



FEBRUARY 2024

Skills needs for mass timber production and adoption in British Columbia

Summary for policymakers



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Acknowledgements

The author of this report is John McNally. Editing, analytical, and writing support and insights on the original research upon which this summary is based were provided by Hem Dholakia, Abdullah Khan, and Caroline Meier. Editing support was provided by Rebecca Babcock. Design was provided by Diane Torlone. The authors would like to thank Alex Stephens and the team at the Future Skills Centre for their comments and insights. This report does not necessarily reflect the views of the funder or any of the reviewers. Any errors remain the sole responsibility of the authors.

Suggested Citation

McNally, J. (2024). *Skills for mass timber production and adoption in British Columbia: Summary for policymakers*. PLACE Centre. Smart Prosperity Institute.

February 2024

With support from



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Skills needs for mass timber production and adoption in British Columbia

Stakeholders across British Columbia (BC) are exploring the potential of mass timber, an engineered wood product used as a building material, to drive economic growth in a number of industries. Mass timber solutions provide opportunities to contribute to the decarbonization of buildings, speed up the construction of new housing, and create jobs in the province's forestry, manufacturing, design, and construction sectors. These solutions are already being developed by eight mass timber manufacturing facilities in the province today, contributing to many of the 352 mass timber projects that have been built (or are under construction) within the province as of 2023.¹ Building off this momentum, the BC government projects the potential for ten new mass timber facilities in the province by 2035, creating an estimated 2,350 — 4,230 new jobs in forestry, manufacturing, technology and engineering, and design.² Stakeholders generally expect growth in both the production (manufacturing panels, which involves forestry, transportation, and manufacturing) and adoption (using panels in buildings, which involves manufacturing, design, and construction) of mass timber products. This growth is anticipated despite uncertainties around different aspects of the production and adoption of mass timber products in BC, such as access to sufficient fibre supplies, a lack of required transportation infrastructure, and unclear market demand for mass timber products.

The greatest promise mass timber offers BC is as a source of investment and employment for rural and resource communities seeking new economic opportunities.

The decline in the forestry sector has adversely impacted many communities, and a thriving mass timber sector could help generate novel growth opportunities. A key step in helping capture these benefits is to understand how this emerging opportunity will change the skills needs of existing industries and how prepared workers are today to fill roles that may emerge in the coming years (if these growth targets are realized). This is not the only step needed to grow this sector, but it is an important one as the province considers how to support this opportunity. Focusing on skills also allows policymakers to evaluate how prepared different regions are to support the growth of this sector and invest in the foundations that employers, learners, and community organizations need for stable growth.

This brief summarizes the research conducted for two reports published by SPI detailing skills and labour needs and challenges in BC's growing mass timber supply chain: *Framing BC's low-carbon future: Identifying the skills and workforce needs of British Columbia's growing mass timber sector*, and *Making mass timber in Northern BC: An evaluation of readiness of workers and policies for producing more mass timber products in North-Eastern British Columbia*. Research for these reports was collected through a combination of surveys, interviews, and informal discussions with stakeholders across BC's mass timber sector, and was supplemented by a literature review and quantitative analysis about future skills and knowledge needs for workers. Additionally, a virtual workshop bringing together mass timber stakeholders in BC, with a specific focus on Northern BC, was hosted to support discussions about the particular challenges the sector faced in each region. For more insights about the methodologies used to generate these findings, please refer to the appendices in *Framing BC's low-carbon future*.

Abbreviations

3D	Three-dimensional
BC	British Columbia
BCIT	British Columbia Institute of Technology
BIM	Building information modelling
CAD	Computer-aided design
CLT	Cross-laminated timber
DfMA	Design for Manufacturing and Assembly
GLULAM	Glue-laminated timber
NLC	Northern Lights College
SME	Small and medium-sized enterprise
SPI	Smart Prosperity Institute
UNBC	University of Northern British Columbia



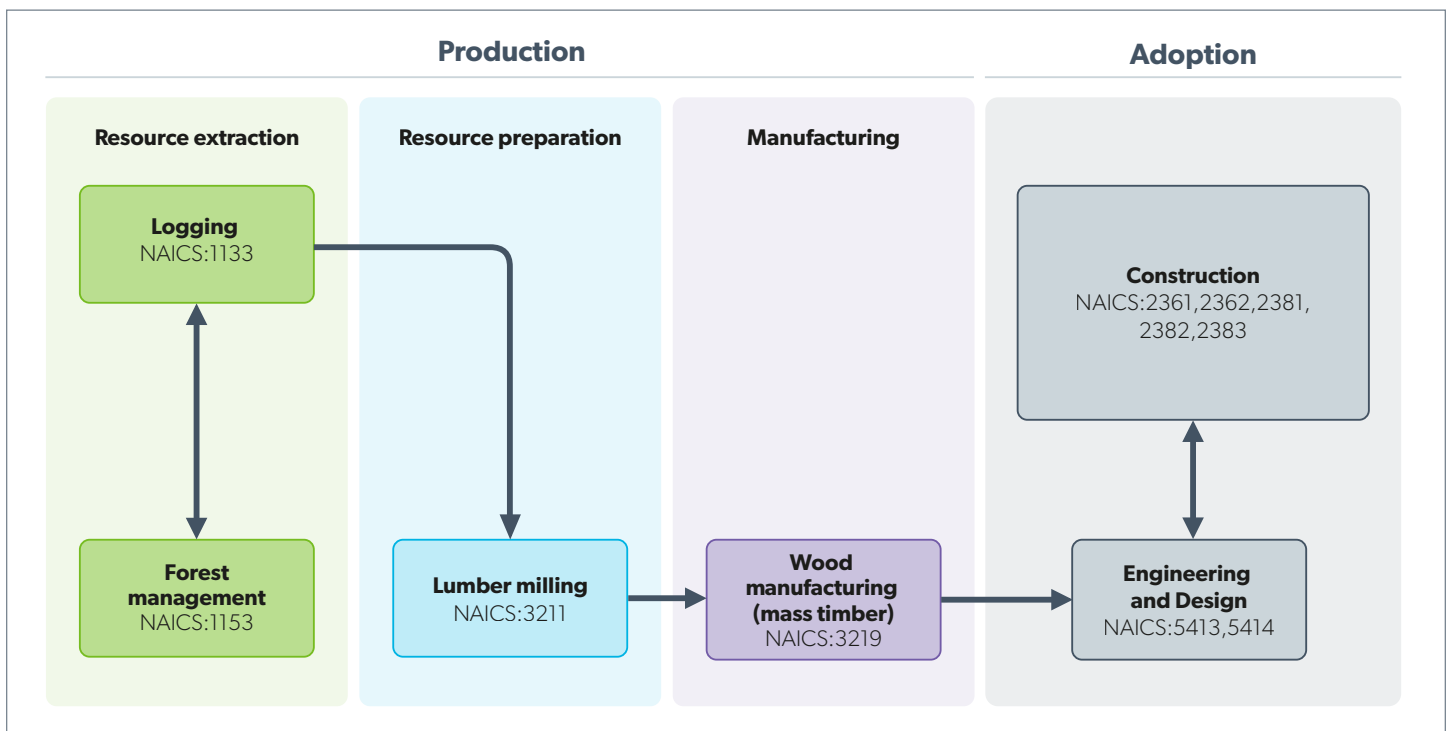
How does mass timber differ from other available technologies?

Skills and labour requirements for producing and adopting mass timber are based on the differences in technological requirements between mass timber and readily available alternatives, like steel and concrete. Mass timber products are “engineered wood products,” which are comprised of thick, compressed layers of wood. Products include cross-laminated timber (CLT), glue-laminated timber (GLULAM), nail-laminated timber, and dowel-laminated timber. Many mass timber products are designed to be load-bearing, and their technical use ranges from individual homes to 18-storey commercial or residential buildings (the current height granted by the 2021 International Building Code).³ Mass timber panels (the end-products developed through the manufacturing process) are manufactured off-site and then brought onto a construction site for assembly. Fabrication shops produce these panels to exact specifications, typically using digital tools such as robotic and computer numerical controlled machines. Computer numerical controlled

machines also allow for pre-cutting openings, such as windows, staircases, and utilities. Most exterior and interior finishes can also be installed off-site, meaning that all mass timber components arrive at the construction site pre-built and may require only minor adjustments. On-site, the different elements are hoisted into place and connected with fastening systems such as bolts, screws, and nails, allowing for a fast and quiet construction process with only minimal disruption to the local area.⁴ This production process stands in contrast with steel and concrete framed structures, which require more on-site construction beyond assembly and follow more conventional construction practices. Figure 1 below details the sectors impacted by the growth of mass timber by stage in the production and installation process.

The three most produced products in Canada are GLULAM (with 13 production facilities), CLT (with eight production facilities), and laminated veneer lumber (with seven production facilities). Based on completed projects and manufacturing capacities, BC is currently leading in both the production and adoption of mass timber in Canada.⁵

Figure 1. Overview of mass timber supply chain in British Columbia



How will this shift impact the skills workers need to work in these impacted sectors?

It is important to emphasize that the industries relevant to mass timber’s supply chain will experience different impacts depending on the degree of production and/or adoption within the province. For example, in scenarios with high production volumes but low adoption, we can expect substantial workforce impacts in resource extraction, resource preparation, and manufacturing, but limited impacts in construction and design. Similarly, scenarios with high adoption but low production volumes would see the majority of workforce impacts concentrated in the construction and design sectors, with a limited need for labour or skills changes in more upstream industries.

If both production and adoption grow alongside each other, certain occupations within each supply chain segment will likely see increases in demand, especially those in manufacturing and machine operations. Jobs like woodworking machine operators, wood product processors, manufacturing managers, mechanical engineers, carpenters, and construction labourers will be impacted by the growth of this opportunity. Within the context of this shift, research identified that most of the roles that will be created as the industry changes already exist today. The workers involved in production and adoption will, therefore, need to upskill to add new skills or knowledge areas to their existing knowledge bases or potentially reskill from one occupation into another. Table 1 below summarizes some emerging skills needs and shows where the shifts will be most impactful within these sectors.

Table 1: Summary of occupations impacted by the growth of mass timber throughout the supply chain⁶

Occupation	Tasks traditionally performed	Change due to greater uptake of mass timber	The geographical region of employment
Lumber graders and other wood processing inspectors and graders	Inspect wood products and classify according to industry specifications	New industry classification for mass timber products, specific focus on the moisture content of wood	Mainland/Southwest (36.4%), Cariboo (19.2%), Thompson-Okanagan (15.7%)
Other wood processing machine operators	Run drying kilns to reduce wood moisture	Increase amount or intensity of the drying cycles to reduce wood moisture	Mainland/Southwest (33.9%), Thompson-Okanagan (27.1%), Cariboo (16.8%)
Woodworking machine operators	Use CNC machines to produce furniture, use glueing machines to join pieces of wood	More extensive use of digital tools, produce precise building components	Mainland/Southwest (48.8%), Thompson-Okanagan (16.5%), Vancouver Island/Coast (11.0%)
Other wood processing machine operators	Glue layers of wood to produce veneer and plywood	Produce stronger, thicker layers of wood using adhesive	Mainland/Southwest (33.9%), Thompson-Okanagan (27.1%), Cariboo (16.8%)
Supervisors, wood product processing	Supervise and manage workflow	Align work schedule with construction, increased knowledge of construction and design processes	Mainland/Southwest (26.6%), Cariboo (26.0%), Thompson-Okanagan (13.0%)
Manufacturing managers	Plan plant activities to meet production targets, plan resource use	Increased communication with external stakeholders (i.e., designers, construction managers, etc.), plan resource use under a ‘just-in-time’ approach	Mainland/Southwest (69.0%), Thompson-Okanagan (12.4%), Vancouver Island/Coast (10.9%)
Architects	Prepare building design, prepare building plans	Engage with manufacturers and construction professionals, prepare building design according to wood’s structural properties	Mainland/Southwest (84.04%), Vancouver Island/Coast (10.7%), Thompson-Okanagan (4.2%)
Mechanical engineers	Design building heating and cooling systems	Engage with manufacturers and construction professionals, design mechanical systems according to the thermal properties of wood	Mainland/Southwest (75.6%), Vancouver Island/Coast (11.4%), Thompson-Okanagan (6.0%)
Electrical and electronic engineers	Design building electrical and power systems	Engage with manufacturers and construction professionals, design electrical systems according to the properties of wood	Mainland/Southwest (82.6%), Vancouver Island/Coast (8.7%), Thompson-Okanagan (5.4%)
Construction managers	Plan construction projects according to building design, oversee construction activities	Involved in the design stages, use of building information modelling (BIM), coordinate with designers and manufacturers	Mainland/Southwest (66.6%), Vancouver Island/Coast (13.6%), Thompson-Okanagan (11.9%)

Occupation	Tasks traditionally performed	Change due to greater uptake of mass timber	The geographical region of employment
Carpenters	Form building foundation, install floor beams, walls, and roofs	Provide inputs in the design process, assemble building components on site, increased precision in work, knowledge about wood and connectors	Mainland/Southwest (52.6%), Vancouver Island/Coast (21.2%), Thompson-Okanagan (13.5%)
Construction trade helpers and labourers	Load and unload construction material, support tradespersons and heavy equipment operators, mix various materials	Support moisture management, manage construction site for on-site assembly	Mainland/Southwest (62.0%), Vancouver Island/Coast (14.5%), Thompson-Okanagan (12.8%)
Plumbers	Install, maintain, and repair plumbing systems	Involved in design, coordination with engineers and manufacturers, precision in working with finished products	Mainland/Southwest (66.1%), Vancouver Island/Coast (14.8%), Thompson-Okanagan (10.6%)
Electricians	Install, maintain, and repair electrical and power systems	Involved in design, coordination with engineers and manufacturers, precision in working with finished products	Mainland/Southwest (60.1%), Vancouver Island/Coast (17.3%), Thompson-Okanagan (13.2%)
Heating, refrigeration and air conditioning mechanics	Install, maintain, and repair heating and cooling systems	Involved in design, coordination with engineers and manufacturers, precision in working with finished products	Mainland/Southwest (61.5%), Thompson-Okanagan (17.3%), Vancouver Island/Coast (13.8%)

What will be required of the workforce to learn these new skills?

As workers, employers, and employment stakeholders consider what is needed to help workers learn new skills, a few key points will be important to remember:

Stakeholders expect mass timber to grow, but there is uncertainty around the growth trajectory.

Overall, stakeholders we engaged with through this research expressed great confidence that mass timber will experience further growth. However, there is uncertainty around the growth trajectory. A majority of survey respondents (57%) believe that mass timber will experience slow but steady growth in BC. The remaining (43%) believe that mass timber will quickly overcome the challenges limiting its growth, such as building codes restricting its usage and uncertainty from financiers (including banks and insurance companies, who often see mass timber projects as being riskier than traditional alternatives).

Opportunities exist for upskilling workers from other industries to become more acquainted with the properties of advanced wood manufacturing.

For example, while workers from other industries (such as metal or plastic processing) can operate computer numerical controlled machines to produce prefabricated structures with precision dimensions, they lack experience working with wood (or engineered wood) as a production material. They also lack knowledge of construction and wood adhesion. This example of specialized knowledge requirements illustrates a clear need to upskill workers to become more acquainted with the properties of wood before mass timber manufacturers can employ individuals in similar roles from other sectors.

Non-technical skills will be key, as mass timber solutions involve a high degree of coordination and collaboration on designs between different sectors.

Non-technical skills will be the most in-demand across all industries, indicating a greater need for communication, coordination, and collaboration within sectors responsible for designing, manufacturing, and assembling panels. This will require roles in sectors that previously did not communicate regularly, such as manufacturing, design, and construction, to develop a stronger understanding of each other's tasks and requirements and collaborate on project designs. One manufacturer noted that hiring manufacturing managers with experience in construction was a genuine asset for their company, as these individuals already had the required experience and knowledge for the job.

Stakeholders identified that the majority of occupations discussed in this report would not need to fully retrain to work with mass timber. Rather, they would need to upskill, and the skills gaps can be plugged in a relatively small amount of time.

For trained engineers, stakeholders estimated that around 60 hours of additional training was required to learn the necessary knowledge to work with mass timber products. As such, stakeholders have noted that they prefer shorter, more targeted programs to support this upskilling, such as the University of British Columbia's regularly held Design for Manufacturing and Assembly (DfMA) workshop.

How well prepared are regions in BC looking to attract investment in mass timber facilities?

For rural and resource communities that were adversely affected by the downturn of the primary forestry sector, mass timber represents an opportunity to attract investment and create jobs. Yet capturing these benefits is not a simple task; doing so will require reducing the uncertainties stakeholders currently face and developing a strong foundation of talent (and investor interest) upon which prosperity can be built. One region with particular interest in addressing these uncertainties is Northern BC. Currently, Golden, represents the furthest north where a mass timber manufacturing facility is located in the province. However, communities such as Prince George, Mackenzie, Chetwynd, Fort Nelson, and Quesnel would benefit greatly from establishing a foothold in the sector. The centralization of forestry operations, decline in fibre supply, and increase in global competition seen since the 1990s have had particularly negative impacts on smaller resource-dependent communities in Northern BC, especially those with a high reliance on the forestry sector and low levels of economic diversification.⁷ In 2023 alone, over 600 jobs have been lost as a result of closures in Prince George, Chetwynd, and Houston.⁸ For these communities, mass timber represents an opportunity to reverse these trends. There are no established mass timber facilities in North-Eastern BC yet, but the region has already completed a number of major mass timber building and construction projects, such as the Prince George Airport Extension,⁹ the Quesnel Junior School,¹⁰ and the Upper Skeena Recreation Centre in Hazelton.¹¹

One critical aspect of supporting a mass timber sector in Northern BC is ensuring that a robust skills ecosystem (a network of stakeholders and institutions, including post-secondary institutions, employers, coordinating bodies, learners, and governments, all working on skills and labour challenges in a given region or sector) exists to support the development of the skilled and capable workforce needed. While it is worth reiterating that a lack of skilled workers is far from the only relevant factor impeding future growth in the sector (current market demand, fibre supply challenges, infrastructure gaps, and other barriers will also need to be addressed), it is indisputably important. When mass timber has become an established economic opportunity in other regions globally, the emergence of a skills ecosystem has played a critical role in supporting this shift. The following details how prepared each stakeholder category is in Northern BC to support the growth of mass timber and what steps need to be taken to align the current state of affairs with international leaders in the DACH region — a leading wood manufacturing cluster in Germany (D), Austria (A), and Switzerland (CH).

How ready are post-secondary institutions to provide training in Northern BC?

- Providers of both short-term options (such as micro-credentials, one-off seminars, and online resources) and long-term options (such as post-secondary education programs and apprenticeship programs) are well-positioned to offer programming aligned with the needs of mass timber technologies.
- Post-secondary institutions, including the College of New Caledonia, Northern Lights College (NLC), University of Northern British Columbia (UNBC) and British Columbia Institute of Technology (BCIT), already offer programs relevant to occupations that will be created through the mass timber supply chain and are developing new ones to fill gaps (such as a mass timber development micro-credential at UNBC). Existing post-secondary institutions also have strong relationships with global leaders in the mass timber space, including those in the DACH region.
- The region needs more programs aimed at teaching general wood skills, which have been essential in establishing mass timber industries in the DACH region. This would ensure graduates learn about a wider variety of advanced and engineered wood products and techniques, including three-dimensional (3D) modelling, computer-aided design (CAD), building information modelling (BIM), and the use of computer numerical controlled machines, as examples. Employers stressed that this broad range of skills made graduates more attractive to hire. Creating this programming might involve revitalizing a local wood technology program, an idea previously floated by the College of New Caledonia, NLC, and UNBC (but that had been suspended due to a lack of interest).

How well-positioned are employers to hire, and to offer training and supports?

- There is a lack of employers in the mass timber space, with zero mass timber manufacturers currently operating in Northern BC. There are some employers in advanced wood processing and engineered wood manufacturing more broadly, but none have yet begun manufacturing mass timber technologies.
- Existing employers who have expressed a general interest in mass timber, including some sawmills, have noted they have yet to invest due to concerns such as a lack of knowledge around product standards needed to meet future building code requirements and uncertainty around effectively marketing mass timber products. For new companies interested in entering the market, other issues, such as uncertainty around market demand, a lack of infrastructure, and difficulties securing the needed fibre supply, have all been cited as barriers to investment.

In the DACH region, most of the well-established mass timber manufacturers started as small family-run small and medium-sized enterprises (SMEs), such as sawmills, and gradually diversified into a variety of advanced wood products, including mass timber.¹² This could be a pathway for Northern BC to emulate if attracting a major mass timber manufacturer in the short term is not seen as realistic.

What coordinating bodies exist, and what role can they play?

- Coordinating bodies are groups that exist to improve the flow of information between stakeholders (by sharing job postings, connecting employers with prospective candidates, teaching students about careers, etc.). They include employment agencies, career counsellors, industry associations, and local networks (such as the Forestry Initiatives Program in Quesnel).
- Stakeholders currently feel the network of coordination bodies that exists today is doing a good job of supporting the sector. However, given the absence of a major employer, they cannot play their full role in connecting employment opportunities in mass timber with prospective workers.

Are policymakers creating the right programs and supports to train and upskill workers?

- There are a range of available programs and policies relevant to Northern BC (including many focused on the needs of small, rural, or remote communities). Still, the majority of supports are aimed at individual programs and learners and are targeted towards shorter-term education programs.
- There is a missing layer of policies and programs that aim to set a common vision and drive coordination and collaboration within the sector. These are critical for ensuring stakeholders' actions are aligned and that priorities for growing the sector (instead of supporting only individual learners, employers, or programs) can be advanced. Within the DACH region, Germany's Charter for Wood 2.0 is cited as a leading example of this type of policy, which could be replicated for Northern BC or the province at large.¹³

What should be prioritized to improve the skills ecosystem for mass timber in Northern BC?

Priority #1: Attract more employers to Northern BC

The biggest gap in the current skills ecosystem in North-Eastern BC is the lack of mass timber manufacturers, and attracting employers both within mass timber manufacturing, as well as advanced wood processing and engineered wood manufacturing, should be a key priority for the region.

- While North-Eastern BC needs to attract employers in general, various barriers need to be addressed to make attracting mass timber manufacturers more feasible (see Priority 2). In the absence of these barriers being meaningfully addressed, the region could prioritize certain opportunities with fewer barriers by focusing on communities that have fewer transportation challenges and have existing SMEs (such as sawmills) with reliable fibre access. Combining the growing interest from a number of sawmills to diversify their operations and enter the mass timber manufacturing space with existing funding opportunities for capital investments and programs for on-the-job training could help more existing SMEs begin manufacturing panels in the region.
- One strategic approach that the North could adopt from the DACH region is thinking about advanced wood manufacturing more broadly. In the DACH region, most of the well-established mass timber manufacturers started as small family-run SMEs, such as sawmills, and gradually diversified into a variety of wood products, including mass timber. There are also mass timber manufacturers within BC that followed a similar path, such as Kalesnikoff.

Priority #2: Address major barriers, with a special focus on infrastructure and fibre access

Access to fibre and lack of transportation infrastructure have been some of the major bottlenecks preventing the recent establishment of value-added opportunities in North-Eastern BC, notably in Mackenzie and Fort St. John.

- The region requires appropriate transportation infrastructure, notably railways, to support greater access to markets. In Fort St. John, when a required railway upgrade did not receive the necessary provincial funding, a group exploring investing in mass timber production decided not to pursue the opportunity in the community as they felt market access would be unreliable.
- Considerations also need to be given to enhancing transport accessibility for SMEs to help drive down regional production costs. While this is a priority for the province more broadly, it is more of an immediate bottleneck for communities such as Mackenzie and Fort Nelson, and less of a

concern for communities like Prince George. Transportation costs for northern regions were some of the highest in the province and will need to be addressed to attract more employers.

- The difficulty of accessing fibre, especially for SMEs, needs to be addressed since this is one of the most significant concerns stakeholders have expressed. In Mackenzie, an interested manufacturer was unable to secure access to fibre and therefore, could not pursue their investment.

Priority #3: Ensure training programs are available for all industries and occupations within the supply chain, distinguishing between production and adoption

Throughout the supply chain, there is a need to ensure training programs are available for workers seeking to work on mass timber projects. Policymakers need to ensure training is available for all sectors involved in the production and adoption of mass timber. This means designing training programs that tackle the major challenges experienced by each set of workers:

- Focus on upskilling workers in production in regions where investments in mass timber facilities are anticipated within BC, recognizing that investments in skills training need to follow investments in production facilities or buildings.
- Ensure all occupations involved in the adoption side receive greater training in communication, collaboration, and coordination between industries and technical disciplines. These include occupations such as architects, manufacturing managers, construction site managers, and plumbers, all of whom will need to understand each other's technical terminology to be able to work swiftly on a project.
- Create opportunities for workers to reskill in occupations where the primary change is not about the need to collaborate across sectors, but related to changes in the technology/technologies used. These include occupations such as manufacturing engineers, mechanical/electrical engineers, and carpenters.

Priority #4: Ensure training programs focus on upskilling for gaps, and focus on wood skills more broadly (not just mass timber)

Ensuring training programs focus on upskilling for gaps (i.e., they should be short, targeted, and low-cost) rather than fully retraining has a greater chance of supporting upskilling. These programs should also teach general wood skills rather than focusing on mass timber specifically.

- Stakeholders have suggested that their preferred mode of learning mass timber-related skills would be short, targeted training programs or industry roundtables. These training programs could be focused on software skills (e.g., Revit), manufacturing and design skills (e.g., DfMA, BIM, and CAD), as well as artificial intelligence and robotics skills, as stakeholders indicated that these programs would be ideally suited to teaching the digital skill sets required on the job.
- Within the DACH region, focusing on wood skills was foundational for launching a mass timber ecosystem. A broader, more generalized wood-focused curriculum produced graduates that can occupy a variety of positions and occupations along the supply chain of mass timber and other wood products, equipping them all with digital skills, such as 3D modelling, CAD, BIM, and the use of computer numerical controlled machines, as well as high levels of practical work experience.

Priority #5: Focus on improving the affordability and accessibility of all educational offerings

- The BC and federal governments provide funding for various upskilling and reskilling initiatives, including certain micro-credentials, but full degrees at both universities and colleges remain expensive for many Northern BC learners. For example, the mass timber micro-credential at BCIT, which receives funding from the federal government, has experienced high demand that exceeds the funding available for students, potentially meaning that not everyone who requires support will be able to access it. Opportunities should be explored that could improve the affordability of specific educations and ideally provide an incentive for graduates to stay within the region. One example could be a tuition rebate program, such as the Saskatchewan Graduate Retention Program.¹⁴
- There are currently a multitude of relevant courses, programs, micro-credentials, and diplomas available to interested learners and companies in the wood manufacturing and mass timber space, and in-person and virtual offerings are rapidly expanding. Yet, learners do not have a central location to see all the available programs and face an added barrier in understanding what programs will best suit their desired career trajectories. A central platform detailing all educational offerings, similar to the Swiss Timber Construction Association's list,¹⁵ should be created for BC.



Conclusion

Producing more mass timber products represents a clean economic opportunity in British Columbia.

While many stakeholders in the mass timber space, including in manufacturing and construction, perceive it as a relatively niche opportunity in its early stages, there is consensus that it will grow from today's levels. Regions that would benefit most from investment should take steps to make themselves more attractive to emerging companies. Stakeholders in communities like Prince George, Mackenzie, Chetwynd, Fort Nelson, and Quesnel can begin to advance these priorities today to be prepared for the changes to come, informed by the analysis conducted for our reports. This will support the growth of this promising opportunity and ensure the economic benefits accrue to regions that may not have otherwise benefitted from investments in clean innovation and growth.

For additional details and discussion on any of the ideas, analyses, or recommendations presented in this summary for policymakers, please read SPI's two reports *Framing BC's low-carbon future: Identifying the skills and workforce needs of British Columbia's growing mass timber sector*, and *Making mass timber in Northern BC: An evaluation of readiness of workers and policies for producing more mass timber products in North-Eastern British Columbia*.

Endnotes

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