



The Road to 2050

Bridging the Gap Between Challenges
& Solutions in the Forestry Sector

Forestry

Bridging the Gap Between Challenges and Solutions in the Forestry Sector

British Columbia's forests are a defining feature of the province, historically, culturally, and economically. Two-thirds of BC's land base is covered in trees and the province has the one of highest proportions of land covered with forests (57%) in the world.¹

Another defining feature of BC is the provincial government's commitment to transition to a low carbon economy through its progressive CleanBC program that has set province-wide GHG emissions reduction targets of 40%, 60% and 80% for 2030, 2040, and 2050.

The forestry sector has a pivotal role to play in achieving these targets in three significant areas:

- 1) Operational: Reducing carbon intensity of forestry, logging and pulp and paper industrial operations
- 2) Carbon sequestration: Sustainable forest management, wildfire mitigation/prevention
- 3) Bioeconomy: Converting wood-based biomass into value-added products (e.g. electricity, transportation fuels, bio-chemicals, bio-plastics, bio-materials and engineered building products), within the framework of transitioning to a low carbon, circular economy

A decarbonized province will require not only an industrial shift to low carbon technologies and practices but also a market and consumer shift away from petroleum products toward bio-based products and fuels, many of which can be derived from wood-based biomass.

BC's forests are a high-value resource whose significance to the province's future can not be overstated. The forestry sector can and should lead the way toward a full-scale economic resurgence for the province as it transitions into a technology driven bio-economy model.

What's At Stake

- Forestry contributes \$12.9 Billion to BC's GDP ²
- There are over 50,000 direct jobs in forestry in BC ³
- \$1.2 billion has been spent by federal and provincial governments since 2001 to mitigate mountain pine beetle damage ⁴
- In 2017, the largest B.C. wildfire season on record emitted an estimated 190 million tonnes of greenhouse gases into the atmosphere — a total that nearly tripled B.C.'s annual carbon footprint ⁵
- BC First Nations Forestry Workforce Strategy has set a goal to double First Nations employment in the BC forest sector from the current 5% to 10% of total by 2027 ⁶
- Total net emissions of CO2 equivalent from Canada's managed forests: 217 million tonnes (Mt) ⁷



Cover photo courtesy of naturallywood.com

Photo courtesy of Forest Products Association of Canada (FPAC)



How Are We Getting There? The Roadmap Matrix

CORE Cleantech Cluster and Foresight are producing a series of roadmap landscapes in the six sectors of CORE's focus. The intent is to provide a snapshot of the roadmaps that exist in each, and how they are being used to achieve these emission goals industry-wide. The goal of this roadmap landscape series is to help identify gaps in the required elements, as well as places where roadmaps either don't exist or are insufficient to achieve the government's targets.

In BC, there is no widely used industry roadmap in place specifically to guide the forestry industry toward CleanBC targets. However, there are a range of sustainability related certification programs, policies and strategy papers that are driving decision-making in BC.

The programs cover a wide range of both scope and purposes - some are provincial, some are national/international, some cover internal forestry practices, while others extend wider into the role of the forestry sector in creating a value-added bio-economy. Some larger organisations have also developed their own internal roadmaps to meet targets.

Photo courtesy of naturallywood.com

Programs, Strategies & Roadmaps: A Snapshot

Strategy Paper

ROADMAP/PROGRAM	ORGANIZATION	DESCRIPTION
Canada's Bioeconomy Strategy	Bioindustrial Innovation Canada (sponsored by Agriculture and Agrifood Canada)	The strategy details the priority areas in which industry is recommending action to move toward an industrial bioeconomy.
A Forest Bioeconomy Framework for Canada	Canadian Council of Forest Ministers	A framework that outlines a comprehensive approach to stimulating new economic activity by converting sustainably managed renewable forest-based resources into value-added products and services using novel and repurposed processes.

Technology/Market Development Roadmap

ROADMAP/PROGRAM	ORGANIZATION	DESCRIPTION
Industry Leading Industry Sustainability Plans/Strategies	Large multinational companies have published sustainable packaging roadmaps and plans for their suppliers that are influencing technology and market planning in BC's forestry and pulp and paper sectors	Examples: PepsiCo Sustainability Agenda Danone Sustainable Development Action Plan Tetrapak Sustainability Plans

Industry Certification/Standards Program

ROADMAP/PROGRAM	ORGANIZATION	DESCRIPTION
Sustainable Forestry Initiative	A non-profit organization headquartered in Ottawa, ON and Washington DC	SFI Standards promote sustainable forest management in North America and responsible procurement of forest products around the world.
Sustainable Biomass Program	Multi-stakeholder governed non-profit organisation.	The Sustainable Biomass Program (SBP) is a certification system designed for woody biomass, mostly in the form of wood pellets and woodchips, used in industrial, large-scale energy production.
The European Organization for Packaging and the Environment (EUROPEN)	An industry organization developing sustainable packaging standards and presenting the opinion of the packaging supply chain	Developed an EU harmonised methodology for measuring the environmental impact of products (a Product Environment Footprint PEF), and is developing a Global Protocol on Packaging Sustainability (GPPS), which enables the global packaging value chain to assess the relative sustainability of packaging, as part of the product, with one harmonised tool and common language.

Policy Tool/Government Program

ROADMAP/PROGRAM	ORGANIZATION	DESCRIPTION
Forest Stewardship Plans	Province of BC	A forest stewardship plan (FSP), is a map-based, landscape-level plan of potential forest development activities that are intended to take place in the plan area. Forest agreement holders must prepare, and have approved by the BC government, a forest stewardship plan before harvesting or road building activities can begin.

The time has arrived when we are to decide whether we will be simply hewers of wood and drawers of water...or will rise to the position, which, I believe Providence has destined us to occupy.⁸

- Leonard Tilley, Canada's Minister of Finance, 1879

The Value Chain Pyramid & The Bioeconomy Opportunity

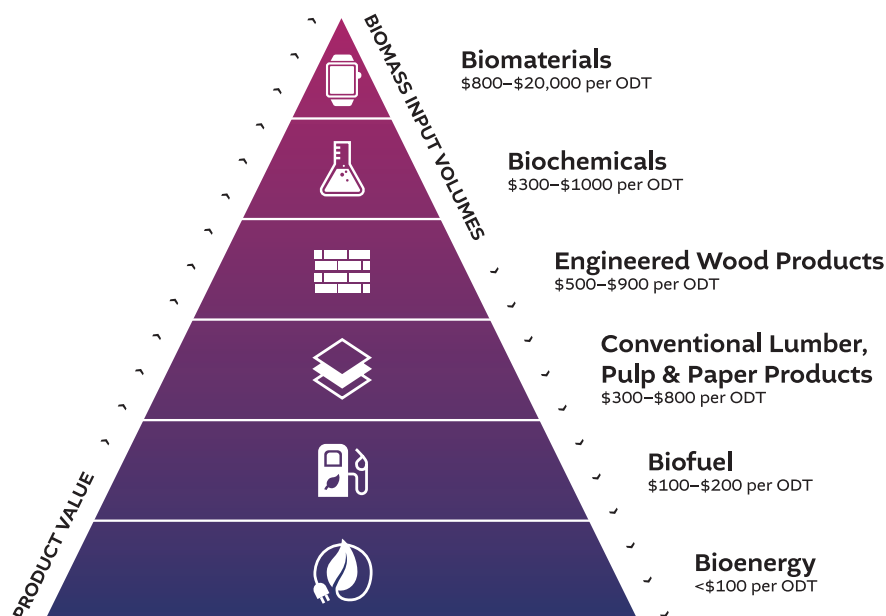
The forestry sector in BC is active in developing a forest-based bioeconomy focused on the substitution of fossil-based materials in downstream industries and on principles of a zero-waste circular economy.

The bioeconomy has enormous potential for British Columbia. The drive to develop the forest industry in BC to become valued-added producers of forest-derived products has been woven into the political and economic story of BC since before Confederation.⁹ Today, that drive continues as new technologies and the imperative to decarbonize have led to multiple new opportunities emerging to convert wood-based biomass into everything from electricity and heat to transportation fuels, bio-chemicals, plastics and next generation bio-materials and engineered building products.

The question the industry is grappling with is what opportunities should be pursued and when? What is the optimal, highest value use of forest resources that will be of greatest benefit to the well-being of the people of BC? What are the economic, technological and ecological impacts of this transformation to a bioeconomy and how do they drive market development decisions?

The Province of British Columbia breaks down these questions into a value chain pyramid that provides some answers.¹⁰ It shows a high-level pathway for transitioning into a value-added bioeconomy based on the fact that different bioproducts provide different economic value and require different amounts of biomass feedstock to be viable:

- Bioproducts on top can be economically viable and highly profitable with 10,000-50,000 oven dried tonnes (odt) of biomass/ year
- Bioproducts on the bottom require ~800,000 – 1M+ odt/ year to be economically viable
- Bioproducts on the top are not limited to comparatively small biomass needs; significant growth opportunities as per market analysis
- Advanced Biomaterials is the fastest growing market for bioproducts globally and by 2030 will be the largest market (by value).



“At the end of the day, I think we’re all trying to best utilize the fibre basket that we’re fortunate enough to have in British Columbia.”¹¹

- Chris Kalesnikoff, COO Kalesnikoff Lumber



Observations

The forestry/pulp & paper industry is a source of GHG emissions in the province, and while it has been working toward developing new technologies and practices for reducing emissions and meeting CleanBC goals, the following points were raised as stumbling blocks:

Stumbling Blocks

- **Low Margin, Highly Competitive Industry** - Conventional forestry products such as lumber or pulp and paper products are highly competitive and have low margins. This means that industry players are only willing to invest in low GHG emission technologies or solutions that have an economic benefit and return on investment.
- **Lime Kilns** - The biggest source of GHGs from the forestry sector for which no cost effective long-term solution was identified is the lime kilns used in the production of kraft pulp, with emissions from both combustion and the calcining of the lime.
- **Transportation** - the equipment used in harvesting and transporting forest products is almost entirely diesel fueled. Even on a global scale, forestry was not considered big enough on its own to drive the level of technological advancement needed to transform transportation. The forestry sector will likely adopt transportation-related solutions in lock-step with system-wide changes in industrial transportation, such as vehicle electrification or use of low-carbon fuels. (See the [Transportation Roadmap Landscape](#) report for a discussion of industrial transportation technologies relevant to the forestry sector).
- **Slash Burning** - the practice of burning slash piles (waste cuttings, stumps and branches from logging operations) was identified as a source of GHG emissions in the industry.
- **Forest Fire Protection/Prevention** - The BC Auditor General's February 2018 report, [Managing Climate Change Risks: An Independent Audit](#), emphasizes that British Columbians must prepare for more frequent and severe wildfires due to the impact of climate change. The number of large, high-intensity uncontrolled wildfires represent a significant stumbling block and challenge for the forestry industry in the context of GHG reductions.

Photo courtesy of naturallywood.com

I'm a veteran in the wood products industry, and I can tell you that this mass timber revolution is something that I have never witnessed before.¹²

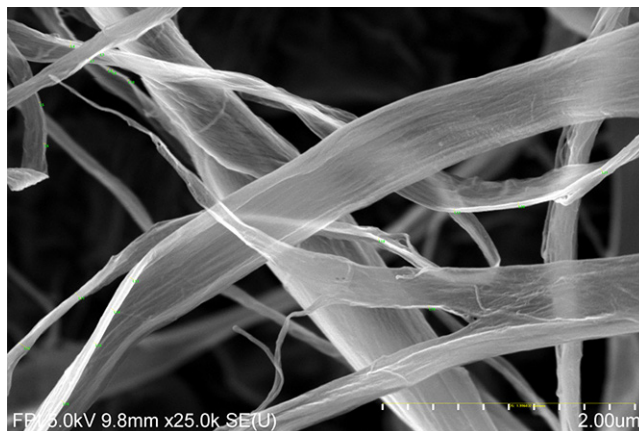
- Structurlam CEO Hardy Wentzel

Opportunities

Within every stumbling block is an opportunity, and the BC forestry and pulp and paper industry are developing innovative strategies and exploring solutions to address GHG emissions.

- **Higher Value/Higher Margin Products** - as discussed in the section above, the higher value biomaterials and bioproducts that can be produced from wood-mass is an area of significant opportunity for the province. The issue that was raised most frequently by interview participants is that BC has a limited quantity of fibre. While different people had different visions of what the best use of the fibre is, there was general agreement that the province should try to maximise the value realised for that fibre. There is an excellent opportunity here for the province to move into action and build world-leading biomaterials and biochemicals industries, replacing need for fuel based plastics etc.
- **Carbon Capture, Utilization & Storage** - some industrial processes in the forestry/pulp & paper sectors (such as lime kilns used in the production of kraft pulp) could reduce or eliminate their GHG emissions through the use of CCUS technology. While this is not currently economically viable, this could be an area of focused innovation and research, especially given BC's growing expertise in this area (and its connections into Alberta's innovation ecosystem, who are also leading in this technology).

Photo courtesy of naturallywood.com



PERFORMANCE BIOFILAMENTS

High Value Forest Products

[Performance Biofilaments](#), headquartered in Vancouver, BC (with offices in Quebec and Germany) is an example of how the forestry industry is moving towards extracting more value from every tree. Performance BioFilaments shareholders are Mercer International and Resolute Forest Products, two large multi-national leaders in pulp & paper. The company's mission is to operate as a fast-moving independent start-up and create new business opportunities and novel bioproducts.

Their core product is "Nanofibrillated Cellulose" (NFC)- wood pulp that is transformed using a chemical-free refining process into fibrils of exceptional strength and purity, with a high aspect ratio and surface area not obtainable through currently applied processes.

NFC fibrils can be used in a wide range of product solutions, including as a reinforcing agent, a stabilizer, or a rheology modifier. Industries that the company has identified as potential users of their fibrils include automotive and manufacturing, construction and consumer products. Applications for their products include creating lighter-weight, more fuel-efficient vehicles, and developing more resilient coatings and stronger concrete.

Photo courtesy of Performance Biofilaments



- **Transformation of the Pellet Sector -** Although the pellet industry has grown significantly in recent years, it is likely that worldwide demand for pellets as a feedstock for energy generation will drop off as the cost of wind, solar and storage all decrease.

Since having a homogeneous feedstock is a requirement for most biomaterials and biochemicals, there is the potential here for the pellet producers to leverage their experience in collecting and processing residual wood fibre and transform their industry into the equivalent of oil & gas “midstream” companies that collect and process raw materials into tailored feedstocks for chemical and materials companies. A thriving fibre industry that collects waste-wood slash piles for conversion to biomaterials and biochemicals also maximizes the value of the forest resources and reduces the GHG emissions from slash burning.

- **Wildfire/Emergency Management -** Many effective and innovative firefighting strategies are already in place, and Emergency Management British Columbia along with the Ministry of Forests, Lands, Natural Resource have established an action plan in response to the 2017 fire season.¹³ One of the recommendations is to establish emergency centres of excellence in Interior locations.

- **Mass Timber/Engineered Wood -** BC is a known centre of excellence in mass timber with potential to include added value wood products in the construction value chain, and there are industry groups working to advance this sub-sector. For example, Forest Innovation Investment (FII) is working to position B.C. as a global supplier of world-class environmentally friendly forest products, including mass timber and engineered wood. (See the [CORE Cleantech Cluster](#) report for a further discussion and recommendations for energizing this growing industry).

Photo courtesy of naturallywood.com

Innovation clusters and ecosystems are important venues in which to develop the bioeconomy and facilitate relationships between actors along the full value chain.

- Canada's Bioeconomy Strategy, May 2019

Recommendations:

BC has multiple competitive advantages in the forestry and pulp and papers sectors that should be leveraged as it builds out a thriving bioproducts industry. Among these advantages include an existing world-class innovation ecosystem, an experienced, educated workforce, biomass supply, and a unique mix of forest resources and tree species. (BC softwood fibres can out-compete other sources of biomass in the production of advanced biomaterials).

There is phenomenal potential for the forestry sector to take a leading role in the shift toward a high-value bioeconomy as it takes action toward reducing GHG emissions and achieving CleanBC goals.

The world is changing and the forestry sector knows it has to change along with it or get left behind. Building a strong biomaterials and biochemicals industry in BC - producing the high value end products here in addition to providing the feedstock - will secure the province's economy for generations to come and ensure we don't get left behind in the global transition to low carbon products and energy sources. While there are competing visions in terms of precise solutions, we found no disagreement around the overall vision of BC staking its claim in the ground and becoming a leader in Canada's rapidly emerging bio-economy.

This will require strategic decisions and investments, and an approach (such as was outlined in the [CORE Cleantech Strategy](#) report) that engages the entire ecosystem in the change process - including building networks that span the entire province, (especially remote and Indigenous communities), providing policy support to encourage the development of advanced bioproducts businesses, building relationships with financiers and institutions, ensuring skills and training and driving local manufacturing of value-added forestry products.

Mobilizing this industry toward a bioeconomy aligns with Canada's obligations under the Paris Climate agreement, and if done inclusively, aligns with the United Nations Declaration on Indigenous Peoples (UNDRIP) bill recently passed in the BC legislature. It can provide jobs and revitalize struggling forestry-based communities across the province.

Forests define British Columbia. They are our past, our present and our future. The pieces are all in place to build the future we desire, and it's time to see this much-talked-about vision come to life.

Photo courtesy of naturallywood.com



The following are concrete recommendations for action:

- The Canada Bioeconomy Strategy recommends using federal government procurement policies to promote the bioeconomy and build anchor companies. In BC, both the federal and provincial governments could de-risk technology adaptation by becoming customers for novel bio-economy products. (For example, all government funded buildings in the province could be constructed using mass timber).
- Given the unresolved problem of GHG emissions from pulp mill lime kilns, focussed research on finding cost effective solutions (CCUS or others) could result in a potential new industry for BC, and advance BC's growing expertise in this area.
- From the perspective of technology and innovation, the recommendation to establish emergency centres of excellence (for responding to wildfires/floods) may be an opportunity to explore solutions and develop capacity for innovative technology for use in forest management, wildfire monitoring/fighting and emergency response, including artificial intelligence, data management, robotics, watertech and high-resolution mapping software. There is an opportunity for capacity building programs for remote and First Nations communities to gain practical, hands-on training in how these technologies will change operations and practices and support technology adoption.

- Further action should be taken to expand on the Province's bioeconomy strategy to maximise the value of fibre in the province and build a biomaterials and biochemical industrial complex. There is an opportunity for innovative programming that supports the forestry sector as it shifts away from a commodity mindset into an advanced value-added industry. This should include:

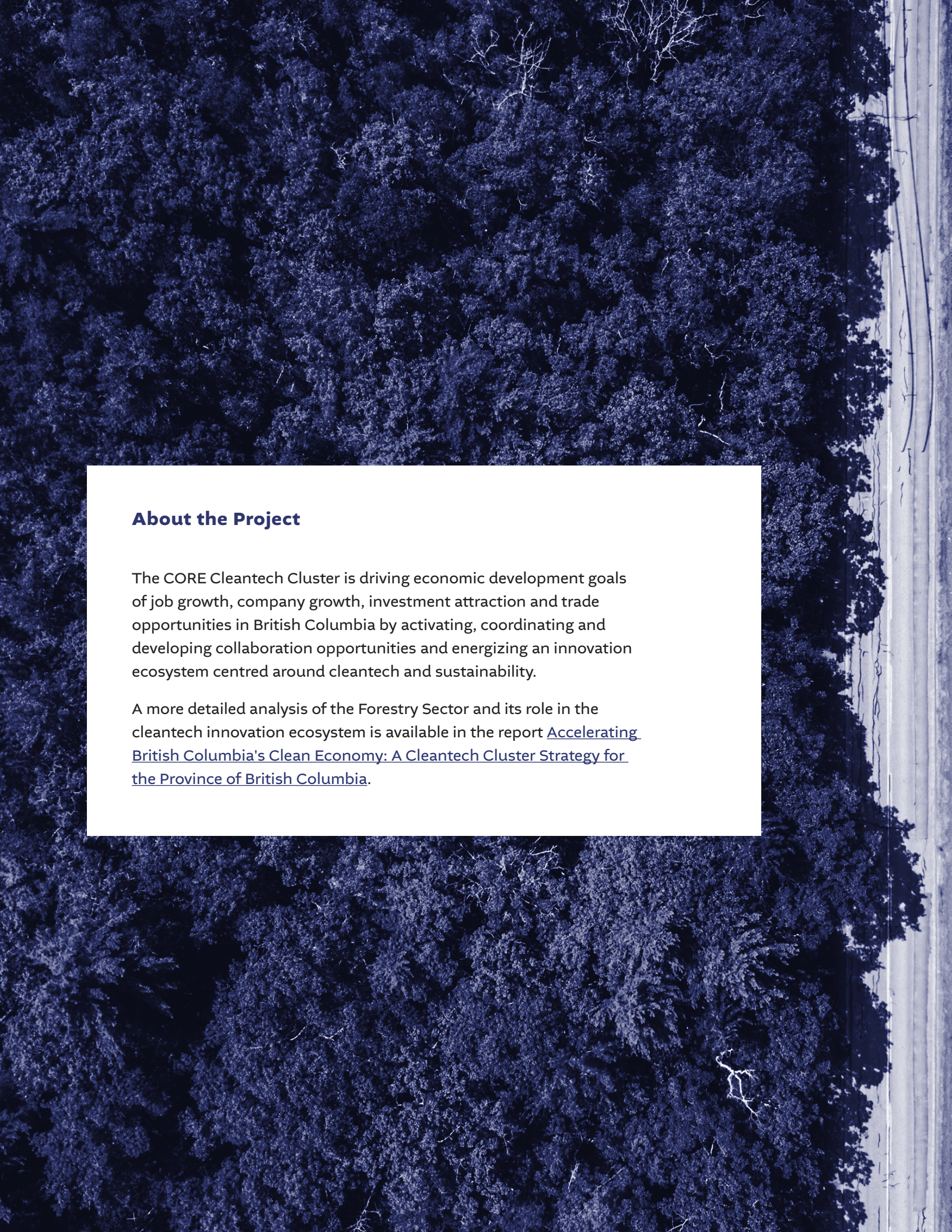
- » Launch a project to develop a BC based technology roadmap for the forestry sector outlining the technology pathways needed to build a bioeconomy in BC and achieve CleanBC GHG emission reduction goals.

This should happen in lock-step with ongoing technology roadmap projects in other interrelated sectors (e.g. transportation, mining, energy, built environment) as larger scale decisions and recommendations in one sector influence planning in the other. For example, higher value liquid biofuels will likely need hydrogen as an added feedstock, which would grow the hydrogen economy in the province.

- » An export-focused marketing program to broaden the reach and impact of the mass timber story (e.g. with Forestry Innovation Investment) and the bioproducts opportunity (e.g. with BC BioAlliance, Bioproducts Institute).
- » As the technology roadmap is produced, consideration should be made to how policy tools such as Forest Service Plans could be used to move the industry toward maximizing value and reducing GHG emissions.
- » Expanded industry engagement programs that bring together investors, industry, researchers/innovators and end users within the forestry, cleantech, biotech and circular bioeconomy space.
- » Project-focused investment for scaling up of solutions into higher TRL and manufacturing. This could include funded industrial challenges that focus on a) specific emission reduction categories (e.g. CCUS related to lime kilns) and b) novel bioproducts.



Photo courtesy of John Andres

An aerial photograph of a dense, dark green forest. A light-colored road or path runs vertically along the right edge of the image. The forest canopy is thick and textured, with some bare branches visible in the upper right.

About the Project

The CORE Cleantech Cluster is driving economic development goals of job growth, company growth, investment attraction and trade opportunities in British Columbia by activating, coordinating and developing collaboration opportunities and energizing an innovation ecosystem centred around cleantech and sustainability.

A more detailed analysis of the Forestry Sector and its role in the cleantech innovation ecosystem is available in the report [Accelerating British Columbia's Clean Economy: A Cleantech Cluster Strategy for the Province of British Columbia.](#)

Foresight

About Foresight Cleantech Accelerator Centre

This roadmap landscape report is funded through [Foresight Cleantech Accelerator Centre](#). Foresight is Western Canada's Cleantech Innovation Centre which supports the identification and validation of cleantech opportunities and the successful commercialization of solutions.

¹ [The State of British Columbia's Forests: A Global Comparison](#)

² Council of Forest Industries. [Smart Future: A Path Forward for BC's Forest Products Industry](#), Sept 2019

³ <https://cfs.nrcan.gc.ca/statsprofile/employment/bc>

⁴ <https://www2.gov.bc.ca/gov/content/industry/forestry/managing-our-forest-resources/forest-health/forest-pests/bark-beetles/mountain-pine-beetle/responding-to-the-1999-2015-outbreak>

⁵ <https://www.cbc.ca/news/canada/british-columbia/it-s-alarmed-wildfire-emissions-grow-to-triple-b-c-s-annual-carbon-footprint-1.4259306>

⁶ <https://www.forestrycouncil.ca/cpages/forest-strategy-public>

⁷ Natural Resources Canada, [Indicator: Carbon emissions and removals](#), Accessed Aug 2020

⁸ Canadian Confederation. Library & Archives Canada.

⁹ Lang, David, [The Log Export Question in British Columbia, 1865-1930](#). University of Victoria, April 2019

¹⁰ <https://www2.gov.bc.ca/gov/content/industry/forestry/supporting-innovation/bio-economy>

¹¹ <https://www.vancourier.com/real-estate/building-the-case-for-more-mass-timber-construction-1.23888675>

¹² <https://www.vancourier.com/real-estate/building-the-case-for-more-mass-timber-construction-1.23888675>

¹³ https://www2.gov.bc.ca/assets/gov/public-safety-and-emergency-services/emergency-preparedness-response-recovery/embc/abbott-chapman_action_plan_update_april_30_2019.pdf