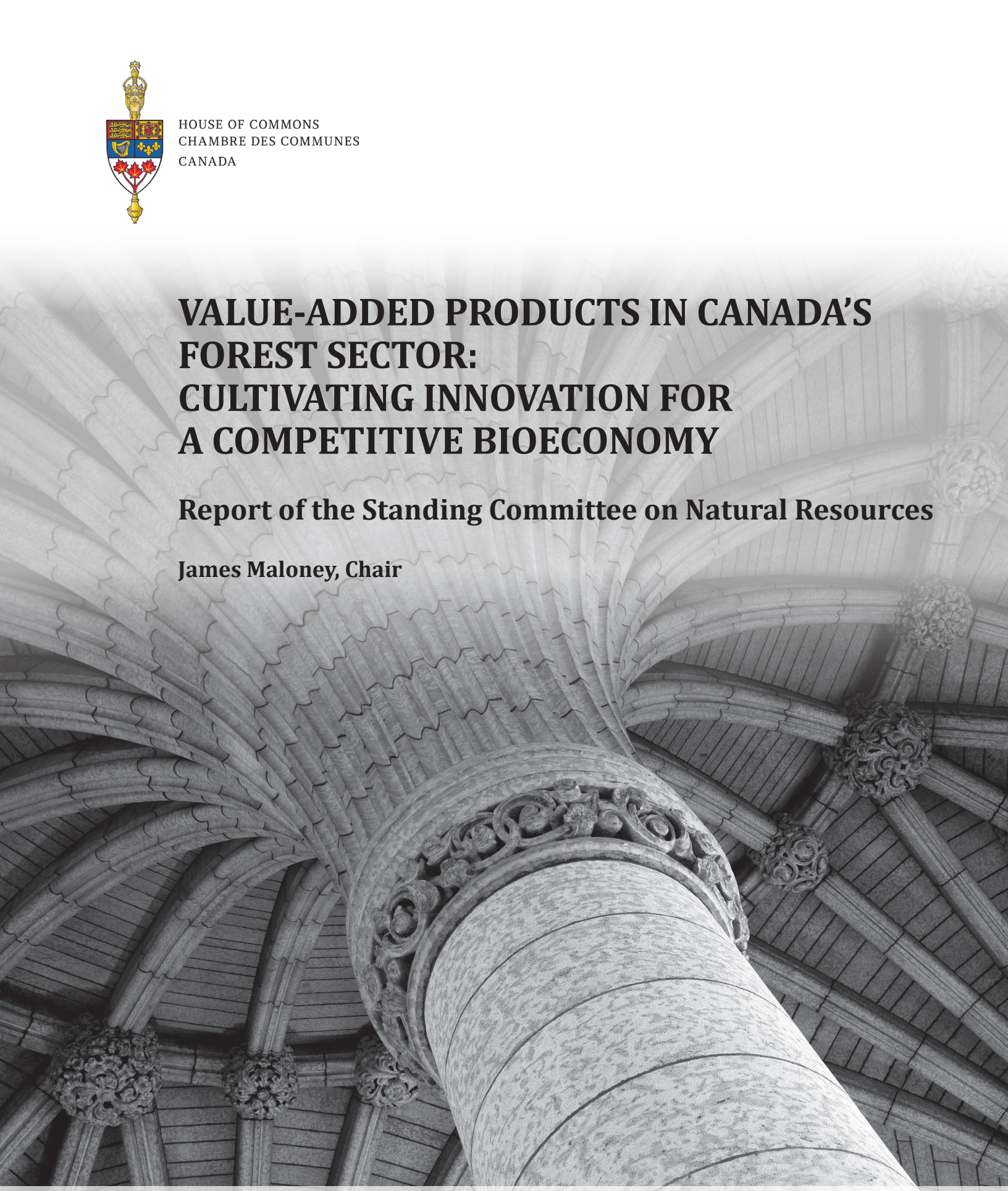
HOUSE OF COMMONS
CHAMBRE DES COMMUNES
CANADA

VALUE-ADDED PRODUCTS IN CANADA'S FOREST SECTOR: CULTIVATING INNOVATION FOR A COMPETITIVE BIOECONOMY

Report of the Standing Committee on Natural Resources

James Maloney, Chair



MAY 2018
42nd PARLIAMENT, 1st SESSION

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NOTICE TO READER

Reports from committee presented to the House of Commons

Presenting a report to the House is the way a committee makes public its findings and recommendations on a particular topic. Substantive reports on a subject-matter study usually contain a synopsis of the testimony heard, the recommendations made by the committee, as well as the reasons for those recommendations.

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THE STANDING COMMITTEE ON NATURAL RESOURCES

has the honour to present its

NINTH REPORT

Pursuant to its mandate under Standing Order 108(2), the Committee has studied the subject matter of secondary supply chain products in the forestry sector in Canada and has agreed to report the following:

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SUMMARY

Value-added manufacturing in the forest industry is a growing contributor to economic and employment growth in Canada. Recent forest product innovations have led to improved industrial competitiveness and environmental performance in a wide range of industries, from natural resources, agriculture and manufacturing, to chemistry, cosmetics and healthcare. Given Canada's abundant forest resources, strong environmental credentials, and effectiveness as an exporting country, many experts think the Canadian forest-sourced bioeconomy has not yet reached its full potential. Priorities for sustainable industrial development include:

1. **Protecting Canada's forests and primary resources:** Value-added manufacturing in the forest industry depends on the sustainability of forest biomass resources and the strength of sectoral supply chains. Canada can protect its forestry resources by staying abreast of short- and long-term climate change impacts, including forest fires, pest infestation and variations in temperatures and biodiversity; by maintaining sustainable forest management practices; and by supporting innovation in forest operations, such as advanced harvesting technologies.

2. **Advancing industrial integration, innovation and talent development:** An integrated value-added supply chain is a foundational factor in the development of an advanced bioeconomy. Forest-sector innovation involves a wide range of interdependent processes, from primary resource management, harvesting and conversion (or refining), to value-added product research, development, testing, commercialization and market delivery. Given the highly specialized and capital-intensive nature of many forest-sourced industries, transformative innovation and technological upgrades depend on access to patient capital and the availability of a skilled workforce, especially in rural areas. The committee also heard that diversity and inclusion – namely of women, minorities and Indigenous peoples – are prerequisites for innovation.

3. **Strengthening partnerships with Indigenous governments and communities:** The bioeconomy represents an opportunity for Canadian governments and industry to strengthen their partnership with Indigenous communities, 70% of which are in, or adjacent to, forests. Indigenous peoples are concerned about the sustainability of both forest resources and employment opportunities; they want to be full

participants in both traditional and new value-added forest operations and product manufacturing. Their participation in the forest sector can be enhanced through targeted and culturally-appropriate workforce development programs, and by investing in Indigenous-owned forestry businesses and value-added facilities. The committee also heard that bioenergy projects are of special interest to off-grid communities that rely on costly and high-emitting fuel imports for energy.

4. **Maximizing market opportunities in Canada and abroad:** The growing interest in renewable forest-based products and solutions is part of a global shift, driven by concern for environmental sustainability and resource security. Market development opportunities include, but are not limited to, bioenergy generation, advanced wood building construction, and biorefining to produce new products and alternatives to traditional petrochemicals and materials for multi-industrial applications. The committee heard that the federal and provincial governments should maintain an active role in the development and/or commercialization of Canadian value-added forestry products (and product applications) in both domestic and international markets.

LIST OF RECOMMENDATIONS

As a result of their deliberations committees may make recommendations, which they include in their reports for the consideration of the House of Commons or the Government. Recommendations related to this study are listed below.

Based on evidence from a wide range of experts from government, Indigenous organizations, industry and civil society, the committee recommends the following:

Recommendation 1

That the Government of Canada work with industry, research institutions, Indigenous governments and communities, and provincial/territorial governments to sustain and improve Canada's forest management policies and practices, by:

a) **continuing to study, address and adapt to short- and long-term climate change impacts, including forest fires, pest infestation and variations in forest temperatures and biodiversity;**

b) **maintaining sustainable forest management policies and practices, according to the most recent scientific evidence; and**

c) **supporting innovation in forest operations, including harvesting practices that maximize the utilization of unused, underused and/or at-risk forest resources, within the allowable harvesting limits.**

Recommendation 2

That the federal government work with Indigenous governments and communities, as well as industry, research institutions and provincial/territorial governments, to develop policies and programs that encourage more investment in value-added manufacturing, including targeted and culturally appropriate support for Indigenous businesses that harvest value-added products and standing forests.

Recommendation 3

That the federal government work with industry, research institutions, Indigenous governments and communities, and provincial/territorial governments to improve the economic competitiveness and innovative capacity of value-added manufacturing in the Canadian forest sector, by:

a) **supporting regional forestry clusters that integrate primary, secondary and tertiary value-added supply chains;**

b) **investing in talent and skills development programs, especially in rural areas, including targeted and/or culturally appropriate programs for women, Indigenous peoples and minorities;**

c) **providing financial incentives to support the development of transformative forest product innovations and low-carbon products and technologies with high economic potential, especially through the commercialization gap;**

d) **developing performance-based standards and favouring policies that prioritize public safety, cost competitiveness and greenhouse gas emission reduction, according to the most recent scientific evidence and industry market research; and**

e) **supporting workforce development initiatives, including industry skills development and industry-specific regional immigration programs and policies to allow for long-term regional sustainability.**

Recommendation 4

That the Government of Canada work with industry, Indigenous governments and communities, and provincial/territorial governments to support biofuel projects in diesel-dependent, off-grid communities, including targeted and culturally appropriate support for Indigenous peoples.

Recommendation 5

That the federal government continue to facilitate the market access of Canadian forest products in domestic and international markets:

a) **through market-access policies, such as the Expanding Market Opportunities and Green Construction through Wood programs (or similar programs);**

b) **through government procurement policies, such as Bill C-354, An Act to amend the Department of Public Works and Government Services Act (use of wood) – at the date of tabling of this report, the last stage completed by Bill C-354 was Concurrence at Report Stage in the House of Commons;**

c) **by supporting the research and development of value-added product applications (i.e., "market pull" strategies), in collaboration with industry, Indigenous governments and communities, and/or provincial/territorial governments; and**

d) **by continuing to promote Canadian forestry products, technologies and practices in international trade missions.**

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INTRODUCTION

Between November 2017 and February 2018, the House of Commons Standing Committee on Natural Resources (the committee) conducted a study on the secondary supply chain products in Canada's forest sector. The committee heard from a wide range of experts about the sector's role in advancing the Canadian bioeconomy, especially with regard to economic growth, employment creation, the environment and technological innovation. The committee is pleased to table its final report, which presents the study findings and recommendations to the Government of Canada.

The committee heard that Canada's abundant forests can be the source of a wide range of bioproducts and solutions. Value-added forest product supply chains can create new industries and employment opportunities, while utilizing the forest's natural carbon sequestration capacity to advance Canada's transition to a low-carbon economy (Figure 1).[1] In the words of Glen Mason of Natural Resources Canada (NRCan): "The forest sector is increasingly a source of solutions for the challenges society faces. Today Canada has a clear opportunity to leverage its global forest sector leadership into bioproducts, biochemicals, and bioenergy that will lower our greenhouse gas [GHG] emissions and drive economic growth across

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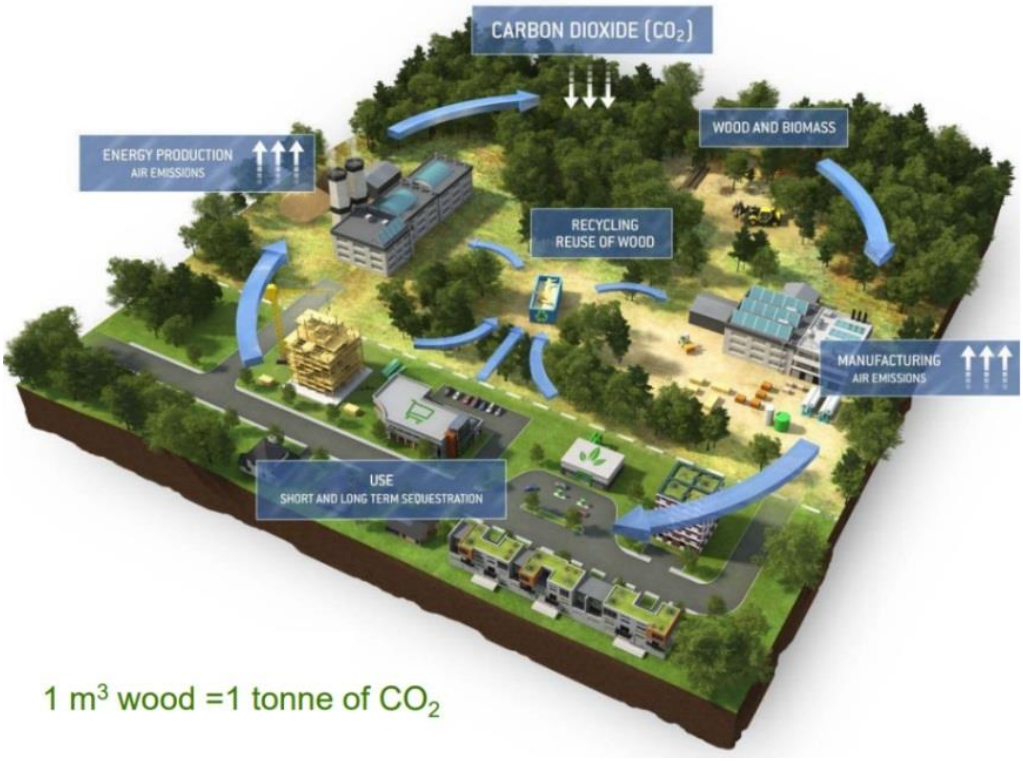
>
> Glen Mason,
> Assistant Deputy Minister,
> Canadian Forest Service

1 Standing Committee on Natural Resources (RNNR), *Evidence*, 1st Session, 42nd Parliament (*Evidence*): Glen Mason (Assistant Deputy Minister, Canadian Forest Service, Natural Resources Canada [NRCan]); Robert Larocque (Senior Vice-President, Forest Products Association of Canada [FPAC]); Sandy Ferguson (Vice-President, Corporate Development, Conifex Timber Inc. [Conifex]); Bruno Marcoccia (Director of Research and Development, Pulp and Paper Division, Domtar Inc. [Domtar]); and Catherine Cobden (President, Cobden Strategies).

Canada and in rural areas in particular." Similarly, Catherine Cobden of Cobden Strategies stated that the bioeconomy represents an opportunity for employment creation, economic growth and trade expansion, especially given Canada's abundant resources, strong forest management credentials and effectiveness as an exporting country.

Figure 1: The Forest Carbon Cycle

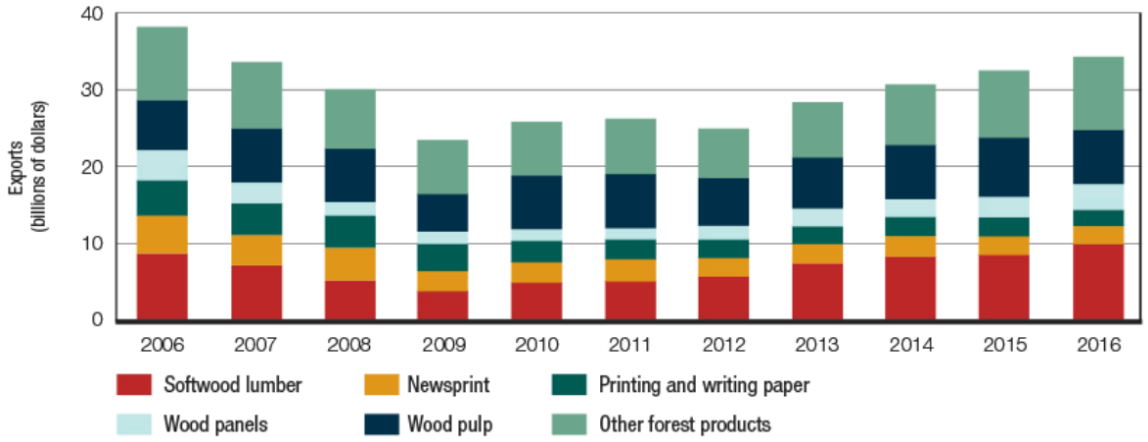


Source: FPInnovations

According to the Forest Products Association of Canada (FPAC), the Canadian forest products sector is a $67-billion industry, accounting for approximately 12% of Canada's manufacturing gross domestic product (GDP). It operates in 600 forest-dependent communities, mainly in rural Canada, and provides direct employment to 230,000 Canadians from coast to coast. According to The State of Canada's Forests Annual Report 2017 (produced by NRCan), the forest industry harvested approximately 160 million cubic metres of wood to produce 77 million cubic metres of wood products and 23 million tonnes of pulp and paper products. It also supplied 12 million cubic metres of wood residue, mainly used to generate low-carbon electricity. In 2016, the Canadian forest industry exported products valued at more than $34 billion to 180 countries around the world (Figure 2).[2]

2 RNNR *Evidence*: Larocque (FPAC) and Mason (NRCan).

Figure 2: Exports of Canadian Forest Products, 2006–2016



Source: Natural Resources Canada

Over the past decade, innovations in Canadian value-added forest products have led to improved industrial competitiveness and an expanded product and process portfolio – for example, the development and/or production of bioenergy, advanced building systems with a lower carbon footprint, new bio-sourced chemicals and products with renewable properties, and new forest management tools, such as forestry genomics.[3] Citing an NRCan report, Robert Larocque of FPAC told the committee that forest sector investments in the 2000s to generate electricity from wood residues "have sustained more than 14,000 jobs, reduced greenhouse gas emissions by 543,000 tonnes, atmospheric emissions by about 15%, and the water used by mills by the equivalent of 4,000 Olympic-size pools." According to Mr. Mason, advanced bioeconomy revenue, where measured, "has been shown to grow on average over 10% each year over the past decade, which is much faster than the rest of the economy. The associated employment growth has also been shown to be more rapid [than] other knowledge-driven, technology-based sectors such as finance and insurance, aerospace, and computer hardware."

In September 2017, the Canadian Council of Forest Ministers unanimously endorsed the report, A Forest Bioeconomy Framework for Canada, outlining "a new vision for the future of the forest sector and the role for biomass in the transition to a low-carbon, sustainable economy."[4] The Framework's four key pillars include:

3 RNNR *Evidence*: Larocque (FPAC).

4 RNNR *Evidence*: Mason (NRCan).

(1) *Communities and Relationships*, including the creation of employment and training opportunities and the enhancement of partnerships with Indigenous peoples;

(2) Supply of Forest Resources and Advanced Bioproducts;

(3) Demand for Advanced Forest Bioproducts and Services; and

(4) Support for Innovation.

According to Mr. Larocque, these pillars align well with the forest industry's objectives of "establishing new bioeconomy value chains, accelerating disruptive technologies, sustaining rural economies, and improving the environment."

In spite of the aforementioned progress in Canadian value-added forest product development, the committee heard that Canada's bioeconomy has not yet reached its full potential.[5] In the words of Alexander Marshall of Bioindustrial Innovation Canada:

> For a sector with such high growth potential and access to vast resources, our bioeconomy is lagging. In 2018, the sector was valued at 6% of GDP, on a per-capita basis, whereas in the U.S. it's over 8%. Furthermore, Sweden is considered to be a leader in the bioeconomy, with 30% of its natural energy supply fed from biomass, compared to 1% in Canada.

The committee also heard that Canada's forest-sourced industries are facing financial and market challenges that are affecting investments, exports, innovation and talent retention. Witnesses explained that value-added forest product manufacturing is a highly specialized and capital-intensive industry; transformative innovation requires a skilled workforce and access to patient capital.[6] Furthermore, the committee heard that the Canada-U.S. softwood lumber dispute has resulted in fluctuating tariffs, especially for the Canadian

5 RNNR *Evidence*: Alexander Marshall (Executive Director, Bioindustrial Innovation Canada); Timothy Priddle (President, The WoodSource Inc. [The WoodSource]); Larocque (FPAC); Mason (NRCan); Cobden (Cobden Strategies); Ning Yan (Professor, University of Toronto); Marcoccia (Domtar); Rick Jeffery (President and Chief Executive Officer, Coast Forest Products Association [Coast Forest]); Keith Atkinson (Chief Executive Officer, BC First Nations Forestry Council [FNFC]); and Paul Kariya (Senior Policy Advisor, Coastal First Nations Great Bear Initiative [CFN-GBI]).

6 RNNR *Evidence*: Yan (University of Toronto); Antoine Charbonneau (Vice-President, Business Development, CelluForce Inc. [CelluForce]); Jeffery (Coast Forest); Marshall (Bioindustrial Innovation Canada); and Marcoccia (Domtar).

remanufacturing sector, leading to investor uncertainty and limiting the access of some businesses to U.S. markets.[7] According to Professor Ning Yan of the University of Toronto:

> The forest sector contributes significantly to the social and economic prosperity of Canada. With the recent shifts in market demand, increasing trade barriers, and higher competitive pressure for traditional forest products, there is an urgent need for the sector to revitalize and transform to ensure that it remains an economic engine of Canada in the future.

The following sections present discussions regarding the challenges and opportunities of advancing Canadian value-added forest products and a forest-sourced bioeconomy. The evidence is organized according to five themes: (1) protecting Canadian forests and primary resources; (2) advancing industrial integration, innovation and talent development; (3) strengthening partnerships with Indigenous peoples; (4) maximizing market opportunities in Canada and abroad; and (5) a case study on building with wood, with a focus on advanced mass timber construction.

PROTECTING CANADA'S FORESTS AND PRIMARY RESOURCES

The committee heard that the sustainability of the secondary forest sectors depends on the health of Canadian forests, as well as the stability of forest product supply chains. Witnesses explained that reduced activity at the sawmill will affect the productivity and economic performance of secondary products in downstream industries.[8] According to Mr. Larocque, "one of the key factors for a prosperous forest sector in the future is to ensure a sustainable, stable, and economic access to fibre from our Canadian forests."

> "One of the key factors for a prosperous forest sector in the future is to ensure a sustainable, stable, and economic access to fibre from our Canadian forests."
>
> Robert Larocque,
> Senior Vice President,
> Forest Products Association of Canada

Witnesses discussed several ways to protect the health of Canadian forests and to maximize the economic value of forest resources – for example, by:

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7 RNNR *Evidence*: Rick Ekstein (Founder, Chief Executive Officer of Weston Forest, Association of Lumber Remanufacturers of Ontario); Greg Stewart (President, Sinclair Group Forest Products Ltd.); Atkinson (FNFC); Charles Tardif (Vice-President, Corporate Development and Procurement, Maibec); and Denis Lebel (Chief Executive Officer, Quebec Forest Industry Council [QFIC]).

8 RNNR *Evidence*: Marcoccia (Domtar); Jeffery (Coast Forest); Tardif (Maibec); and Rod Badcock (Partner, BioApplied Innovation Pathways [BioApplied]).

- **Understanding the potential long-term impacts of climate change on forest ecosystems and resources**: Recent climatic conditions have affected the health of Canada's forests, as well as the supply of timber resources.[9] According to Mr. Larocque, the forest sector must continue to research the long-term potential impacts of climate change, including forest fires, pest infestation and other climatic conditions that may affect biodiversity, or require changes to forest management practices (e.g., planting climate-appropriate trees).

- **Speeding up action against pest infestation, namely the mountain pine beetle in western Canada and the spruce budworm in the east**: According to Mr. Larocque, NRCan modelling shows that pest infestation is expected to worsen by 2050 "if we continue with the status quo."[10] The committee heard that industry and governments need to work together to minimize these anticipated impacts, and to be ready to harvest wood before it loses its value.[11] Keith Atkinson of the BC First Nations Forestry Council (FNFC) explained that Indigenous communities were active in prioritizing the mitigation of the mountain pine beetle epidemic that began 15 years ago in the province: "One of the top three priority goals was participation in the new bioenergy or other bioeconomy business that would utilize the dead pine trees.… Although there were some pellet plants and multiple bioenergy proposals and pilots, the full implementation and utilization are yet to be developed."

- **Strengthening Canada's response capacity to forest fires**: As reported by The State of Canada's Forests Annual Report 2016, forest fires are increasing in Canada with detrimental impacts on communities, the environment and forest resources.[12] According to Mr. Mason, the Canadian Forest Service is undertaking fire modelling and fire prediction, providing data and tools for decision-makers on the ground, and increasing collaboration with the defence industry to improve forest fire monitoring. He added that there is broad agreement among experts that "'firesmarting' communities is one of the best investments we can make" in response to forest fires.

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9 RNNR *Evidence*: Atkinson (FNFC); Kariya (CFN-GBI); and Bob Matters (Chair, Steelworkers – Wood Council, United Steelworkers).

10 RNNR *Evidence*: Larocque (FPAC).

11 RNNR *Evidence*: Lebel (QFIC); Atkinson (FNFC); Jerome Pelletier (Vice-President, Sawmills, J.D. Irving, Limited [J.D. Irving]); and Larocque (FPAC).

12 RNNR *Evidence*: Larocque (FPAC).

- **Improving in-forest harvesting practices and equipment**: The committee heard that Canadian forests are under-harvested, and that a substantial amount of wood residue remains unused or underused.[13] Sandy Ferguson of Conifex Timber Inc. (Conifex) called on the federal government to accelerate the work by FPInnovations to make better use of unused resources for value-added purposes, pointing out that unharvested feedstock often creates fire and pest risk. Furthermore, Denis Lebel of the Quebec Forest Industry Council (QFIC) stated that "the trees in a forest that reach maturity become windthrow, and will be knocked over by high winds or destroyed by forest fires. Not only do we lose their economic value, but they also emit carbon dioxide."

- **Maintaining ecologically suitable reforestation practices**: Rick Jeffery of the Coast Forest Products Association (Coast Forest) told the committee that one of the foundations of Canadian forest management practices is reforestation with species that are "ecologically suited to the climatic, soil, weather, and physiological conditions of [a given] site." He added that industry's ability to grow trees for commercial uses is "tempered by the need to make sure we're planting the right trees in the right places, trees that are going to survive and grow well."

- **Improving forest innovation and resource development technology**: According to Mr. Larocque, "more government support is required to ensure a healthy forest. Currently, most federal funding programs are tailored to mill capital investment support, with significantly fewer funds for forest innovation." He called for financial support – or tax credits – for forest projects that reduce GHG emissions or increase the forest's carbon sequestration capacity (e.g., afforestation projects). Witnesses also discussed the need to improve in-forest communication (e.g., through movable cell towers), access roads and the utilization rate of logging equipment.[14]

The committee heard that the Canadian forest sector would benefit from increased value-added manufacturing and reduced exports of raw resources.[15] According to Bob Matters of

13 RNNR *Evidence*: Badcock (BioApplied); Ferguson (Conifex); and Pascale Lagacé (Vice-President, Environment, Innovation and Energy, Resolute Forest Products).

14 RNNR *Evidence*: Larocque (FPAC) and Badcock (BioApplied).

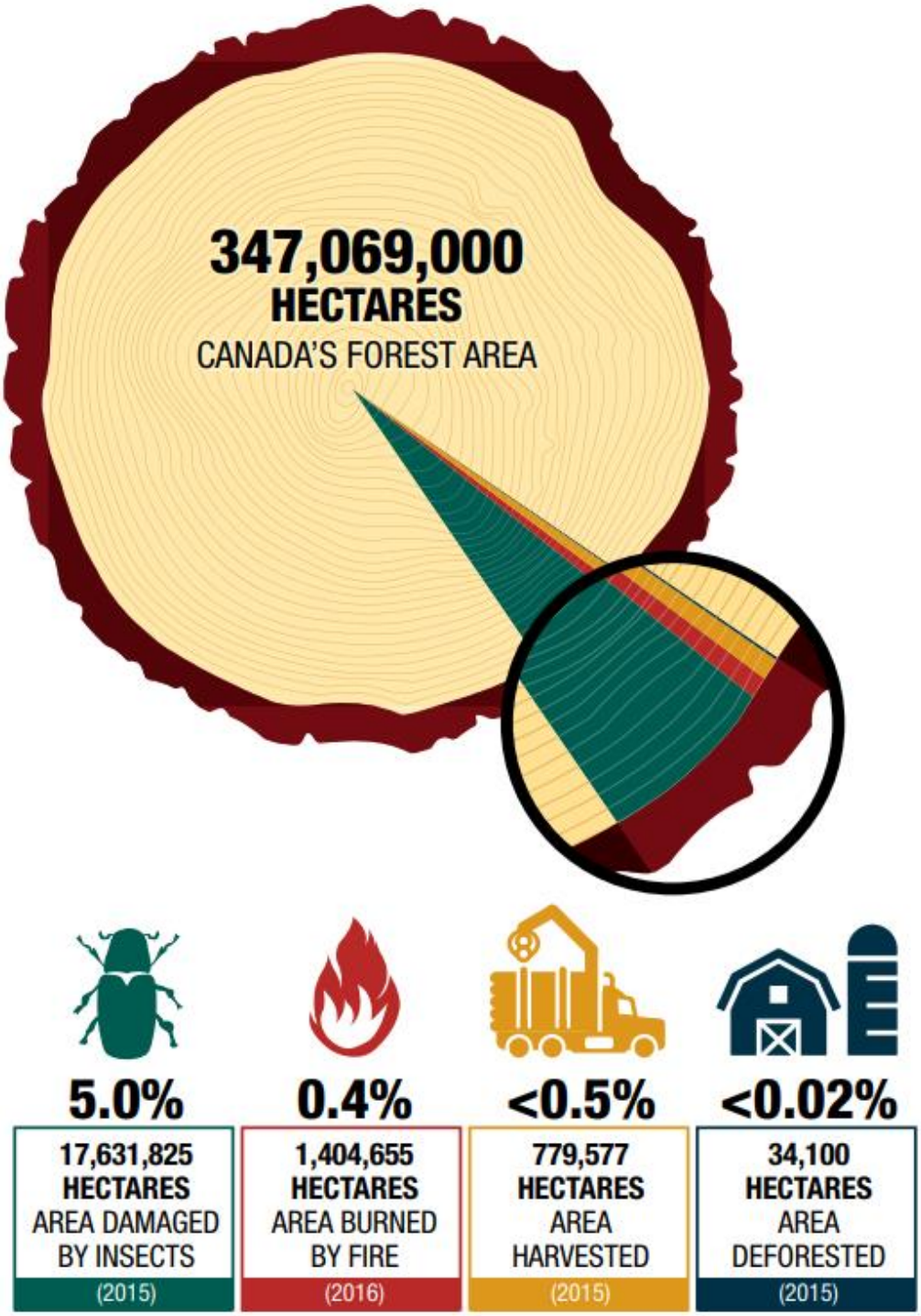
15 RNNR *Evidence*: Mark Mosher (Vice-President, Pulp and Paper Division, J.D. Irving); Matters (United Steelworkers); and Atkinson (FNFC).

the United Steelworkers, "Wood that is milled offshore has led directly to mill closures and job loss, [thereby reducing the amount of fibre available] for innovative product creation." He called for further support to retool and revitalize existing mills, as well as national and provincial strategies that "both discourage the excessive export of logs and encourage domestic manufacturing." Furthermore, Mr. Atkinson stated the following:

> [R]ecent efforts towards revitalization and innovation [in the forest sector] have missed the mark. Instead of innovation, we seem to be on a continued path of liquidating timber resources for primary manufacturing only, and in some cases, in the west here, we are now even seeing a move backwards, towards increased export of raw logs.… In our efforts to collaborate and work with B.C. and Canada on transitions in the forest sector, including adapting to climate change conditions, [the FNFC has] maintained that the value-added sector or secondary manufacturing is required. Raw resource extraction and primary manufacturing will not provide enough employment and benefit to Canada as the change in the sector unfolds.

Mark Mosher of J.D. Irving, Limited, also recommended that Canada "continue to invest and get back into more of the secondary and tertiary value-added products." Owing to a general decline in demand for traditional pulp and paper products, Mr. Mosher explained that some value-added opportunities in his sector (e.g., tissue and box manufacturing), as well as skilled expertise, have migrated to the United States. He stated that "to really create value from the standing forest, [we] need to keep all those jobs in Canada and go through the entire value chain." According to Mr. Jeffrey, reducing the amount of Canadian log exports requires increased investment in both primary and secondary manufacturing businesses: "If [we] can't attract the investment in the manufacturing side of the business, [we're] going to see a continuation of log exports."

Figure 3: Canadian Forest Disturbance by the Numbers



Source: Natural Resources Canada

ADVANCING INDUSTRIAL INTEGRATION, INNOVATION AND TALENT DEVELOPMENT

The committee heard that industrial integration, innovation and talent development are key factors for creating state-of-the-art forest-sourced products. According to Ms. Cobden, successful forest product development strategies must take into account the full supply chain, from the collection of feedstock and other raw material, to conversions/refining and, eventually, market delivery and use in Canada or elsewhere. Similarly, Pascale Lagacé of Resolute Forest Products thinks the integration of primary and secondary supply chains would advance the development of forest-sector innovations and value-added products. She stated the following:

> [Forest] fibre cannot be developed in a linear fashion, not unlike petroleum. To extract maximum economic value out of a harvested tree, the resource has to be refined multiple times through multiple processes and into multiple products. In other words, because of economies of scale and the chemical complexity of forest fibre, we are deeply convinced that the primary supply chain has a role to play in the development of next-generation technologies and non-traditional products. Integration is the best way to extract the most value from each tree.

> “An important factor that allows for building full innovation capacity is to promote equity and diversity and to empower more women, minorities and Indigenous people to take up senior leadership positions in industry and academia in all areas of the innovation ecosystem.”
>
> Ning Yan,
> Professor,
> University of Toronto

Ms. Ferguson told the committee that many bioproducts projects are locating near primary forest-sector operations because it costs more to transport primary materials (e.g., “a log, a pile of shavings, or a bunch of sawdust”) than it does to convert them to a higher-valued product, “whether that product is a biofuel or advanced chemical.”

Witnesses discussed different ways to improve the integration and innovative capacity of Canada’s forest products sector, including the following:

- **Developing innovation hubs (or “forestry superclusters”) with higher integration and automation capacity**: Competition for Canadian producers is strongest from countries with cheaper labour and lower environmental standards (e.g., China), and countries with better-capitalized and more

automated/integrated production plants (e.g., Austria and Sweden).[16] According to Michael Green of Michael Green Architecture, the investments of European competitors in wood building innovation are "far more significant" than Canada's, and their products are cheaper. Several witnesses supported the idea of developing "forestry superclusters" with more integrated processes, expertise and services (e.g., product development, testing, production and market delivery).[17]

- **Expanding government support to research institutions for new and innovative research**: According to Gurminder Minhas of Performance BioFilaments Inc., "increased support for universities and [research] institutions to conduct new and innovative research, which typically is higher risk, should be considered and supported." He added that this will create "a pipeline of new innovations" for companies to leverage, with potential for licensing and commercialization, and produce highly trained student researchers who would be ideal candidates for future employment in value-added forest product manufacturing. Mr. Minhas called for the continuation and expansion of partnership funding, such as the Industrial Research Assistance Program of the National Research Council (NRC) and the Engage Grants of the Natural Sciences and Engineering Research Council, to enable greater collaboration between industry and research institutions.[18]

- **Increasing support for high-risk capital projects, especially through the commercialization gap**[19]: Despite Canada's recognized leadership in forest product research and innovation, the committee heard that industry uptake of new technologies has been limited.[20] Witnesses explained that many forest product innovations are capital intensive and require long-term financing, which makes their commercialization particularly challenging

16 RNNR *Evidence*: Priddle (The WoodSource); Peter Moonen (Manager, National Sustainability, Canadian Wood Council); William Downing (President, Structurlam Products LP [Structurlam]); and Michael Green (Principal, Michael Green Architecture).

17 RNNR *Evidence*: Jeffery (Coast Forest); Larocque (FPAC); Priddle (The WoodSource); and Mason (NRCan).

18 RNNR *Evidence*: Yan (University of Toronto); Marshall (Bioindustrial Innovation Canada); Gurminder Minhas (Managing Director, Performance BioFilaments Inc. [Performance BioFilaments]); and Marcoccia (Domtar).

19 The commercialization gap (also known as "the valley of death") refers to the period between a technology's research and development phase and large-scale commercialization, when companies are expected to start making a profit.

20 RNNR *Evidence*: Yan (University of Toronto).

given the sector's diminishing receptor capacity – owing to recent mill closures – and the limited access to capital of start-up companies.[21] According to Mr. Marshall, many Canadian-developed technologies end up receiving foreign funding and getting commercialized elsewhere, namely in the United States. Witnesses called for industry-specific tax credits to help fund capital-intensive innovations,[22] as well as the continuation and/or expansion of existing funding through Sustainable Development Technology Canada, the Build in Canada Innovation Program and NRCan's Investments in Forest Industry Transformation (IFIT) and Clean Growth programs.[23] Bruno Marcoccia of Domtar Inc. pointed out that high-risk projects are more likely to gain investor confidence if they involve several partners, including governments, private companies and academic/research institutions.

- **Training and talent development throughout the value chain**: The committee heard that the forest industry is dealing with a generational gap as many experienced professionals and skilled workers are starting to retire.[24] Witnesses called on the sector to provide more internships and employment opportunities for engineering and science students and highly trained post-graduates in order to improve its workforce readiness and innovation capacity.[25] Furthermore, Charles Tardif of Maibec highlighted the need to develop a well-educated forest-sector workforce in rural areas. According to Professor Yan, young people should be equipped with scientific knowledge about forest product materials, as well as the entrepreneurial skills needed to drive innovation and commercialization in practice.[26]

- **Building a diverse and inclusive workforce**: As Professor Yan explained, "[an] important factor that allows for building full innovation capacity is to promote equity and diversity and to empower more women,

21 RNNR *Evidence*: Yan (University of Toronto); Charbonneau (CelluForce); and Marshall (Bioindustrial Innovation Canada).

22 RNNR *Evidence*: Charbonneau (CelluForce); Marcoccia (Domtar); and Ferguson (Conifex).

23 RNNR *Evidence*: David Boulard (President, Ensyn Technologies Inc. [Ensyn Technologies]); Badcock (BioApplied); Minhas (Performance BioFilaments); Marcoccia (Domtar); Charbonneau (CelluForce); and Dan Madlung (Chief Executive Officer, BioComposites Group Inc.).

24 RNNR *Evidence*: Atkinson (FNFC) and Marcoccia (Domtar).

25 RNNR *Evidence*: Marcoccia (Domtar) and Yan (University of Toronto).

26 RNNR *Evidence*: Tardif (Maibec); Yan (University of Toronto); Marcoccia (Domtar); Minhas (Performance BioFilaments); and Badcock (BioApplied).

minorities, and Indigenous people to take up senior leadership positions in industry and academia in all areas of the innovation ecosystem." Further, Mr. Lebel highlighted the positive contribution of immigrants to Canada's forest-sector workforce, adding that "we have to open our hearts, our minds and our doors to immigration; it's a necessity."

STRENGTHENING PARTNERSHIPS WITH INDIGENOUS GOVERNMENTS AND COMMUNITIES

The committee heard that the bioeconomy represents an opportunity for Canadian governments and the forest industry to strengthen their partnerships with Indigenous communities, 70% of which are in, or adjacent to, forests.[27] In the words of Mr. Atkinson: "utilizing and maximizing Aboriginal people in the forest sector represents a great opportunity to access local labour resources, to bridge socio-economic challenges in First Nations communities, and to build political and corporate relationships, including cultural awareness." He affirmed that "the rights and title of First Nations people are at the forefront of natural resource management decisions and projects in Canada; … First Nations should be priority partners and decision-makers in the process of considering investment in secondary supply chain products."

> "First Nations should be priority partners and decision-makers in the process of considering investment in secondary supply chain products."
>
> Keith Atkinson,
> Chief Executive Officer,
> BC First Nations Forestry Council

Indigenous peoples are concerned about the sustainability of both forest resources and employment opportunities. According to Paul Kariya of the Coastal First Nations Great Bear Initiative (CFN-GBI):

> The forest sector is very important to member First Nations for both traditional and new value-added forestry. It is a key topic as we negotiate the next phases of reconciliation with the Government of British Columbia. For CFN-GBI nations, at the heart of the matter is that having made significant strides to protect the environment, they need to fashion a sustainable economy that supports healthy communities and human well-being. Traditional and new forestry play a big role in this, as do fish and fisheries, tourism, and potential opportunities in clean energy. The key is sustainability.

27 RNNR *Evidence*: Mason (NRCan).

Mr. Atkinson told the committee that investing in more forest manufacturing facilities is one way to protect Canadian jobs and primary resources, and to create more sustainable economic opportunities for Indigenous peoples. Furthermore, Mr. Kariya stated that culturally appropriate value-added products from the Great Bear Rainforest (e.g., essential oils) could provide "long-term sustainable and meaningful employment for remote communities, while at the same time protecting the forests."

Mr. Atkinson explained that Indigenous communities "are eager to be part of a new forest sector," but that increasing their participation requires capacity-building investments in "stewardship and planning, operational and management support, targeted workforce programs, [and] access to capital for … new manufacturing and value-added facilities." According to David Mackett of the Whitesand First Nation,

> First Nations are so innate…. If you put in one small heating system, electrical system, or district heating system in a First Nation, you're creating one, two, three, four, or five jobs. That may not sound like a lot, but in a lot of these communities, that's the spinoff. The spinoff is that you're building the economy, capacity and employment opportunities.

Several witnesses highlighted the need for targeted training and talent development programs to maximize the employment potential of the bioeconomy for Indigenous peoples, especially in remote areas.[28]

The committee heard that bioenergy is of special interest to off-grid Indigenous communities that rely on imported fuel for power. Witnesses discussed the potential for biomass to phase out diesel fuel in remote areas, leading to greater energy independence, economic savings and reductions in GHG emissions.[29] According to Mr. Mason, "research estimates that a remote community that relies on imported oil sees 90% of the energy revenue leave the community, but 75% of revenues from locally produced wood chips are reinvested in the community." Furthermore, Christopher Struthers, who testified as an individual, explained that "biomass-plus-battery technology offers significant savings in the order of 15¢ to 20¢ per kilowatt hour, [including] the amortization of equipment, things like battery replacements, and the long-term costs." He added that, depending on the type of renewable feedstock used, some biomass could be considered "almost carbon neutral."

According to Mr. Atkinson, "An obvious business model exists to convert over 65 First Nations communities in British Columbia from diesel generators to bioenergy plants. However, jurisdictional power supply issues and policies have challenged this type of

28 RNNR *Evidence*: Christopher Struthers (as an individual); Green (Michael Green Architecture); and David Mackett (Community Development, Whitesand First Nation).

29 RNNR *Evidence*: Mason (NRCan); Kariya (CFN-GBI); Mackett (Whitesand First Nation); and Atkinson (FNFC).

investment." In Northern Ontario, the Whitesand First Nation has partnered with the federal and provincial governments to develop "a five-megawatt combined heat and power plant from biomass, which will replace diesel electricity." Based on an analysis conducted by the governments of Canada and Ontario, by the year 2050, Whitesand will be reducing "488,000 tonnes, or 163 tonnes per person, of GHG, compared to Ontario's target of 26 tonnes per person." According to Mr. Mackett, the project is "revolutionary," akin to a bioeconomy village, based on Swedish and Finnish models. Whitesand is also trying to help other First Nations phase out diesel through the use of wood pellets.

MAXIMIZING MARKET OPPORTUNITIES IN CANADA AND ABROAD

> "[Commercial interest in renewable materials] has moved from a green marketing initiative to a business imperative."
>
> Rod Badcock,
> Partner,
> BioApplied Innovation Pathways

The committee heard that the federal and provincial governments have played an important role in the development of secondary forest product markets in Canada and abroad – namely, through market-access programs like NRCan's Expanding Market Opportunities and Green Construction through Wood (GCWood); through government procurement policies, such as British Columbia's *Wood First Act*; and by promoting Canadian products, technologies and forest-sector practices in international trade missions.[30] According to Robert Jones of NRCan, the Government of Canada is active in facilitating market access for Canadian forest products worldwide. For example, Mr. Jones stated that the federal government recently invested $2.5 million in the development of the Chinese wood building market, including a wide array of activities, "ranging from supporting associations at trade shows to promote Canadian wood products, to working with [Chinese] government officials to change codes to be more amenable to wood, to having construction specialists on site who will help the Chinese builders and developers build with wood."

Éric Baril of the NRC told the committee that the growing interest in bio-based products and solutions is part of a global shift, driven by "an increased desire to be environmentally

30 RNNR *Evidence*: Larocque (FPAC); Cobden (Cobden Strategies); Mason (NRCan); Jeffery (Coast Forest); Green (Michael Green Architecture); Downing (Structurlam); and Frédéric Verreault (Director, Corporate Affairs and Communication, Chantiers Chibougamau).

friendly and questions on the future accessibility and/or depletion of petroleum."[31] Similarly, Rod Badcock of BioApplied Innovation Pathways stated the following:

> [There is] indeed a growing commercial interest among global players to integrate renewable materials into their products. I would say that we've seen a shift happen. This has moved from a green marketing initiative to a business imperative. These companies have begun to realize that if they want to have business sustainability, then their raw materials and processing inputs need to be sustainable as well, and that an overreliance on raw materials from fossil fuels puts them at risk.

In terms of new market development, the committee heard that the forest sector should target both domestic and international markets. According to Mr. Minhas, support for Canadian companies to become early adopters of new forest-based materials would help demonstrate the use and effectiveness of these materials on a large scale, thereby paving the way for market expansion elsewhere. In addition, Mr. Marshall expressed the need for more coordinated market development strategies that balance product development and supply efforts (i.e., "market push") with demand creation in downstream industries (i.e., "market pull"). Similarly, Mr. Baril stated that one of the challenges of the forest industry is that there has been more investment in upstream forest-sector operations ("the genesis of the raw material"), and less in downstream industries ("the application"). According to Nathalie Legros of the NRC, there is an information gap between developers and end-users of forest-based products in Canada. Mr. Tardif stated that the sector needs to improve its understanding of the value chain "right to the end customer," especially for "niche" value-added forest products.

> "Anything you can make from a barrel of oil, you can make from a tree."
>
> Glen Mason,
> Assistant Deputy Minister,
> Canadian Forest Service

The committee heard that forest-based products can benefit businesses that span the entire Canadian economy – in energy, manufacturing, construction, agricultural, chemical, cosmetic, pharmaceutical and health care industries. Witnesses discussed a wide range of existing and emerging market opportunities for value-added forest products, including:

- **Biomass fuel conversion of coal-powered plants**: According to Gordon Murray of the Wood Pellet Association of Canada, wood pellets[32] used for

31 RNNR *Evidence*: Éric Baril (Acting Director General, Automotive and Surface Transportation, National Research Council of Canada [NRC]).

32 Wood pellets are made of compressed wood fibre that would otherwise be wasted (e.g., sawdust shavings or logging remains), and can be used as a biofuel to produce heat or electricity.

power and heat generation emit lower GHGs than coal or natural gas. He told the committee that pellets represent an affordable option to heat homes and businesses that do not have access to natural gas, and can replace coal to produce electricity in coal-powered plants, thereby utilizing potentially stranded assets as Canada implements its coal phase-out. Capital Power Corporation has explored several biomass fuel conversion options, including pelletization, and found that "a 15% biofuel substitution project would contribute over 600 person-years of employment, while reducing greenhouse gas emissions by 600,000 tonnes per year, the equivalent of taking 100,000 cars off the road." The Canadian wood pellet industry provides around 2,000 jobs and generates about $300 million annually, with export markets in the United States, Europe and Asia. Japan and South Korea are currently the fastest-growing markets, "entirely due to [the biofuel] conversion of coal power plants."[33]

- **Biodiesel for higher-grade blended fuels**: The committee heard that the Government of Canada's anticipated clean fuel standard is expected to increase the demand for biodiesel in Canada and may lead to more regulatory uniformity across provincial markets.[34] Mr. Struthers explained that blending biodiesel with an existing fuel stock creates an economical, higher-grade fuel with improved temperature stability and lower GHG and particulate (i.e., smog-forming) emissions. According to David Boulard of Ensyn Technologies Inc., all of Ensyn's customers for the liquid wood energy product are located in the United States because the U.S. renewable fuel standard has created "an economic environment where liquid wood can economically compete with fossil fuels."

- **New value-added products from existing forest-sector assets, namely pulp and paper mills**: Mr. Marcoccia explained that some traditional pulp and paper markets, such as communication papers and newsprint, have been in decline for the past 10 to 15 years, which has led to "significant industry-wide pulp and paper capacity removal and repurposing." Existing pulp and paper mills can be integrated with other value-added industrial processes, such as municipal district heating systems (already a common feature of many European pulp mills); biorefineries that can produce a portfolio of biomaterials, biofuels and biochemicals according

33 RNNR *Evidence*: Gordon Murray (Executive Director, Wood Pellet Association of Canada).

34 RNNR *Evidence*: Pierre Lapointe (President and Chief Executive Officer, FPInnovations); Ferguson (Conifex); Boulard (Ensyn Technologies); and Struthers (as an individual).

to market needs; and carbon capture and sequestration technologies. Despite the capital-intensive nature of these industrial projects, witnesses think they can lead to transformative innovation with long-term economic paybacks and environmental benefits.[35]

- **Wood products for building construction and renovation**: Between 90% and 98% of houses in North America are built out of wood.[36] According to David Foster of the Canadian Home Builders' Association, Canadian residential construction consumes more than $8 billion in forest products annually, "providing a major domestic base for the forest products industry." In 2016, the industry generated $138 billion in economic activity (including $67 billion in new construction and $71 billion in renovation), and supported more than one million jobs across Canada, both directly and indirectly (approximately $60 billion in wages). Mr. Foster explained that dimensional framing lumber represents about 14% of the industry's annual value of consumed wood products, while secondary wood products (e.g., windows, doors and prefabricated wood assemblies) represent about 60% of the total value consumed. The committee also heard that recent innovations in structural engineered products have enabled the creation of larger and taller wood structures, with growing market potential (see case study in the following section).

- **Forest-based alternatives to petrochemicals for economy-wide industrial applications**: According to Mr. Mason, bio-based products "present a realistic alternative to fossil-based products and chemicals" and can help meet Canada's emission targets under the Paris Agreement on climate change. Citing estimates from the Organisation for Economic Co-operation and Development, he added that "advanced bioproducts could contribute up to 35% of the output of chemicals and other industrial products, and up to 80% of pharmaceuticals and diagnostic production [by 2030]. For Canada, this would represent 50,000 jobs and generate $24 billion of revenue." Examples of forest-based materials include: lignin, a renewable, environmentally friendly and cost-competitive carbon source that can be used in plastics, dispersants and polymers; cellulose filaments, which can improve the strength and quality of pulps, papers and bioplastics; and cellulose nanocrystals, with potential applications in different industrial sectors, including aerospace,

35 RNNR *Evidence*: Mosher (J.D. Irving); Marcoccia (Domtar); and Lagacé (Resolute Forest Products).

36 RNNR *Evidence*: Mason (NRCan).

cosmetics, pharmaceuticals and medical devices.[37] Canada has the world's first cellulose filament demonstration and commercialization plant, located in Trois-Rivières, Quebec.

- **Value generation from unharvested feedstock and/or unused residue**: One example is bark, an abundant wood residue generated from mill operations. Professor Yan's research team has developed an extraction process to obtain value-added bark-based adhesives, polyols and polyurethane foams that can be used in the construction and automotive sectors with higher economic return for forest companies. Another example is industrial hemp, which, according to Dan Madlung of BioComposites Group Inc., "is the second-fastest-growing plant on the planet [and] sequesters about five times more CO_2 than a forest does." Mr. Madlung explained that Alberta has 17,000 hectares of industrial hemp grown for the seeds and stalk, while the straw gets wasted; a $200 million investment in straw utilization would result in about a $220 million annual revenue stream and 485 direct rural jobs.

CASE STUDY: BUILDING WITH WOOD

The committee heard that wood construction is undergoing a "global renaissance."[38] Recent innovations in structural engineered products have enabled the creation of larger and taller wood structures, including hospitals, schools, airports, malls and high-rise buildings.[39]

> "[Brock Commons is] not only an engineering and architectural showpiece, it is an environmental game-changer, storing close to 1,600 metric tons of carbon dioxide and saving more than 1,000 metric tons in greenhouse gas emissions."
>
> Glen Mason,
> Assistant Deputy Minister,
> Canadian Forest Service

Wood construction can be grouped into two general categories: 1) lightwood frame construction for small buildings up to six storeys; and 2) mass timber construction for larger structures, including buildings of seven storeys and taller (generally referred to

37 RNNR *Evidence*: Steve Price (Executive Director of Bioindustrial Innovation, Alberta Innovates); Charbonneau (CelluForce); Cobden (Cobden Strategies); Marcoccia (Domtar); Baril (NRC); Nathalie Legros (Research Council Officer, Automotive and Surface Transportation, NRC); and Lagacé (Resolute Forest Products).

38 RNNR *Evidence*: Mason (NRCan).

39 RNNR *Evidence*: Eric Karsh (Principal, Structural Engineering, Equilibrium Consulting Inc. [Equilibrium Consulting]); and Jeffery (Coast Forest).

as “tall wood buildings”). In North America, only a handful of tall wood buildings were built recently, including Brock Commons, a new 18-storey student residence at the University of British Columbia (Figure 4), and Origine, a 13-storey building in Quebec City’s Pointe-aux-Lièvres eco-district. The National Building Code of Canada (NBC) currently allows up to six storeys of wood construction. Taller wood buildings require special authorization by an engineer as an “alternative solution” outside the mainstream code.[40]

Figure 4: Brock Commons Student Residence (University of British Columbia)

Source: J.D. Irving, Limited

Witnesses discussed the following characteristics of building with mass timber:

- **Timber construction is faster and lighter than concrete, with comparable structural properties.** According to Eric Karsh of Equilibrium Consulting, modern engineered timber is “superior to reinforced concrete, because it’s a sixth of the weight [and] has similar strength as normal reinforced concrete.” In addition, the committee heard that timber structures can be erected quickly, saving time and money, and can

40 RNNR *Evidence*: Mason (NRCan); Downing (Structurlam); and Green (Michael Green Architecture).

have long lifespans when designed to remain properly protected from water and ultraviolet rays.[41]

- **As a renewable material with relatively low heat conduction properties, wood can be used to construct carbon neutral or carbon positive buildings.** Growing trees is a method of carbon sequestration. According to studies conducted by FPInnovations, every cubic metre of wood used in a building sequesters one tonne of carbon dioxide, on average, representing "one of the best kinds of return on investment" in terms of emission reduction. In addition, wood's low heat conduction properties, relative to concrete, can improve the energy performance of buildings, thereby advancing government policy objectives to achieve "Net-Zero Ready" standards in building codes by 2030.[42]

- **Mass timber products are naturally more resistant to fire than lightwood.**[43] According to Mr. Karsh, "it can be demonstrated that a timber building will perform as well as a steel or a concrete building if properly designed." However, representatives of the International Association of Firefighters (IAFF) believe the majority of urban fire departments in Canada "probably lack the equipment, resources, and training to safely and effectively respond to a fire in a tall or large wood-frame structure." Mr. Green explained that wood buildings are most vulnerable to fire during construction, "when the building safety systems are not yet in place."

- **Properly designed wood buildings can have good seismic characteristics.** According to Mr. Jeffery, the ability of well-designed wood structures to withstand earthquakes has been a selling feature in seismically vulnerable markets in Japan and China. Similarly, Mr. Karsh stated that engineers in Haiti are interested in lightwood wood construction for the same reason, adding that seismic characteristics are ultimately a matter of design, not material.

41 RNNR *Evidence*: Downing (Structurlam) and Lapointe (FPInnovations).

42 RNNR *Evidence*: Downing (Structurlam); Green (Michael Green Architecture); Moonen (Canadian Wood Council); David Foster (Director of Communications, Canadian Home Builders' Association); and Verreault (Chantiers Chibougamau).

43 RNNR *Evidence*: Karsh (Equilibrium Consulting) and Green (Michael Green Architecture).

The committee heard that building codes can be one way for regulators to encourage innovation and help de-risk the adoption of new wood construction products. Several witnesses called for more performance-based codes that set specific safety and environmental outcomes, rather than prescriptive codes that specify what materials or processes should be used by builders.[44] According to Peter Moonen of the Canadian Wood Council, the performance capabilities of newer wood material – "products that weren't around 20 years ago" – are not reflected in the current NBC.

Mr. Jones told the committee that ongoing research and testing may eventually introduce mass timber buildings of up to 12 storys under the NBC.[45] Areas in need of further development include design and safety considerations (e.g., fire performance and noise proofing), as well as commercial elements such as market development and public awareness about the features of mass timber structures.[46] IAFF representatives called for "more thorough discussion of firefighter and public safety considerations against the backdrop … of inadequate fire protection in many communities and the prospect that any given municipality may reduce its fire protection capabilities in the future." Furthermore, Mr. Foster cautioned against building codes that impact the affordability of home building, urging industry and governments to find innovations that can achieve desired outcomes while maintaining or reducing construction costs.

Considering that between 90% and 98% of North American houses are already built out of wood, the committee heard that the biggest potential for domestic market expansion is for mass timber construction in large public, commercial and high-rise buildings. The United States remains the biggest and most convenient market for Canadian wood products due to its proximity, while European markets have been harder to penetrate owing to greater automation in Europe's fabrication plants, and a well-developed Scandinavian forest products sector. The biggest growth opportunities for Canadian mass timber exporters overseas are in China, followed by Japan, Taiwan, South Korea and India, as well as emerging markets like Turkey and Brazil.[47]

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44 RNNR *Evidence*: Foster (Canadian Home Builders' Association); Verreault (Chantiers Chibougamau); Green (Michael Green Architecture); Moonen (Canadian Wood Council); and Karsh (Equilibrium Consulting).

45 According to NRCan, "provinces and territories have jurisdiction over the construction and design of new housing and buildings. As such, the adoption and enforcement of the National Model Construction Codes is voluntary. A province or territory may choose to adopt the [National Building Code], with or without changes, or publish their own provincial code based on it."

46 RNNR *Evidence*: Downing (Structurlam).

47 RNNR *Evidence*: Mason (NRCan); Jeffery (Coast Forest); Robert Jones (Acting Director General, Trade, Economics and Industry Branch, Canadian Forest Service, NRCan); Pelletier (J.D. Irving); Downing (Structurlam); and Green (Michael Green Architecture).

Witnesses talked about growing interest in transforming wood construction from a craft-based industry to a more mainstream manufacturing process. The committee heard that prefabrication in a factory environment would make wood construction more cost-competitive and less wasteful, with greater potential for automation, customization and design accuracy. Furthermore, it would allow Canadian businesses to manufacture and export more value-added wood products, such as cross-laminated timber, prefabricated timber products or entire building systems. Currently, most Canadian wood exports supply the U.S. single-family home market in the form of lumber.[48]

Finally, the committee heard that there is a skill shortage in Canada for wood architects and engineers, as well as in areas like building prefabrication, hybrid design systems, retrofitting and renovation.[49] According to Mr. Karsh, "as the price of timber buildings comes in line with concrete … demand will grow very rapidly, [leading to a shortage of expertise] not just in design but in manufacturing and construction." He stated that most Canadian engineers and architects who start designing with wood are self-taught, adding that the Canadian industry needs to prepare for greater demand for wood construction "throughout the delivery chain, including in education."

48 RNNR *Evidence*: Downing (Structurlam); Green (Michael Green Architecture); Moonen (Canadian Wood Council); and Pelletier (J.D. Irving).

49 RNNR *Evidence*: Downing (Structurlam); Karsh (Equilibrium Consulting); and Moonen (Canadian Wood Council).

APPENDIX A
LIST OF WITNESSES

Organizations and Individuals	Date	Meeting
Bio Mile and Clean Technology Centre	2018/02/08	84
Dan Madlung, Chief Executive Officer Biocomposites Group Inc.		
Capital Power Corporation		
Sian Barraclough, Vice-President Commercial and Energy Management		
Steven Wollin, Vice-President Engineering		
Forest Products Association of Canada		
Robert Larocque, Senior Vice-President		
Groupe Rémabec		
Éric Bouchard, Executive Vice-President		
Serge Mercier, President Bioénergie AE Côte-Nord		
Maibec		
Charles Tardif, Vice-President Corporate Development and Procurement		
The Wood Source Inc.		
Timothy Priddle, President		
Bioindustrial Innovation Canada	2018/02/06	83
Alexander Marshall, Executive Director		
Ensyn Technologies Inc.		
David Boulard, President		
National Research Council of Canada		
Éric Baril, Acting Director General Automotive and Surface Transportation		
Nathalie Legros, Technology Leader, Polymer and Composite Products Manufacturing		

Organizations and Individuals	Date	Meeting
Whitesand First Nation	2018/02/06	83
David Mackett, Community Development		
Craig Toset, Business Development		
BioApplied	2018/02/01	82
Rod Badcock, Partner		
CelluForce Inc.		
Antoine Charbonneau, Vice-President Business Development		
Cobden Strategies		
Catherine Cobden, President		
Performance BioFilaments Inc.		
Gurminder Minhas, Managing Director		
Sinclar Group Forest Products Ltd.		
Greg Stewart, President		
Alberta Innovates	2018/01/30	81
Steve Price, Executive Director of Bioindustrial Innovation		
As an individual		
Christopher Struthers		
Domtar Inc.		
Bruno Marcoccia, Director of Research and Development Pulp and Paper Division		
Resolute Forest Products		
Alain Bourdages, Vice-President Innovation and Energy		
Pascale Lagacé, Vice-President Environment, Innovation and Energy		
Coast Forest Products Association	2017/12/04	78
Rick Jeffery, President and Chief Executive Officer		
Emily Creek Woodworking Ltd.		
Samuel Meyer, Vice-President Operations		

Organizations and Individuals	Date	Meeting
Equilibrium Consulting Inc.	2017/12/04	78
Eric Karsh, Principal Structural Engineering		
International Association of Fire Fighters		
Greg Hewitt, Research Assistant Canadian Office		
Fred LeBlanc, 13th District Vice-President		
As an individual	2017/11/29	77
Ning Yan, Distinguished Professor in Forest Biomaterials		
Coastal First Nations Great Bear Initiative		
Paul Kariya, Senior Policy Advisor		
Wood Pellet Association of Canada		
Gordon Murray, Executive Director		
Forest Products Association of Canada	2017/11/22	76
Robert Larocque, Senior Vice-President		
FPInnovations		
Pierre Lapointe, President and Chief Executive Officer		
Jean-Pierre Martel, Vice-President Strategic Partnerships		
Trimmed-Line Seismic Services Ltd.		
Shawn Moore, President Tree Services		
United Steelworkers		
Bob Matters, Chair Steelworkers' Wood Council		
Quebec Forest Industry Council	2017/11/20	75
Denis Lebel, Chief Executive Officer		
Structurlam Products LP		
William Downing, President		
Canadian Wood Council	2017/11/08	74
Peter Moonen, Manager National Sustainability		

Organizations and Individuals	Date	Meeting
Cobden Strategies	2017/11/08	74
Catherine Cobden, President		
Conifex Timber Inc.		
Sandy Ferguson, Vice-President Corporate Development		
BC First Nations Forestry Council	2017/11/06	73
Keith Atkinson, Chief Executive Officer		
Canadian Home Builders' Association		
David Foster, Director of Communications		
Chantiers Chibougamau		
Frédéric Verreault, Director Corporate Affairs and Communication		
Michael Green Architecture		
Michael Green, Principal		
Association of Lumber Remanufacturers of Ontario	2017/11/01	72
Rick Ekstein, Founder, Chief Executive Officer of Weston Forest		
Steven Rustja, President, Vice-President of Weston Forest		
Department of Natural Resources		
Robert Jones, Acting Director General Trade, Economics and Industry Branch, Canadian Forest Service		
Glenn Mason, Assistant Deputy Minister Canadian Forest Service		
Anne-Hélène Mathey, Acting Director Economic Analysis Division, Trade, Economics and Industry Branch, Canadian Forest Service		
J.D. Irving, Limited		
Mark Mosher, Vice-President Pulp and Paper Division		
Jerome Pelletier, Vice-President Sawmills		

APPENDIX B
LIST OF BRIEFS

Organizations and Individuals

United Steelworkers

Weston Forest

REQUEST FOR GOVERNMENT RESPONSE

Pursuant to Standing Order 109, the Committee requests that the government table a comprehensive response to this Report.

A copy of the relevant *Minutes of Proceedings* (Meetings Nos. 72, 73, 74, 75, 76, 77, 78, 81, 82, 83, 84, 91 and 92) is tabled.

Respectfully submitted,

James Maloney
Chair