemented by other members of the association, and improve the process to minimize the perceived risks of innovation.
2. Use the community forest development process as an avenue for various local actors to engage in knowledge exchange and trust-building. Establishing a common vision and securing commitments may encourage local actors to use their expertise to address landscape problems and improve social, economic, and environmental benefits.
3. Expand opportunities for small and medium enterprises through the community forest by providing more options for obtaining product inputs and a platform to connect with a wider network. More diverse and reliable local source enables the industry to provide goods and services at different scales to different types of consumers.
4. Advance a training initiative to attract and retain employment in the primary and secondary sectors to prepare for future forest industry that prioritizes climate change adaptation.
5. Conduct further network research that include more influential, high-level actors that are involved in the decision-making process at the provincial level and study alternative business models that can help minimize the barriers to innovation identified by research participants.

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1. Introduction

Forests have played a significant role in improving the livelihoods of many communities in BC. However, the BC forest industry has been facing immense challenges in responding to the rapidly changing context at regional and global scales. The Mountain pine beetle epidemic and wildfires have drastically reduced the timber supply, which caused mill closures and shift reduction across BC. Research shows that these two phenomena are highly interrelated and closely linked to climate change[1]. A growing public awareness of climate change is encouraging forest industries to adopt sustainable practices and create new, higher-value products to increase timber utilization.

The increasing global wealth is likely to expand the potential consumer base for these sustainably-produced paper and wood products. The emerging market will come from countries with increasing value-added sectors such as Vietnam and China[2]. Both countries have been able to revamp their forestry and business practices in recent decades. Collective actions to maximize this market potential are needed if BC is to protect its environment and maintain income from forestry.

Following the passing of the Declaration of the Rights of Indigenous Peoples Act into law in 2019, the BC government is starting to look into transition pathways that prioritize the well-being of the people that are reliant on the forest sector[3]. The future of forest policies and regulations must allow for inclusive forest governance by accommodating the rights of the Indigenous Peoples and favoring a bottom-up decision-making process. This process might challenge the way the forest industry has been operating in the province, but inclusivity more often creates an enabling environment for sustainable and resilient forest industry in the long run. This is important for the continued vibrancy of the BC forest sector.

In Quesnel, multiple measures have been applied to address these converging issues. In 2018, the City of Quesnel initiated the Future of Forestry Think Tank to bring together the provincial government, forest industry, funding organizations, research institutions, and universities in exploring new opportunities for moving towards a more sustainable and resilient forest sector in Quesnel. Several topics that emerged from the discussion are (i) ecological and social system resilience, (ii) innovation and sustainability in manufacturing, and (iii) training, education, and research.

The City of Quesnel established the Forestry Initiatives Program in 2019 to facilitate collaborations amongst different players in the forest sector to help achieve the intended goals. This includes facilitating discussions between

research groups, industry, and other interested parties in fostering innovation in manufacturing, implementing the Community Wildfire Protection Plan (CWPP), and leading the community forest agreement application with local First Nation communities.

Mitacs Accelerate Research Project

Advancing community-based forestry and innovation is the major focus of the City of Quesnel's Forestry Initiatives Program. The City of Quesnel is currently in the process of partnering with local First Nations to establish a community forest in the Quesnel Timber Supply Area. The proposed community forest would allow for a holistic approach to forest management that could provide economic, social, and environmental benefits for the communities.

The Forestry Initiatives Program has also begun to explore innovations in sustainable forest management practices, engineered wood products, and new bio-products ito stimulate the competitiveness and the resilience of the local industry. The BC government identified four key drivers for a successful transition from commodity forest products to a new generation of forest products. These are access to raw materials, competitive processing capacity, market demand, and sustained partnerships[4]. However, engaging in a transition can be a particularly challenging task for small businesses as they often have limited capacity and financial resources. Governance processes that allow for adaptive and collective problem solving, and knowledge sharing across players in the forest industry provide a platform for innovation. Creating conditions where small businesses can participate in the process is therefore important to ensure improved benefit flows from forest industries to local communities.

The partnership between the Vibrant Forest Landscapes Lab at UBC Forestry and the City of Quesnel's Forestry Initiatives Program through the Mitacs Accelerate Program was a six-month research project that sought to understand the relationships between players in the Quesnel forest sector to identify conditions that foster learning and innovation, particularly among smaller forest businesses. Building on previous studies about adaptive governance of a system shaped by human and nature interactions such as forestry[5], we took a network approach to investigate Quesnel's social assets. We also learned from other communities that have been successful in managing community forests. We drew examples of partnership building that enable greater participation in forest management from these communities.

2. Sustainable and Resilient Forestry

The concepts of sustainability and resilience are widely discussed in the scientific realm. Sustainable and resilient thinking approaches stress the inevitable changes that we have to deal with as we interact with nature. One thing that has been the focus of many national and transnational initiatives in improving our capabilities to adapt is innovation. Innovation is a string of activities that consists of exploration, production or adoption, and assimilation of a new value that can give economic, social, and environmental benefits.

Innovation is not a new concept in the forest sector. Forest companies were able to gain success in commodity markets during the industrial boom era (1950s-1970s). Large-scale investments were directed to vertical integration of different functions in the supply chain and technological innovations to increase efficiency and reduce costs. The deep recessionary crisis and increasing public demand for sustainable forestry in the early 1980s triggered a transformation in the forest sector[6]. BC government has expressed their interest to transition to sustainable pathways by encouraging value-adding activities and diversification of tenure holders.

This research project draws from the Consortium of International Agricultural Research Centres (CGIAR)'s seven principles of applying resilience thinking to understand how a system such as the forest sector can create an enabling environment for innovation[7]:

1. Redundancy & diversity

Redundancy and diversity are about anticipating risks of systemic failure. The forest industry is a system that consists of components: suppliers, distributors, processes, products, consumers, and competitors. Redundancy or having many different components in a system allows some components to make up for the loss or failure of others. Diversity, on the other hand, can reduce pressure in some parts of the system and ensure productivity. Studies show that diversity of business size, from small to large, is critical to producing products and services at different scales for different types of consumers.

2. Manage connectivity

Managing connectivity is maintaining a certain structure and level of strength of the network of different players and components. Strong relationships in the forest sector can promote trust and information sharing. However, strong relationships between homogenous players are more likely to contribute to negative outcomes. Diverse compositions of players within a system can

introduce new ideas and perspectives that help facilitate recovery or transition to sustainable pathways.

3. Manage slow variables and feedback

Forest product market trends are fast-moving, but the availability and quality of timber used as inputs is influenced by slowly changing variables. Warmer temperatures have been contributing to the mountain pine beetle epidemic and more frequent forest fires in BC. Maintaining desirable feedback for more sustainable and resilient forestry includes developing adaptive silviculture practices and diversified use of forests. The Stockholm Resilience Centre highlights the importance of establishing governance systems that can monitor and respond to slow variables.

4. Foster complex adaptive systems thinking

Forestry is a complex adaptive system, which means that it is made of connections between multiple "actors" such as humans, wildlife, trees, fire, among other things. These connections occur within a space that is influenced by many factors. Forestry is indeed unpredictable and uncertain, so acknowledging that forestry would never be at a steady-state can drive sustainability and resilience thinking.

5. Encourage learning

Adaptive governance requires knowledge sharing across scales and broader participation to stimulate learning. The Stockholm Resilience Centre suggests several points to foster learning, many of which stress the importance of involving a variety of participants, enabling a network for knowledge sharing, and creating communities of practice.

The World Commission on Environment and Development, later known as the Bruntland Commission after Gro Harlem Brundtland, the former Prime Minister of Norway and the first Chairperson of the Commission, released *Our Common Future* or the Bruntland report in 1987. The report mainstreams *sustainable development* as a long-term strategy to address intertwining environmental and development issues, which suggests that "the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs."

Stockholm Resilience Centre at the Stockholm University defines *resilience* as "the capacity of a system, be it an individual, a forest, a city, or an economy, to deal with change and continue to develop."

6. Broader participation

Broader and meaningful participation is a foundation for collective actions. Involving diverse groups of people in forestry can raise awareness and shared understanding. Many multi-sector innovation initiatives across the world begin with a long process of building trust and relationships to enable long-term collaborations.

7. Promote polycentric governance

Each governing body has a limited capacity to attend to complex and ever-changing problems in the forest sector. Polycentric governance is seen as one of the best alternatives to address this problem; it refers to a governance system in which "multiple governing bodies interact to make and enforce rules". CGIAR noted that maintaining a tight network of interacting governing bodies is a recipe for a successful polycentric governance system.

In the following sections, we will see the state of Quesnel's social network, lessons learned from other community forests about mobilizing social networks, and how the seven principles can guide us in identifying leverage points and ways forward.

3. Insights from Quesnel

The data was collected through in-depth interviews with different groups of actors in Quesnel and the Cariboo, including municipal, provincial, and First Nations governments, university faculty members, primary industries, secondary industries, supporting services such as logging contractors, and non-governmental organizations. The interviews were carried out in three phases that stretched from June to September 2021. In the first phase, research participants were purposively selected by the researchers with the help from the Forestry Initiatives Program. The selection criteria were based on (i) group representation (government, NGO, industry association, and private sector), (ii) willingness to participate, (iii) specialized knowledge in the topic of interest, and (iv) their established connection with the Forestry Initiatives Program. The rationale behind involving the Forestry Initiatives Program in the initial stage is to identify actors that are directly involved with the network that was established by the program. The participants were then asked to give recommendations of individuals or organizations that were interested in similar topics (snowball sampling). The second phase included interviews with First Nation governing bodies, medium-sized secondary industries, and those who were suggested by first-phase participants. The third phase was dedicated to small-sized secondary industries, the construction industry, and industry associations who had no or minimal contact with the Forestry Initiatives Program. There were three main questions that were asked to participants:

1. How do you describe your business/organization?
2. What are the challenges that hamper the achievement of the desired organizational goals?
3. Who have you exchanged information or knowledge with to improve your product/service/forest practices in the last year?

The interviews were carried out in three phases. In the first phase, we contacted potential participants who had established connections with the City of Quesnel's Forestry Initiatives Program. The participants were then asked to give recommendations of individuals or organizations that were interested in similar topics. The second phase included interviewing First Nation governing bodies, medium-sized secondary industries, and those who were suggested by first-phase participants. The third phase was dedicated to small-sized secondary industries, construction industry, and industry associations that had no or minimal contact with the City of Quesnel's Forestry Initiatives Program.

Among 48 people that were contacted to participate in this research, 29 people responded and were available and willing to be interviewed (Table 1). Given the provincial policy and regulation governing tenure rights in BC, research participants may have multiple ventures that administer both primary and secondary industry activities. This research categorizes research participants by their main activities to define the boundaries of each research participant, particularly between licence holders, primary, and secondary industry actors. Licence holder includes forest professionals or managers of community-based licence and woodlot owners. Some licence holders have processing facility, but their main responsibility is to manage the forests for the benefit of the community or individual holder according to the requirements set by the government. Primary industry actors are representatives or business owners whose main activity is processing non-timber forest materials into consumable products or roundwood logs into commodity products such as pulp and paper, dimensional lumber, composite panels. Secondary industry actors refer to enterprises that further process sawnwood, and manufacture engineered wood products, wooden packaging (ex: pallets), furniture, cabinet, and carpentry[8]. The forest fires in July 2021 prevented several NGOs and license holders from participating although they had shown some interest in this research project. Opportunities to interview businesses in construction and secondary industry actors were also limited as they declined the interview invitation or were busy with projects that could only be carried out in the summer. Challenges identified by participants during the interviews are discussed in the next section.

Table 1. Categories of respondents interviewed

Category of respondents	Number of respondents
Licence holder	7
Government	4
Non-governmental organization	6
Post-secondary education	2
Primary industry	3
Secondary industry	5
Construction industry	1
Supporting service	1
Total	**29**

*Respondents are categorized by main activities.

Data collected were recorded and transcribed using NVivo software. Research participants' responses to questions related to their knowledge-sharing activities were put together in a form of a network to get a holistic understanding of the relationships between forest sector actors in Quesnel. Social network analysis can provide information regarding influential players and the relationship gap between players. We use an open source social network analysis software called Gephi to map the knowledge sharing activities and identify actors that play a central role in fostering learning across the knowledge sharing network. The players were visually represented by a circular 'node' and linked to other nodes by a line called 'edge'.

Social Asset

Knowledge sharing activities

Graph 1 provides an illustration of a knowledge-sharing network between different players that were associated with Quesnel's forest sector. Nodes represent actors and edges show the flows of knowledge or information from one node to the other. The types of knowledge shared included further studies or research needed to improve goods or services, trainings, regulations, or collaboration. This should not be mistaken with business agreements or cooperations, however, as the graph does not capture monetary exchange between players.

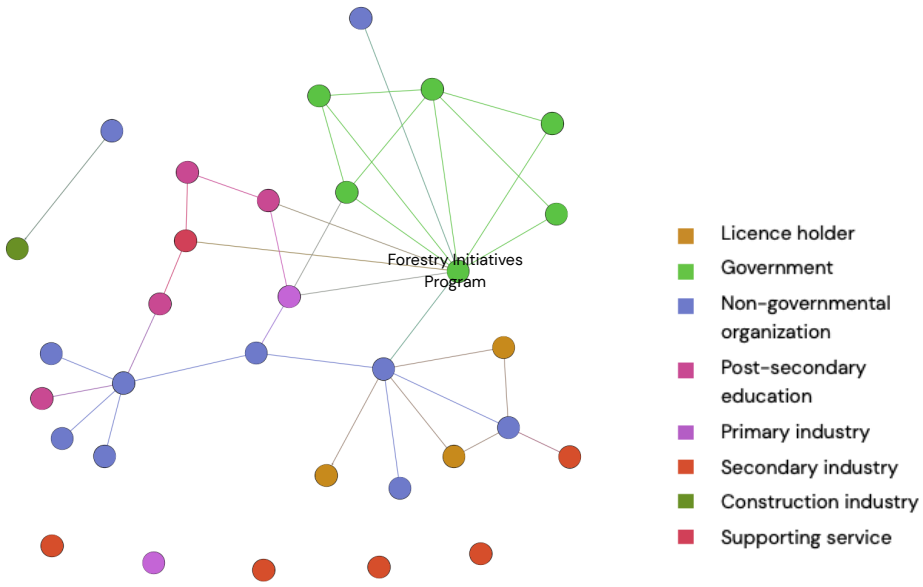
Research participants shared their knowledge both informally and formally via meetings. Some participants had pre-established connections with others prior to their current positions, which helped broaden the network reach. The goals of sharing knowledge varied across actors, indicating a diversity of perceptions and approaches to adapting to multiple changes in the forest sector.

Licence holders were active in sharing information or knowledge related to small-scale forestry through province-level associations. One association regularly convenes conferences for licence holders and other interested parties to discuss various topics, including but not limited to sustainable forest practices and organizational management. ***The sharing activities have helped these licence holders to collectively advocate their needs and goals to the government.***

The benefits of connecting with other actors through knowledge-sharing networks lie in the capability to help people manage risks associated with innovation. One construction industry that we interviewed articulated this very well; they highly valued their strong relationship with a relevant industry association, acknowledging that knowledge sharing activities within the association had helped them identify future business trajectories, learn about

the incremental changes implemented by other members of the association, and improve the process to minimize the perceived risks of innovating. The research participant saw the benefits of preparing their business to adapt to the net-zero energy ready building code change imposed by the government. With the information and knowledge obtained from the association, the research participant wished to be an early mover in the construction industry in Quesnel. One of the primary industries maintained close connections with the Forestry Initiatives Program to communicate their operations and share the challenges that arose from implementing new practices that were not yet common in BC such as commercial thinning.

Graph 1. Knowledge sharing network



In contrast, other secondary manufacturers were not connected to other groups of actors in this network. During the interviews, the secondary manufacturers mentioned that they did not have connections with any industry associations or local business service providers. We confirmed this statement by interviewing one industry association and one local business service provider, who admitted that they did not have a member from Quesnel, and reviewing online documents of other industry associations. There are two possibilities in regards to this: (1) local secondary manufacturers were lacking in exposure to resources or research disseminated by post-secondary institutions through industry associations that might be useful for their business, and/or (2) there were no incentives to connect with other actors given the limitations. The latter is based on the statements made by more than one secondary manufacturer that preferred to work with in-house resources that they already had. One of the secondary manufacturers that we interviewed claimed that the technology that they built was designed and

assembled by their staff without support from any third parties. They also noted that they did not receive or share information from other actors regarding innovation to increase efficiency despite their membership in a province-level secondary industry association. Another secondary industry owner expressed their interest to participate in a local small business forum, but refrain from doing so due to time constraints. This indicates a gap in the network that needs to be addressed if Quesnel is to enhance the downstream side of its forest product value chain.

Network structure

We analyzed the structure of the network by calculating the centrality of each actor using Gephi. The purpose is to identify actors that play a central role in fostering learning across the knowledge-sharing network. Table 2 provides a brief description of the measures used in the analysis. We then adjusted the visual representation of each actor in accordance with their centrality scores.

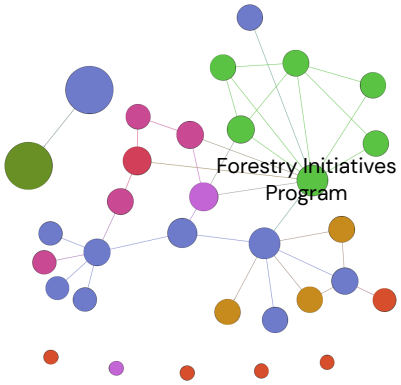
Quesnel's social network is largely defined by the relationships between government bodies, NGOs, and post-secondary institutions. These three groups of actors were well-connected, indicated by their relatively similar closeness centrality level (Graph 2). The Forestry Initiatives Program has a strong influence and role in diffusing information and knowledge (Graph 3 and Graph 4) as they took the lead in convening meetings and discussions in Quesnel. Informal and formal meetings initiated by the Forestry Initiatives Program mainly focused on addressing land-based issues such as community-based forest fire management and community forestry.

There were three NGOs that acted as a bridge that connects different sets of actors to the broader network. These NGOs were province-level associations that provided support and advocacy for their members. The industry association that we interviewed prioritized opening new markets and providing training for small to medium-scale secondary manufacturers in BC, which might be appealing to small manufacturers in Quesnel that want to expand their businesses. Building strong partnerships with different industry associations can be an entry point to connect with secondary manufacturers in Quesnel.

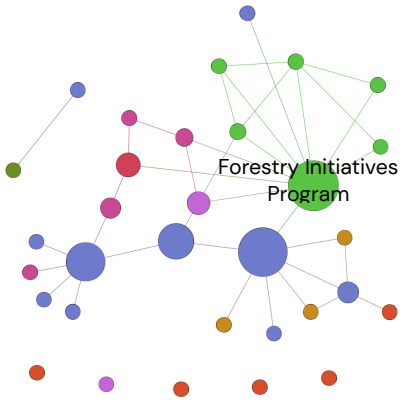
Table 2. Description of statistical measures used in the structure analysis

Metric	Definition[9]
Betweenness centrality	Describes actors who act as a bridge between disconnected social circles. Actors with high betweenness centrality are more likely to diffuse knowledge or information across a broader network.
Closeness centrality	Identifies actors that are closest to other actors in the network. Knowledge or information exchanged in the network tend to reach actors with strong closeness centrality faster than to other actors.
Eigenvector centrality	Measures the influence that an actor has in the network. High eigenvector centrality indicates actors' proximity to influential actors.

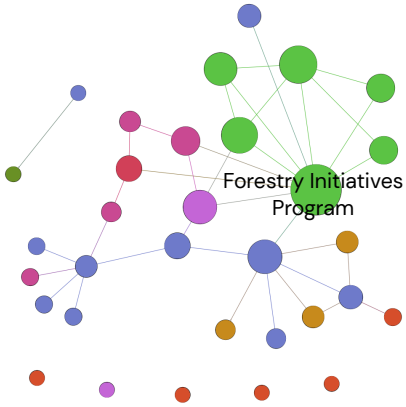
Graph 2. Closeness centrality



Graph 3. Betweenness centrality



Graph 4. Eigenvector centrality



Challenges

Lack of Skilled Labour

All research participants reported a shortage of skilled labor in the Cariboo as a major problem. Without skilled labour, small-sized secondary manufacturers are limited in their capacity to take up more work and, subsequently, expand their businesses. Some secondary manufacturers and supporting service cited low morale among younger members of the workforce as the main reason for refraining from recruiting new workers and retaining entry-level talents. This result is consistent with the 2021 Cariboo Regional District's labour market study and 2021 BC Wood's Workforce Development Strategic Plan. Training programs directed to a younger workforce are particularly needed for the construction industry in Quesnel, considering the BC government's intention to gradually adjust the building code to zero-energy ready by 2030. Zero-energy ready building requires high-precision building components, which will open up opportunities for the engineered wood industry. More skilled labor is needed to operate engineered wood machinery and navigate the new, complex building code.

For secondary industry, competition in securing labour with primary industry was hard to navigate, especially during the boom period when the workforce was absorbed by commodity lumber mills. There is a demand from small to medium-sized secondary manufacturers for supporting regulations specific for the value-added sector to expedite the recruitment process.

High dependence on the commodity market

All research participants agree that the future of forest management in Quesnel should incorporate non-timber values a lot more than in the past to improve forests' adaptive capacity and expand opportunities for non-timber industries. The current regulatory framework that favoured commodity products is identified as a challenge to achieving sustainable forest industry defined by participants. The stumpage or pricing system has not yet reflected aspirations for diverse use of forests as it heavily emphasizes sawlog over other values.

The structure of the forest sector that is highly dependent on commodity markets affects industry players differently. For community-based licence holders, the presence of commodity mills owned by major licencees in the Cariboo allows them to sell low value timber from salvage harvesting that they cannot process economically at a decent price. Some licence holders chip these timber and send it to co-generation plants with subsidies from a province-level

NGO. They acknowledge, however, that a limited number of buyers available within the Cariboo can drive down their bargaining power. They also aspire to use their licence to protect the forests or develop other types of products such as tourism and agroforestry; the latter is a concern, especially for community-based licence held by municipalities in partnership with First Nations or First Nations band councils.

For construction industry and secondary manufacturers, the way in which forest industry operates has limited their opportunities to access lumber from more diverse sources. One secondary manufacturer said that their business was highly dependent on major primary industry actors and that it would be at risk if the major primary industry actors were to reduce mill capacity. Another research participant complained about the scarcity of good quality lumber for construction in Quesnel. They considered that commodity mills owned by a major primary actor absorbed most timber harvested in Quesnel and exported it to market outside Quesnel, leaving locals with products sold in wholesalers that were more expensive. When we confirmed this statement with the major primary actor mentioned the research participant, they claimed that products processed in their mills were available to local businesses. It is likely that this information is not known to the wider public. In the case of smaller secondary manufacturers with low production volume, obtaining their input from wholesalers was the best option available. However, they had to frequently change their cost structures to be able to adjust to fluctuating commodity price.

Based on the social mapping exercise, we learn that:

1. The Forestry Initiatives Program occupied a central position in Quesnel's social network comprising multiple actors from different groups.
2. Training and other schemes to attract and retain employment in the primary and secondary sectors are critically needed.
3. Research participants identified lack of skilled labour and policies and regulations that favour commodity lumber as barriers to innovation.

Principles of resilience thinking in the previous section underline the importance of maintaining diversity, inclusivity, and connectivity in order to improve the adaptive capacity of a system. In Quesnel, addressing barriers to innovation might require improving connection between primary and secondary sectors and strengthening the role of the Forestry Initiatives Program as a bridge between different groups of actors.

4. Learning from Others: Community Forest Agreement

Community forest agreements were introduced in BC to allow local communities to pursue their aspiration and address local problems through the use of forest resources. Insights from other Community Forests (CF) show the importance of collaboration in encouraging innovation and learning. Bridging differences and building shared understandings among actors are crucial for establishing meaningful collaborations. Collaboration allows community forests to be more responsive to local needs. Collaboration with other local actors involved in various forest practices can improve people's capacity to adopt innovative forest practices, such as managing wildfire, protecting watershed, and utilizing biomass as an additional source of income. As the City of Quesnel is currently in the process of partnering with local First Nations to establish a community forest in the Quesnel Timber Supply Area, we spoke with four communities in BC that manage community forests to learn from their experience. This section is a compilation of lessons learned on developing a community forest to achieve sustainable and resilient forestry.

Moving as a collective

The first challenge communities faced when establishing a community forest is in building a sense of community or promoting consensus-building and collective action. Promoting collective action starts with creating a vision for the community forest as one community and managing it in a manner that fulfills the community's vision. It is common for different groups to have different aspirations. Promoting collective action is not about eliminating those differences, but rather managing them in a manner that enables people to focus more on common and potentially unifying values to move forward as a collective. Achieving such a scenario requires a good understanding of the social and political context of the different groups who are part of the community forest partnership.

Establishing a common ground as a foundation for the community forest

One major determinant of a successful community forest for most communities we talked to is people's capacity to organize collective action. Community forests need to have clear objectives to inform managers of the necessary skills they

need to build to manage the community forests effectively. Objectives must be grounded in the community's shared identity and common visions to legitimize the community forest's operations. Establishing clear objectives requires the capacity to manage and reconcile varying perspectives of various local groups. Different governing bodies involved in the community forest application must settle their differences to develop a common vision for the community forest. Frequent meaningful engagement and discussions may be necessary to help people settle their differences and establish a common ground.

Although the BC government has requirements for community engagement and participation to acquire a community forest agreement, other communities noted that establishing extra measures to engage various local groups may be necessary to develop clear objectives that are grounded in the community's common visions. Various local groups should be allowed to voice their concern over the community forest initiative and measures must be put in place to address people's concerns. The BC Community Forest Association (BCCFA) has numerous guides on how to cultivate meaningful relationships between various local groups through the process of developing and managing a community forest.

The goal of building meaningful relationships is not to aim for an idealistic scenario where everyone agrees with each other, but to establish arrangements where individual interests and agendas cannot prevail over visions for the community forest. Institutions and rules should help reconcile the different interests and aspirations of partners. For community forest partnerships, these rules and institutions are commonly laid out in the partnership agreement. Agreements should identify actions that are restricted or require approval from other partners, and actions that individual partners are free to perform[10]. Based on our discussion with the research participants, a strong partnership agreement should provide clarity regarding shared objectives, secure commitments among actors to jointly develop procedures and terms of reference, and recognize the respective authorities of different parties[11]. Research participants reported that this could only be achieved if agreements were developed collaboratively by both parties, and sometimes with the help of lawyers, accountants, or other people experienced in drafting partnership agreements.

Research participants agreed that wider conflicts often arose in the day-to-day management of the community forest, and when politics have intervened too much in the partnership business. They emphasized the importance of separating politics from the partnership business or the management of the community forest. When politics comes into play, the partnership's sense of

agency can deteriorate. It will be difficult for partners to establish a shared vision and show firm commitment to achieving a common goal. A common example of this is when the directors are more interested to represent the interest of the people that appointed them rather than using their expertise to bear on the problems of the community forest partnership. When conflict arises, it is within the discretion of partners to decide whether they should resort to an informal process of negotiation or a more formal dispute resolution process. All partners must see the importance of working together and be united to achieve a common goal. It may require some time and frequent discussions before partners can see 'eye to eye', but a commitment to work together and be united with little interference from politics should be the foundation of the community forest partnership.

Improving expertise to achieve the community forest's objectives

Research participants highlighted that managers needed to acknowledge that they may not have the necessary expertise to achieve the community forest's objectives. People may have experience in certain forest activities, but this does not necessarily translate to having the capacity to manage a forest at a scale that is required in community forest management. It is crucial for managers to have the necessary skill to harvest, market, and sell forest products in a manner that fits the community's agenda. Most communities have to hire forest professionals to manage the community forest and build local forest expertise simultaneously. In a few rare cases, communities can adopt a "learning by doing" approach. However, this requires a level of community participation that may be difficult to sustain for a long time, especially because a "learning by doing" approach requires significant trial and error, and a few errors commonly discourage participation.

Managers should never hesitate to seek assistance when it is necessary. Other community forest managers reported that they had to seek assistance from NGOs, other license holders, and service providers to develop a management plan, maps, and partnership agreements. Most community forest managers reported that, initially, they did not have the capacity to manage the community forest adequately. However, the process of developing and managing a community forest has provided them with 'room for practice' to improve their expertise. With firm commitments, the process of developing a common vision for the community forest should enable community members and community forest managers to improve their capacity for conflict resolution. Additionally, the

process of managing a community forest should improve peoples' capacity in harvesting and marketing forest products.

5. Conclusion

Achieving a sustainable and resilient forest sector requires collective actions to realize the economic, social, and environmental values of forests and address evolving challenges in different landscapes. Based on previous studies on the principles of sustainable and resilient thinking, sustainable and resilient forestry is made up of a continuous learning process that involves a variety of actors. The in-depth interviews and social network analysis presented here suggest that learning and innovation among licence holders, primary and secondary industries occur differently. Licence holders and primary industry actors are more likely to connect with other actors to share knowledge and information, while secondary industries prefer to learn new practices individually. Fostering learning can start with minimizing barriers to innovation by broadening the network reach to include different groups of actors to promote trust, learning, knowledge sharing, and business diversity. Examples of how collaborations can lead to learning were drawn from our interviews with community forest managers in BC. Insights from the interviews show that community forests can be used as a collaborative platform to foster learning and innovation by establishing a common ground and improving expertise among multiple actors involved in the forest sector.

Considering that the identified barriers to innovation are not exclusive to the Quesnel area, there are opportunities for future research to expand the network analysis to include high-level actors that influence decision-making at the provincial level and study alternative business models that can contribute to enhancing redundancy and diversity of actors in the forest sector.

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