

OFFICE OF THE CHIEF FORESTER

2019–20

INNOVATION, BIOECONOMY AND INDIGENOUS OPPORTUNITIES BRANCH



Ministry of
Forests, Lands, Natural
Resource Operations
and Rural Development



INDIGENOUS FOREST BIOECONOMY PROGRAM *and* INDIGENOUS FORESTRY PROGRAM

ANNUAL REPORT

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1. Executive Summary

Through the Office of the Chief Forester, the Innovation, Bioeconomy and Indigenous Opportunities branch (IBIO) delivers two programs that enable economic development and participation in the forest sector by Indigenous people. BC's Indigenous Forestry Program (IFP) has provided support to Indigenous partners for over a decade and funds projects in the areas of forest management, workforce training, and production of conventional forest products such as sawn lumber. This year, support is being expanded through the development of a new Indigenous Forest Bioeconomy Program (IFBP) which provides targeted support for Indigenous partners to create new bioproducts fueling the revitalization of BC's forest sector.

The IFP and IFBP exist to enable Indigenous communities to unlock the full suite of economic, social and environmental benefits from their participation in BC's forest sector with partners [across BC](#) through specific project support. Today, the forest sector in BC faces many challenges such as high operating costs, significant forest disturbances, and an increasingly competitive global forest products market. These challenges make both programs essential to ensuring that Indigenous communities are supported to navigate these challenges and thrive as full participants in the natural resource sector.

Projects delivered over the 2019-20 cycle by the IFBP include applications for forest biomass that increase the [utilization of harvest residuals](#), the manufacture of high value bioproducts such as [essential oils](#), or [tannins](#). As the IFP provides support for foundational forestry activities such as starting up a [small mill](#), further projects through the IFBP can expand on conventional activities, such as [utilising the mill residuals](#) for new applications. The IFP in 2019-20 supported the creation of tools to empower an Indigenous community to [manage the risk of wildfire](#), [skills training](#) to develop the Indigenous workforce, and [operational benchmark testing](#) to keep an existing First Nations forestry company competitive.

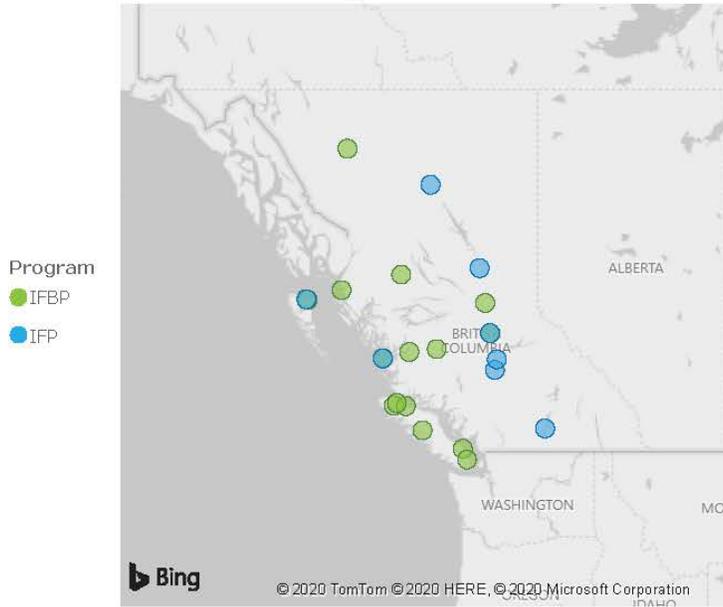
In the 2019-20 project cycle, the two programs:

- Delivered 27 projects: 17 through the IFBP, 10 through the IFP
- Collaborated on these projects with 20 distinct First Nations
- Engaged with 58 Indigenous communities
- Created 28-30 new jobs for Indigenous individuals: 13-14 through the IFBP and 15-16 through the IFP
- Supported projects with the potential to create over 75 jobs through the IFBP and 48 jobs through the IFP

These numbers capture a snapshot of the impacts of these programs but do not provide the full story. To give an insight to the impacts on less easily quantifiable benefits such as supporting cultural values and self-determination, project descriptions are provided in the rest of the report, organized by geographic location.

The foundational funding for the IFBP is provided through the *Coast Forest Sector Revitalization* initiative and most of the program's projects are in coastal BC. The IFBP is guided by the goal, principles and objectives of the [Indigenous Forest Bioeconomy Framework](#) which was developed through collaboration and engagement with numerous First Nations and Indigenous organisations. The IFP also follows these principles and shares some of the objectives. As part of implementing the *B.C. Declaration on the Rights of Indigenous Peoples Act* and the Truth and Reconciliation Commission Calls to Action, the Ministry's Indigenous Forest Bioeconomy team takes a collaborative approach to identifying and pursuing project opportunities that reflect Indigenous interests. As the programs focus on specific on-the-ground projects they are an embodiment of reconciliation in action. The two programs aim to remove as many barriers to participation as possible by engaging with potential participants early and breaking down larger projects into distinct phases to fit within the constraints of a fiscal year. The nature of novel product development by the IFBP leads projects in this report to fall across the [project development scale](#) that moves from scoping to commercialisation and scale-up. The focus of these projects also covers a [range of bioproducts](#).

Provincial Program Distribution



Indigenous Community Partners Engaged With

20

Communities Engaged With

58

IFP Jobs Created

13-14

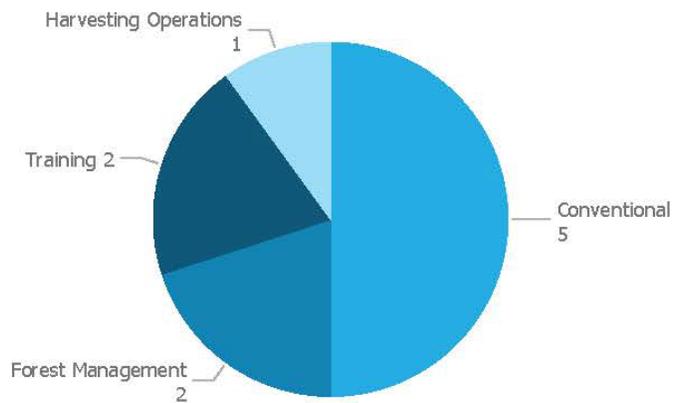
IFP Projects

10

IFP Potential Jobs

48

IFP Project Type



IFBP Jobs Created

14-15

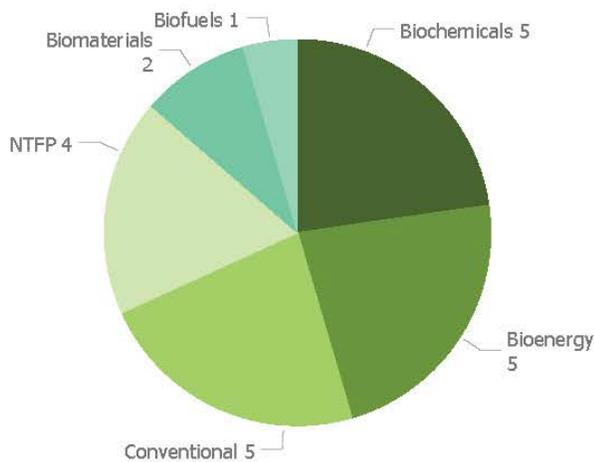
IFBP Potential Jobs

327

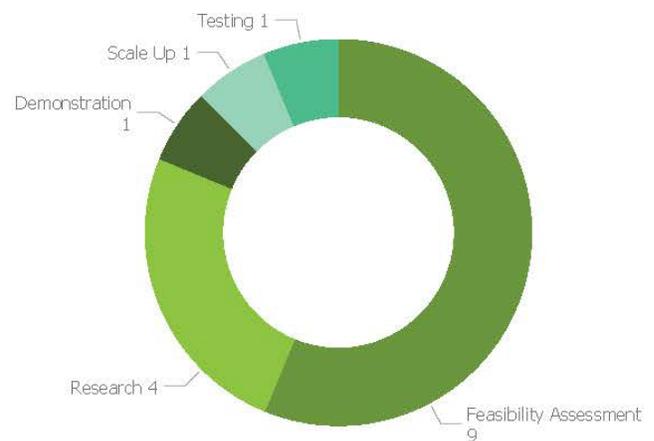
IFBP Projects

18

IFBP Project Type



IFBP Project Scope



Note that under 'Types of Projects' a number of projects spanned several bioproduct types and are counted multiple times.

2. Introduction

First Nations in BC are increasingly active participants in forestry activities that provide both economic opportunity and community sustainability. BC's Indigenous Forestry Program (IFP) has supported this development for over a decade through partnerships with over 100 Indigenous communities and/or organisations in forest sector economic development. The IFP funds projects in the areas of forest management, workforce training, and production of conventional forest products such as sawn lumber. This year, support is being expanded through the development of a new Indigenous Forest Bioeconomy Program (IFBP) which provides targeted support for Indigenous partners to create new bioproducts fueling the revitalization of BC's forest sector. As part of implementing the *B.C. Declaration on the Rights of Indigenous Peoples Act* and the Truth and Reconciliation Commission Calls to Action, the Ministry's Indigenous Forest Bioeconomy team takes a collaborative approach to identifying and pursuing opportunities that reflect Indigenous interests.

Forest bioeconomy development is based on using forest biomass as the key input for producing consumer goods and/or industrial products or bioproducts while displacing petrochemical-based products throughout our economy. A forest bioeconomy uses a broader lens than conventional forestry to consider a wide range of product and resource development opportunities beyond conventional products like lumber, or pulp and paper products. The overarching goal is to maximize the value of forest biomass and within the context of a forest bioeconomy. Value is viewed as a holistic measure that encompasses: environmental values such as sustainable forest management and the production of environmentally friendly forest bioproducts, economic values such as profitable revenue streams from the manufacture and marketing of these bioproducts, and social values such as addressing community infrastructure needs and providing job opportunities for communities around the province in forest operations, manufacturing, high-tech design and production applications, and artisanal applications.

The foundational funding for the IFBP is provided through the *Coast Forest Sector Revitalization* initiative, meaning that most projects delivered through the program this year are in coastal BC. The 2019-20 annual report marks the first iteration of a compendium of projects delivered as part of both the IFP and the IFBP. This report aims to describe the key activities, outcomes and impacts of both programs and is expected to evolve in the coming years.

2.1 Indigenous Forest Bioeconomy Framework

The Indigenous Forest Bioeconomy Framework guides project development within the IFBP and aims to provide another platform for Indigenous-centric opportunities in the natural resource sector by responding to a community's interests and needs through collaboration and partnerships. The principles, goals, objectives and economic development pathway reflected in this Framework are the result of engagement and collaboration with numerous First Nations across the province over the last couple years. The principles and parts of the objectives of this framework also guide the work of the IFP. As we continue to work with First Nations on Indigenous forest bioeconomy opportunities we will continue to improve and refine this Framework.

Goal, Principles and Objectives

The Framework has one overarching **goal**: To promote the development of forest bioeconomy opportunities that respect and support Indigenous community culture, values, and traditional territories.

To achieve this goal, the Framework adopts the following **principles**:

- i. Support is provided in addition to and independent of negotiated treaty or non-treaty agreements (i.e. a collaborative approach not directly tied to government to government agreement processes);

- ii. Supports reconciliation objectives, constitutional and historic obligations but is not an alternative to land claim negotiations;
- iii. Recognizes and prioritizes Indigenous values, traditions, and knowledge;
- iv. Supports Indigenous community and/ or Indigenous business driven projects designed to meet community needs while also supporting regional economic development opportunities;
- v. Supports collaboration with industry and business, as well as across ministries and agencies to meet common objectives; and
- vi. Considers and supports Indigenous community capacity development.

The goal is supported by three objectives:

Objective 1: Identify and prioritize bioeconomy opportunities

- a. Engage with Indigenous communities to identify opportunities and priorities
- b. Develop action plans to realize priorities with relevant partners

Objective 2: Develop bioeconomy opportunities

- a. Generate community-based employment and businesses
- b. Build capacity for diversification and scalability

Objective 3: Increase participation in the natural resource sector

- a. Prioritize clean tech and innovative projects that contribute to sustainability in natural resource management
- b. Foster Indigenous entrepreneurship and participation in the natural resource sector

Economic Development Pathway

The Framework uses a community/ culture-centric and strength-based approach through an economic development engagement pathway. The model can be described as a holistic view of interconnectedness and collective process of inquiry and decision-making to encourage harmony and empowerment within natural resource economic development opportunities. The Framework supports Indigenous communities’ governing their own economic activities to build a self-sustainable community.



2.2 Policy Context

The assistance that the IFP and IFBP provide enables Indigenous economic development in targeted areas. The IFBP supports the development of a forest bioeconomy which creates new opportunities for using residual fibre to manufacture cutting edge products that help drive forest sector revitalization. This marked the first year of IFBP projects, with funding for this program coming through the *Coast Forest Sector Revitalization*. Both programs focus on specific on-the-ground projects, and as such are an embodiment of reconciliation in action furthering the implementation of the *B.C. Declaration on the Rights of Indigenous Peoples Act*.

Projects such as the [Fibre Recovery Heat Mapping](#) delivered through the IFBP on the North of Vancouver Island focused specifically on modelling the forest biomass supply chain serving to fill the gaps identified in the *Canadian Council of Forest Ministers Forest Bioeconomy Framework for Canada*. These spatial inventories are required to connect the supply of forest biomass with current and future demand when investigating applications for it. Working with Indigenous people as key partners in the forest bioeconomy supports the first pillar of this framework.

The *Clean-Tech Innovation Strategy for the B.C. Forest Sector 2016-24* identifies the need for the viability of new products and clean technologies to be demonstrated to enhance the value chain and advance the BC forest sector. Projects found in the [Province-wide section](#) of this report do this by exploring new products such as tannins extracted from tree bark or providing an analysis of which forest bioproducts may provide some of the best opportunities for coastal Indigenous communities. Both the IFBP and the IFP also support the goal of this strategy to create resilient and prosperous forest-based communities in partnership with First Nations.

Bioeconomy development and expansion through the IFBP promote the fight against climate change by increasing the utilisation of carbon stored in forest biomass and displacing carbon intensive alternatives. The CleanBC priority of helping communities reduce dependence on diesel and switch to bioenergy is facilitated through the IFBP's community combined heat and power projects.

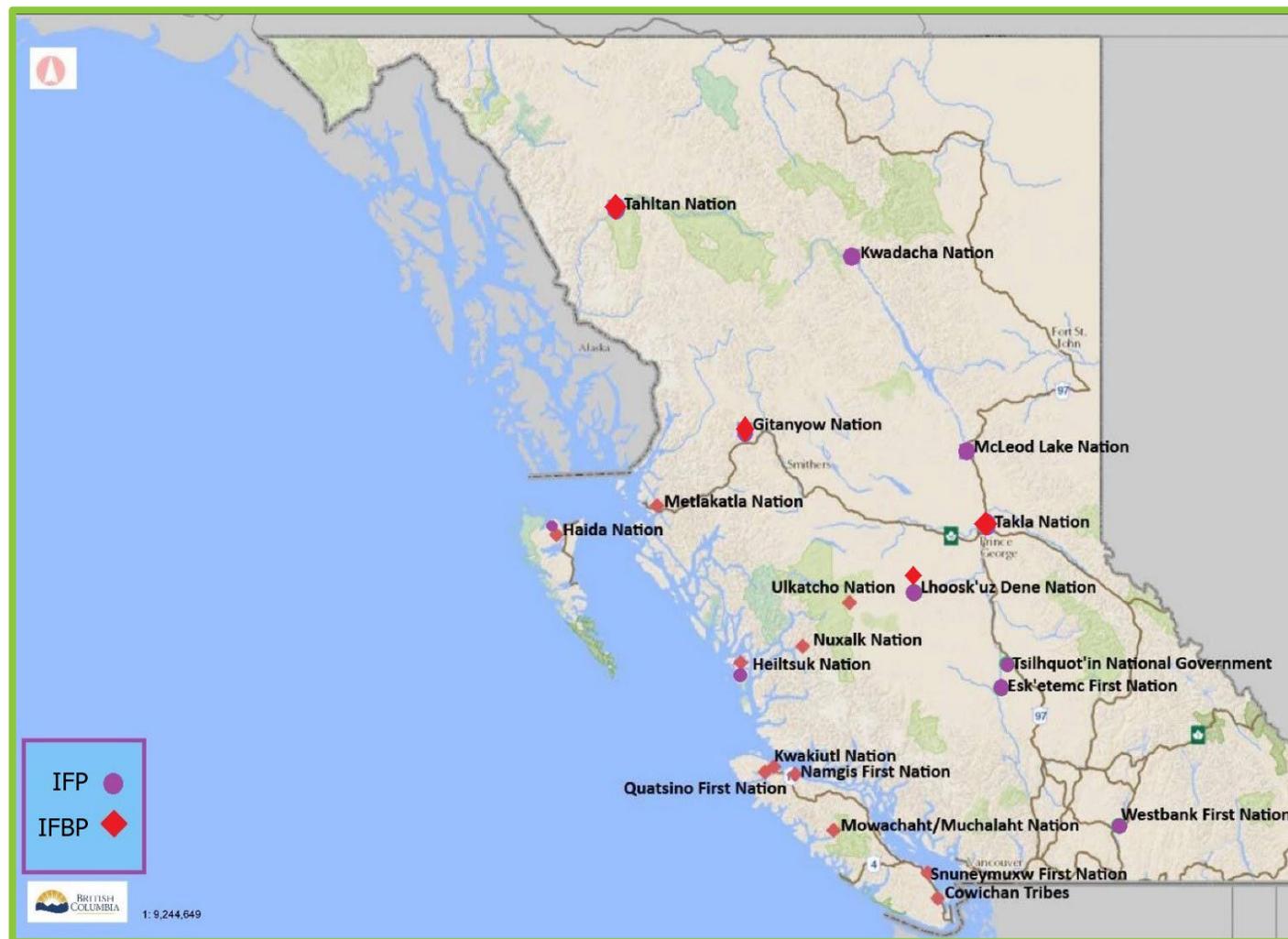
2.3 Report Format

Following the executive summary in Chapter 1 and a description of the IFBP and IFP in Chapter 2, this report describes the projects completed in 2019-20. In Chapter 3, a summary of our aggregated project statistics provides an overall picture of impacts of both programs this year. Chapters 4-6 describe each project in detail, based on where they are located. Chapter 4 details projects on the Coast, Chapter 5 in the South, and 6 in the North. Each project description provides a description of what each project is and how the project came about, an overview of a community's priorities, community context, socio-economic benefits, and next steps and future opportunities.

3. Summary of Projects

This section provides a summary of all activities supported through both the Indigenous Forest Bioeconomy Program (IFBP) and the Indigenous Forestry Program (IFP). Individual projects are described in Chapters 4 to 6.

3.1 Geographic Distribution



Most projects under the IFBP are located on the Coast as most funding was provided through the Coast Revitalization Initiative.

3.2 Community Engagement

Over the course of the 2019-20 project cycle the Innovation, Bioeconomy and Indigenous Opportunities branch engaged with 58 different communities across B.C. Many of these engagements were initiated with face-to-face meetings in the community. This approach is important for establishing and building strong relationships. However, engagement with communities also included phone calls, e-mails, and web meetings.

As the COVID-19 pandemic limits the ability of the branch to engage in face-to-face meetings, new engagement sessions have shifted to online and phone-based meetings and introductions. It is expected that this will continue over the 2020-21 project cycle, but the branch has developed safety protocols to guide all engagement activities if travel and in-person meetings are later allowed by both public health officials and the communities themselves.

3.3 IFP: Project Categories

Limited to the projects within the Indigenous Forestry Program which supports projects in the following categories.

5	2	2	1
Foundational Forest Products 	Training / Capacity 	Forest Management 	Forest Operations 

3.4 IFBP: Range of Bioproducts

Limited to the projects within the Indigenous Forest Bioeconomy Program which supports the development of bioproducts, the table below provides a summary of where all the projects fall within the bioproduct categories. Generally, bioproducts on the left of the table are lower value compared to bioproducts on the right.

5	1	4	4	5	2
Bioenergy 	Biofuels 	Conventional Bioproducts 	Non-Timber Forest Products 	Biochemicals 	Biomaterials 

Note that some projects spanned several bioproduct categories and therefore are counted in multiple categories.

3.5 IFBP: Project Development Scale

The table below highlights, generally, where on the project development scale the projects supported by Indigenous Forest Bioeconomy Program fall this year. In order to be able to support initiatives that develop new products over several program cycles, projects are generally broken down into phases. Usually projects move one or two phases up the scale over a project cycle. However, it is both possible and desirable projects to move down the development scale as they add new manufacturing capabilities or expand the range of bioproducts they produce.

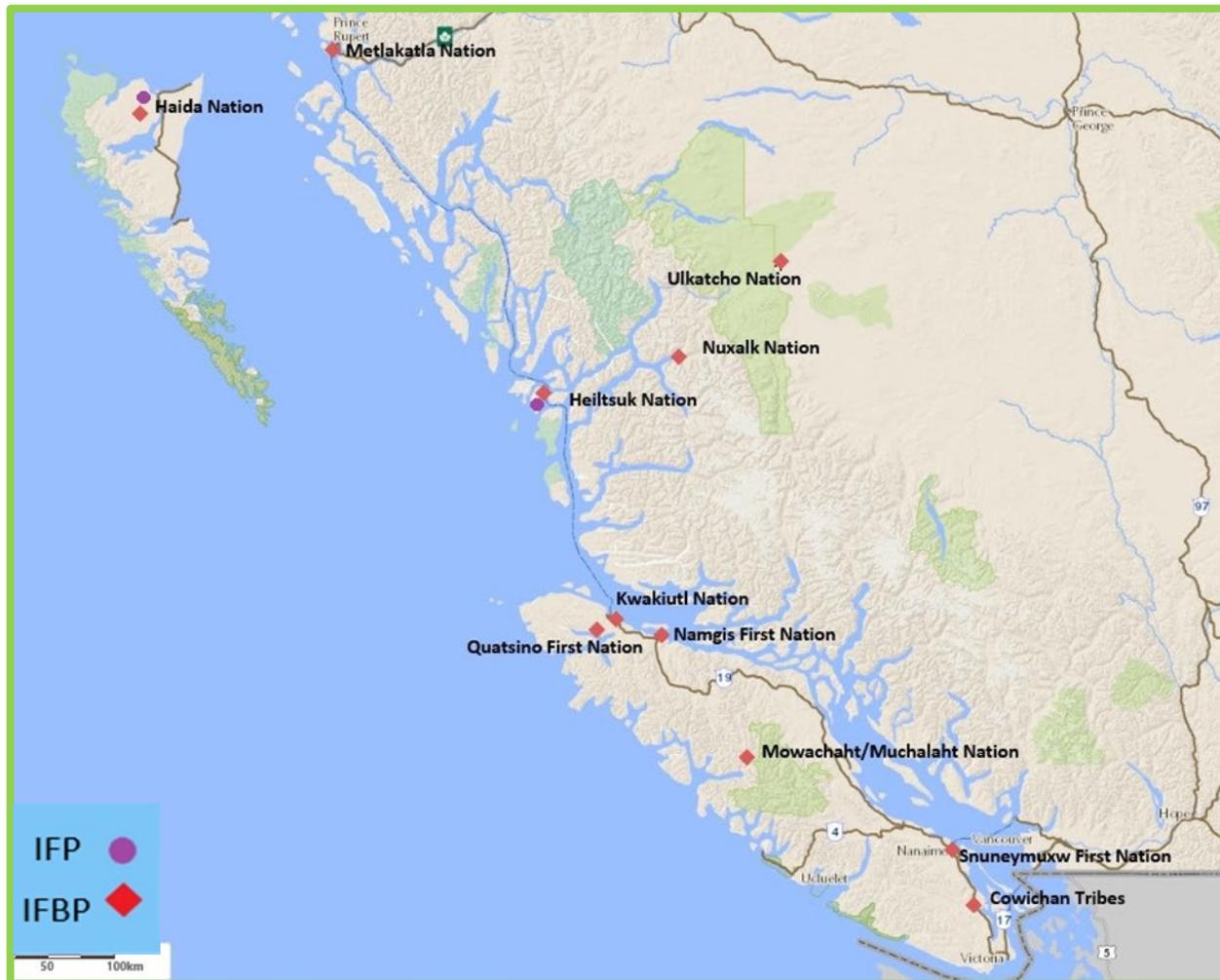
4	9	1	0	1	0	1
Scoping (Research) 	Assessment (Feasibility) 	Testing/pilot (Prototype) 	Validation (Performance) 	Demonstration (Proof of concept) 	Commercialization (Implementation) 	Scale-up (Expansion) 

In addition to the projects in the table above 3 training initiatives were completed in this project cycle.

3.6 Employment

Indigenous Forest Bioeconomy Program	13-14 Jobs Created	325+ Potential Jobs in Development	
Indigenous Forestry Program	15-16 Jobs Created	48 Potential Jobs in Development	35 Jobs Maintained

4. Coast Projects



4.1 Indigenous Forest Bioeconomy Program - West Coast

4.1.1 Forest Residual Recovery Study, Cowichan Tribes, Duncan, BC

Cowichan Tribes are in an area where the forest sector is active, resulting in significant quantities of logging residuals that are piled and control-burned on site. Khowutzun Forest Services (KFS) wants to capitalise on these residuals through a biomass use opportunity. A local forest company will deliver residual tops and pulp logs to KFS over the next two years. This is an opportunity for KFS to develop skills, build infrastructure and explore other types of biomass use businesses.

Through this feasibility study, viable residual biomass use opportunities were identified, and related benefits, challenges, equipment, skills and timelines were outlined. A summary of essential attributes for potential residual harvest blocks sites were created, a Residual Harvest Cost Assessment Tool was prepared, and three potential harvest sites were assessed. Eleven potential businesses came from these discussions, with varying levels of complexity and feasibility. These options include production of pulp, firewood, tree shelter stakes, hog fuel, combined heat and power, briquettes, biofuel, a small-scale sawmill, pellets and/or essential oils, which are described below.

Community Priorities

The goal of this study was to develop a profitable business, to create employment and revenue for the Cowichan Tribes. Additionally, the community has benefitted from an increased knowledge and confidence with residual harvesting and biomass-based products, which will allow KFS to make informed decisions in the future.

Community context

Population	2,060 Cowichan Tribes has a population of nearly 5,000 and are comprised of seven traditional villages including Kw'amutsun, Qwum'yiquin, Hwulqswelu, S'amanu, L'uml'umultus, Hinupsum and ti'ulpalus.	
Main Economic Drivers	Forestry.	
Urban/Rural/Remote	Urban	
On/Off Grid	On grid	Not eligible for Renewable Energy for Remote Communities funding
Transportation Infrastructure	Accessible by road; 51 km from Nanaimo, BC and 130 km and one 1.5-hour public ferry ride from Vancouver, BC.	
Existing Agreements	Completed agreements Hul'qumi'num Treaty Group Transition to Stage 5 and Treaty Revitalization Agreement – 2019. Forestry Agreements Cowichan Tribes Forest Consultation and Revenue Sharing Agreement – 2017 Cowichan Tribes Forest Agreement – 2004 (PDF)	

Employment

Number of Jobs Created	3 or more, dependant upon the selected businesses.
Community employment rates	Cowichan has a 26% unemployment rate, with 38% of workers who were full-time last year.

Pulp

Product Overview	Residual tops and pulp logs can be converted to pulp, which has a strong market demand on Vancouver Island. Not all residual components can be converted to pulp, leading to remaining waste. Distance and cycle time between residual location and delivery point will impact the profitability of pulp production.
Benefits	<ul style="list-style-type: none"> • Strong market demand • Work with an experienced contractor • Reasonably valuable product • Equipment already owned • Creates jobs for Cowichan Tribe Members • Develops relevant skills
Capital Costs	There are low capital costs for a log loader and two trucks with trailers. De-limber or de-barker chippers have high capital costs of over \$1 million.

Firewood

Product Overview	<p>Firewood production can be profitable with appropriate material and access to markets. Logs less than 8 feet in length that cannot be converted to pulp are the target feedstock.</p> <p>The business will require a firewood splitter or processor, and a mechanism for hauling split firewood and logs.</p>
Benefits	<ul style="list-style-type: none"> • Wood splitters can be rented, or cost shared • Meet market demand for Cowichan's firewood needs • Employment for Cowichan Tribes members
Capital Costs	Wood splitters and firewood processors vary between \$10,000-\$200,000. Rentals and cost sharing options should be explored.

Stakes for Khowutzun FreeGro Tree-Shelters (KFT)

Product Overview	KFS manufactures tree shelters that protect seedlings from ungulates. One component includes a cedar stake (1" by 1" by 5'), costing between \$0.80-\$1.00 to produce per stake, with no local producer exists.
Benefits	<ul style="list-style-type: none"> • The customer is internal, removing market risks • Stakes can be produced for resale • An already established price exists • Employment for Cowichan Tribe Members • No local competition
Capital Costs	Capital costs include the stake splitter or small sawmill such as a Wood Miser.

Hog Fuel

Product Overview	<p>Hog fuel is a very common low value product made from forest residues. It is used to produce energy in industrial boilers or combined heat and power plants.</p> <p>Hog fuel is variable in particle size, species make-up, moisture content, contamination level, bark content and several other characteristics. Hog fuel is produced by a grinder, either on the cut block or nearby. Due to its low value, a long transportation distance is often not profitable.</p>
Benefits	<ul style="list-style-type: none"> • Existing and potential users exist • Grinding operators can provide machinery, experience and customers • Employment for Cowichan Tribe Members • Disposes of all piled roadside residue, removing the need to burn remaining residue.
Capital Costs	A grinder may cost over \$1 million.

Combined Heat and Power

Product Overview	Combined Heat and Power (CHP) units are increasingly common for generating heat and power to nearby buildings. Many plants can run on low-grade hog fuel. This could be an effective heat and power method for nearby schools and office spaces, displacing the need for electricity from the grid or fossil fuel generators.
Benefits	<ul style="list-style-type: none"> • Provide energy for local buildings, reducing reliance on the grid • Hog fuel can be used • Employment for Cowichan Tribe members • Funding opportunities available through the government
Capital Costs	Establishment of a CHP system can range from \$500,000 to \$10 million.

Briquettes

Product Overview	This involves pressing feedstock into bricks through the application of pressure. These can be used as a firewood substitute or as hog fuel.
Benefits	<ul style="list-style-type: none"> • Potential markets locally and in Asia • An outlet for by-products from other operations including stakes and firewood • A potential substitute for firewood in Cowichan • Employment for Cowichan Tribes members
Capital Costs	Required equipment includes a forklift, a structure to house the machinery, and a press which can be quoted from suppliers.

Biofuel

Product Overview	Biofuels in this context are fuels derived from woody fibre.
Benefits	<ul style="list-style-type: none"> • Experience and employment for Cowichan Tribes members • Potential for revenue by selling the product locally • Funding opportunities available from government
Capital Costs	Largely dependant on the chosen technology and the scale of systems, but much higher than other options described in this feasibility study.

Small-scale Sawmill

Product Overview	This option includes the milling of rough-cut timber from residual fibres. The focus would be on small dimension products such as 1" by 2" or 1" by 3", due to fibre availability.
Benefits	<ul style="list-style-type: none"> • Locally sold products to meet community needs • Relatively low capital costs • Funding opportunities from government
Capital Costs	This option involves a relatively small capital cost, but machinery may be needed to move feedstock and milled products.

Pellets

Product Overview	<p>Pellet making is a mature technology which supports a large industry in the Interior of BC but has not yet migrated to the coast. This is largely due to transportation costs, fibre supply and moisture content of feedstocks available.</p> <p>The scale of pellet operations varies from 300,000 dry tonnes produced per year to very small community scale markets.</p>
Benefits	<ul style="list-style-type: none"> • Pellets are popular for home heating, and local markets can be established • Transferable skillset to a sawmill and manufacturing facilities • Employment for members of the Cowichan Tribes • Funding opportunities from the government
Capital Costs	This depends on the scale of operations, ranging from a few thousand dollars to large facilities costing close to \$10 million.

Essential Oils

Product Overview	Essential oils are derived from the distillation of organic materials including leaves and bark. This is a high value product, considering the low transport cost per unit. Existing essential oil operations are in Alert Bay, Bella Coola and Haida Gwaii regions. KFS should visit these operations and determine whether essential oils are the right fit for Cowichan Tribes.
Benefits	<ul style="list-style-type: none">• High value product• Employment for Cowichan Tribes members, youth and women.
Capital Costs	Low to moderate initial costs for distillation machinery.

Cultural Considerations

Supports Cultural Values	KFS is committed to maintaining cultural values including maximising the use of the forest resource and mitigating environmental impacts associated with these business ventures.
Promotes Well-being of Community	Any residual recovery venture will create jobs and meet local market demands for the Cowichan Tribes, adding to the well-being of the community.
Supports Self-Determination	By diversifying the economic activities of the Cowichan tribes and reducing reliance on imported lumber, stakes, and expanding its fuel resources, self determination is supported.

Climate Considerations

Maximising the use of the forest resource by utilising forestry residuals is the most sustainable and value-added approach to the industry. By reducing the forestry residuals burned, carbon emissions will be lowered.

Next Steps and Future Opportunities

- The first stage of any residual fibre project will be the securing of tops and pulp logs. This will provide a guaranteed access to fibre, and a steady, low risk stream of income. This will allow KFS to increase their capacity for other biomass businesses, with the benefit of guaranteed supply.
- Two self loading logging trucks and a 2019 Hitachi 210 Forrester will be purchased.
- During this two-year contract period, KFS will develop other areas of a residual forest biomass use business based on the recommendations provided in this feasibility study. Each of these options will require further business case analysis and planning.

4.1.2 Mill Residue Bioenergy Feasibility Study, Bella Bella, Heiltsuk Nation, BC

The Heiltsuk nation identified a business initiative to build and operate a small-scale sawmill to supplement community lumber needs and sell these products on the market. It was determined that if production benchmarks are met, this potential sawmill would employ 5 people operationally, with the potential to operate a dryland sort and a biomass project to effectively deal with wood waste.

Following this feasibility study, it was determined that the resulting sawmill residuals could be utilised in a biomass boiler that could provide thermal energy to potential dry kilns, mill buildings, nearby housing or other uses such as greenhouses or firewood drying sheds. This study estimated the amount of sawmill residue available, biomass boiler

size estimates, technical and economic values of the broiler, and includes a brief description of a Combined Heat and Power (CHP) unit.

Community Priorities

The Heiltsuk Nation would like to maximise the benefits of their forest resource, create opportunities for employment and promote community well-being.

Community Context

Population	Approximately 1155 people living on the reservation at Bella Bella, with a total registered population of 2,470 as of January 2020.	
Main Economic Drivers	The Heiltsuk nation is currently involved in fisheries management, forestry, and a local freight company and according to the HEDC are looking to further diversify their economic activities.	
Urban/Rural/Remote	Heiltsuk's traditional territory spans across the central coast of BC, encompassing 35, 553 square kilometers. Bella Bella is a remote town located on Campbell Island, 181 km north of Port Hardy on Vancouver Island.	
On/Off Grid	Off grid community powered by diesel electricity generators.	Eligible for Renewable Energy for Remote Communities Funding.
Transportation Infrastructure	Bella Bella includes an airport that operates direct flights from Vancouver through Pacific Coastal. The territory is accessible by boat, BC Ferries operates the Inside Passage route from Port Hardy. The journey is approximately 7 hours. Roads are paved and well connected from the Ferry terminal to the main part of town.	
Existing Agreements	<p>Forestry Agreements</p> <p>Heiltsuk Forest Consultation and Revenue Sharing Agreement - 2017</p> <p>Heiltsuk (Bella Bella) Nation Forestry Agreement - 2004</p> <ul style="list-style-type: none"> o Amendment - 2005 o Amendment - 2009 <p>Reconciliation Agreements</p> <p>Tuígila Agreement for Implementation of Heiltsuk Title, Rights and Self-government - 2019</p> <p>Haílčístut Tripartite Meeting Protocol Agreement - 2018</p> <p>Amending Agreement of the Haílčístut Framework Agreement for Reconciliation - 2017</p> <p>Coastal First Nations Reconciliation Protocol Amending Agreement (Gitga'at, Haisla [Not a member of Coastal First Nations], Heiltsuk, Kitasoo, Metlakatla, Nuxalk, Wuiknuxv) - 2017</p>	

Socio-economic Benefits

Employment

Number of Jobs Created	To be determined; dependant upon several factors including sawmill residual quantities and the size and scale of the boiler.
Community Employment Rates	From the 2016 Census, Bella Bella has a 46% employment rate, 15% unemployment rate.

Residual Biomass Availability

- With the current Lumber Recovery Factor (LRF) of log intake levels this sawmill will produce a total of 1,485 Oven Dried Tonnes (ODT) of sawmill residues.
- The energy content in this volume of residuals would incorporate 28,215 GJ or 7,870 MWH of energy.
- Boiler Efficiency reflects the 50% moisture content of the residuals combusted in the boiler. Drier chips will increase this efficiency dramatically.
- The estimated boiler capacity/size is 1,000 kW.

Boiler Technical and Economic Values

- The information derived from this study is based on the technical and economic parameters of a generic 1,000 kW biomass boiler with a net thermal efficiency of 70% (assuming 50% moisture content of input chips).
- The boiler capital cost will be approximately \$1.25 Million, calculated from \$1,250/kW installed.
- The energy rate for all costs is \$.084 kWh, which is lower than current heating oil cost of \$.156 kWh.
- A payback time of 3.8 years was estimated, indicating a highly viable investment.
- Carbon offsets of 1,350 tonnes CO_{2eq} per year (0.25 kgCO_{2eq}/kWh for heating oil) are estimated.

Biomass CHP technology

- The approximate cost of a CHP unit is \$370,000 for a containerized system.
- Manufacturers of this technology includes Volter Finland, Spanner Germany and ESPE Italy.
- These take dry biomass storage and convert it to a grid or a heat exchanger to reach customers.

Cost Savings/kWh	The energy rate to cover all costs of \$.084/kWh is much lower than the current heating cost of \$.156/kWh.
Indigenous Share in Project	This bioenergy project would be owned and operated by the Heiltsuk Nation.
Production Cost	The cost of the boiler is \$1,250,000. The cost of engineering and overhead at 20% of capital cost will be \$250,000. The total annual operational cost is \$255,767 including labour, annual heating oil costs, greenwood chip quantity and bone-dry wood chip quantity.
Production Quantity	The boiler would utilize the total amount of 1500 ODT of residues generated by the mill each year.
Scalability Potential	A biomass combined heat and power unit was discussed as a potential project.

Cultural Considerations

Supports Cultural Values	A bioenergy project would further utilise the sawmill residuals produced, minimising waste derived from economic activity. This would support the community's environmental stewardship values.
Promotes Well-being of Community	A bioenergy project in Bella Bella would significantly reduce heating and power costs for the community and create five jobs.
Supports Self-Determination	By reducing the community's reliance on imported diesel generators for heating and power needs, self determination is increased.

Climate Considerations

Carbon offsets of 1, 350 tonnes CO_{2eq} per year are estimated by using the sawmill residuals for heating. Utilizing residual biomass for heating and power needs reduces the community's reliance on fossil fuel-based generators, while maximising the use of forest resources.

Next Steps and Future Opportunities

- An estimated annual sawmill residue volume of 1500 ODT could be generated at the proposed sawmill capacity. A biomass boiler would effectively utilise residual biomass from the sawmill while lowering heat and power costs.
- A 1,000-kW boiler would utilise the available biomass to produce heat for the estimated production time of the facility.
- The energy rate to cover all costs of \$0.084 kWh for this biomass boiler is significantly lower than the current heating oil cost of \$0.156 kWh
- A simple payback of 3.8 years was estimated, indicating a highly viable investment.
- A biomass combined heat and power unit was also presented, and could be further explored if interest is present.

4.1.3 Non-Timber Forest Product Scoping Study, Kwakiutl Nation, Fort Rupert, BC

The Kwakiutl First Nation is working with the Indigenous Forest Bioeconomy Program (IFBP) to explore potential opportunities to increase fibre utilization, generate revenue and create jobs within their Traditional Territory. Currently at the scoping stage, this project took the first steps towards identifying viable non-conventional forest product opportunities. Analysis of the potential fibre supply and a high-level pro-forma assessment was completed for a potential fibre recovery enterprise. The fibre could be utilized for firewood production and delivery in the Kwakiutl First Nation and surrounding area, or supply carvers and woodworkers with wood for projects. This is one of several options being explored by the Kwakiutl for dealing with waste residual fibre.

Community Priorities

The Kwakiutl Nation's priority is to increase the value of the forest resource from an economic, environmental, and social lens. Value can be added to forest resources by diversifying through non-timber forest products (NTFPs), reducing and repurposing wood harvesting and manufacturing waste. Successful businesses resulting from this would create jobs for community members and provide economic diversification.

Community Context

Population	827 registered members, with 322 living on the reserve.	
Main Economic Drivers	Forestry, fishing, aquaculture, services.	
Urban/Rural/Remote	Remote	
On/Off Grid	On grid	Not eligible for Remote Energy for Rural Community funding.

Transportation Infrastructure	Accessible by road, airport, and public ferry. Fort Rupert is 228 km from Campbell River, BC and is 459 km and one 1.5-hour public ferry ride from Vancouver, BC.
Existing Agreements	Douglas Treaty Nation, no other current agreements with the Province.

Socio-Economic Benefits

Employment

Number of Jobs Created	5-7 potential local operational jobs could result from a firewood business if chosen as the option to pursue by Kwakiutl.
Community Employment Rates	From the 2016 census, Kwakiutl has a 13% unemployment rate, with 35% of workers who were full time last year.

Business Development

Indigenous Share in Project	The Kwakiutl Economic Development Corporation (KEDC) is a community business that is 100% Indigenous owned and operated.
Scalability Potential	This feasibility study suggests scalability potential to provide wood to local carvers and a small -scale milling opportunity for the Kwakiutl Nation to pursue. These ventures could be supported by the tools and business foundation created in this residual wood recovery business.
Biomass Supply	<p>The biomass source to supply a fibre recovery business would either be hemlock/ balsam pulpwood or red alder cut as a by-product of second growth timber harvest. Firewood from this region is mostly hemlock, balsam, or alder.</p> <p>There is high quality wood waste from the harvest of old-growth stands, containing a suitable volume for firewood processing. Wood waste from second growth stand harvest has less breakage and less viable firewood.</p>

Cultural Considerations

Supports Cultural Values	By better utilising the forest resource and reducing the amount of waste from logging and timber production, this enterprise could support community values and environmental stewardship practices.
Promotes Well-being of Community	If the enterprise were realised it could create 5-7 jobs, community well-being will be supported.
Supports Self-Determination	This project will facilitate further determination of natural resource management for the Kwakiutl Nation's territory.

Climate Considerations

Increasing the utilisation rate for fibre within the Traditional Territory of the Kwakiutl First Nation would result in climate benefits by either displacing petrochemical products with a higher carbon footprint or serving as long-lived carbon stores in finished wood products.

Next Steps and Future Opportunities

- Complete in the 2020-21 fiscal year a survey of bioeconomy opportunities for the Kwakiutl Nation with continued support from the IFBP.
- Once a full review of opportunities has been completed, the Kwakiutl First Nation will need to review the options and determine which opportunities make the most sense for the region and their community.
 - These options can then be moved along the project development scale with pilot-scale demonstrations and then full commercialisation.
- If firewood is pursued as an option, basing the business model for the operation around a lower start up and lower production cost for seasonal firewood sold through a pick-up mode is the most viable options. This option has the potential for profitability, employment of 5-7 locals, and a maximisation of the forest resource with waste reduction.

4.1.4 North Island Forest Residual Recovery Heat Map, ‘Namgis and Kwakiutl First Nation

A partnership formed between Kwakiutl First Nation, the Regional District of Mount Waddington and the ‘Namgis First Nation through their forestry entity, Atli Resources Limited Partnership, wishes to explore potential opportunities to utilize wood waste for joint value-added business opportunities. The partnership has plans to take a phased approach to identify these opportunities and develop plans to turn them into businesses for the two Nations. Both Nations and the communities on the North of Vancouver Island agree that the long-term economic health of them all would be supported by the development of a wood product value-added industry in the area.

This project was the first phase of the initiative. It was an overall review of the waste wood available on the land base of the North Island. Once the wood waste was identified, a ‘cost heat map’ was developed showing which harvest residues could be economically viable to collect depending on the delivery point(s) selected. Not only does this provide the information needed to determine what amount of waste could be available to support value-added manufacturing, it also helps to identify the best potential locations for such facilities.

Community Priorities

The ‘Namgis and the Kwakiutl are both looking for future investments in viable businesses in the forest sector and are especially interested in value-added solutions that utilize the North Island’s wood waste. This project is intended to lay the groundwork for identifying these options.

Kwakiutl Community Context

See [4.1.3](#) for this information.

‘Namgis Community Context

See [4.1.5](#) for this information

Socio-economic Benefits

Employment

Number of Jobs Created	As this was the first phase in a much larger project, no specific job-related impacts could be determined yet. However, value-added wood manufacturing from harvest debris would have significant employment impacts on the communities on the North of Vancouver Island.
Community Employment Rates	From the 2016 census, Kwakiutl has a 13% unemployment rate, with 35% of workers who were full time last year; the 'Namgis has a 30% employment rate and a 17% unemployment rate.

Business Development

Indigenous Share in Project	This project was a joint initiative between the Kwakiutl First Nation, the Regional District of Mount Waddington and the 'Namgis First Nation through their forestry entity, Atli Resources Limited Partnership.
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Cultural Considerations

Supports Cultural Values	Increasing utilization of trees that are harvested is aligned with the cultural values of both the 'Namgis and the Kwakiutl.
Promotes Well-being of Community	Employment that flows from successful value-added manufacturing will benefit the well-being of the associated communities.
Supports Self-Determination	Working with the Nations to collect the information that they both need to make sound business decisions related to their economic development supports their self-determination.

Climate Considerations

The utilization of wood waste for value added products rather than burning it as slash reduces GHG emissions, air pollution, and increases community protection from wildfire disturbances.

Next Steps and Future Opportunities

- Complete a high-level scan of value-added business opportunities.
- Follow up with a detailed assessment of the best identified opportunities.
- Develop a business and work plan for the chosen value-added business.
- Pilot, commercialise and scale-up the business.

4.1.5 Chipping Facility Business Pro-Forma, 'Namgis First Nation, North Vancouver Island, BC

North Island Chipping Ltd. is a chipping operation located in Beaver Cove at the North of Vancouver Island, within the Traditional Territory of the ‘Namgis First Nation. Atli Resources LP (Atli) is 100 percent owned by the ‘Namgis First Nation and operates as their forestry entity managing forest licences and forestry related businesses. Atli is interested in acquiring the North Island Chipping operation at Beaver Cove, and has been in discussions with Paper Excellence, a major coastal pulp and paper company, about establishing a business relationship. This project was to analyze the viability of this acquisition through a pro forma analysis, building upon a previous analysis of the fiber supply for this plant.



Community Priorities

It is essential that the ‘Namgis only move forward with the acquisition of the chipping operation if it will be financially viable and is able to provide an acceptable return on investment so Atli that can provide financial benefits for the ‘Namgis as a whole. Other potential benefits could be providing jobs directly to ‘Namgis members, however there are currently staff members employed at the chipping facility who are familiar with its operation and it is unclear if they have any direct connection to the ‘Namgis First Nation. It does not appear likely that there is opportunity for significant expansion of the extant operations, so any new jobs for ‘Namgis members may only become available as there is natural turnover of the current employees at the chipping facility.

Community Context

Population	1,875 total, 573 live in ‘Namgis territory. Alert Bay has a population of 1,200-1,500.	
Main Economic Drivers	Commercial fishing, forestry, aquaculture (land-based closed containment), sand & gravel extraction are the main drivers of the economy on the north of Vancouver Island. The ‘Namgis have developed their local economy around eco-tourism, energy production, fisheries, and forestry.	
Urban/Rural/Remote	Remote (Alert Bay)	
On/Off Grid	On grid	Not eligible for RERC funding
Transportation Infrastructure	Much of the ‘Namgis territory is accessible by road on northern Vancouver Island, while Alert Bay is located on Cormorant Island which is accessible by BC Ferries just a short trip from Port McNeill, BC. Alert Bay is 480 km from Victoria (one 30 min ferry) and 450 km from Vancouver (two ferries).	
Existing Agreements	<p>Forestry Agreements</p> <p>‘Namgis Forestry Fund Agreement - 2015</p> <p>‘Namgis Forest Consultation and Revenue Sharing Agreement - 2014</p> <p>‘Namgis First Nation Interim Forestry Agreement - 2005</p> <p>Other Agreements</p> <p>Letter of Understanding regarding a government-to-government process to address finfish aquaculture in the Broughton Area (Kwikwasutinuxw Haxwa’mis, ‘Namgis & Mamalilikulla) 2018</p>	

Socio-economic Benefits

Employment

Number of Jobs Created	10 local jobs will be maintained.
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Community employment rates	From the 2016 Census, 'Namgis has a 30% employment rate and a 17% unemployment rate.
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Business Development

Indigenous Share in Project	Atli Resources is 100% owned by the 'Namgis First Nation.
Production Quantity	It is estimated that between 165,000 m3 and 195,000 m3 of waste fibre would be available to the chipping plant with potentially another 65,000 m3 per year.
Scalability Potential	There is not significant room for scaling up current operations; scalability would be limited to completely new applications for the chips produced by the plant.
Market Size	The chip market on Vancouver Island and the Coast has tightened substantially from a lack of available fibre supply from the BC Interior. Currently there is a shortage of feed stock for pulp and paper mills on the Coast, so there should be no shortage of interest in purchasing wood chips from the facility.

Cultural Considerations

Supports Cultural Values	This project is not significantly tied to cultural values beyond increasing the economic activity of the 'Namgis within their Traditional Territory.
Promotes Well-being of Community	Any revenue generated from the chip plant could be used by the 'Namgis to benefit the community. Jobs may become available for 'Namgis members gradually over time.
Supports Self-Determination	This study is specifically to provide important information to the 'Namgis so that they can decide whether it makes sense for them to move forward with the purchase of the chipping facility. Supporting a First Nation in gathering or accessing the information that they need to make their own decisions supports their own self-determination.

Climate Considerations

Projected GHG implications of the continued operation of the North Island chipping facility in Beaver Cove were not calculated as a part of this project. However, as chipping allows wood that is not suitable for use in other applications to be utilised rather than left in the bush to decompose or be burned, operating the chipping facility should contribute to a net reduction in carbon released as a part of forestry operations on the north of Vancouver Island.

Next Steps and Future Opportunities

- It is expected that the earnings associated with the chipping facility will be lower than their current levels due to the increased cost of fiber.
 - The current owner of the facility also operates a forest harvest and salvage operation and is therefore able to supply a significant amount of fiber to the facility at cost.

- The estimated annual earnings before interest, depreciation, and amortization seems acceptable enough to continue looking into the acquisition of the plant.
 - Actual earnings will be greatly affected by the actual financing and business relationships established both with customers for the chips, and fiber suppliers.
- The key elements that will be required to support the investment are:
 - Long term wood supply of 200,000-260,000 m³.
 - Long term contract and business relationship with a large pulp and paper company as a customer for the wood chips produced. Paper Excellence has expressed interest in this.
 - At least one operational shift will need to be supported by this contract.
 - There may be potential to grow the business with a partner such as Paper Excellence, especially if they contribute to the sourcing of fiber off Vancouver Island (e.g. the Mid-Coast).
 - Continuing to utilize “waste fiber” that does not meet the specifications for traditional saw log or pulp wood. The current plant can convert chuck material into chips, as opposed to just pulp logs, which is unusual.
- One of the greatest risks identified is that any changes to the current log supply may present operational and profit challenges.
 - It is unclear how recent policy changes to waste and residue pricing will affect the availability and cost of waste fiber to chipping facility. Additionally, if there were to be a significant decrease to harvesting activity relative to present there may not be enough fiber for the plant to operate profitably.

Next steps:

- Finalize discussions with chip customers to solidify what the financial picture would look like.
- Complete a detailed financial analysis based upon this prior to finalizing the purchase of this plant.

4.1.6 Virtual Mapping of Territory, Mowachaht Muchalaht First Nations, Gold River, BC

This project is to use cutting-edge technology to produce a 3D software program for the Mowachaht Muchalaht First Nations of their traditional territories that incorporates an inventory of known features including named places, culturally modified trees, fisheries information and other points of interest. This software delivers actionable information crucial for making informed natural resource management decisions that respect the cultural values of the Nations and support their self-determination.



Community Priorities

The Mowachaht Muchalaht First Nations receive hundreds of referrals for natural resource development projects, particularly mining and forestry. The priority for this territorial mapping project in the near term is to enable them to make informed decisions regarding these referrals by allowing them to review a geographic database of landscape features including named places, culturally modified trees, and archaeological sites to understand how they interact with the proposed development areas. Presently referral staff rely on 2D paper maps that must be manually compared with their inventory of these sites, and interpretation varies from person to person. However, this kind of information for the territory will enable Mowachaht Muchalaht First Nations to make more informed decisions across all aspects of natural resource management across their territory.

Community Context

Population	611	
Main Economic Drivers	Forestry, fishing.	
Urban/Rural/Remote	Remote	
On/Off Grid	On grid	Not eligible for funding under the Renewable Energy for Remote Communities program.
Transportation Infrastructure	Accessible by road, airport, and public ferry. Gold River is 86 km from Campbell River, BC and is 318 km and one 1.5-hour public ferry ride from Vancouver, BC.	
Existing Agreements	First Nations Clean Energy Business Fund (FNCEBF) Revenue Sharing Agreements Mowachaht/Muchalaht FNCEBF Revenue Sharing Agreement (Cyprus Creek Hydro Project) - 2014 Forestry Agreements Mowachaht/Muchalaht Forest Consultation and Revenue Sharing Agreement - 2017 Mowachaht/Muchalaht First Nation Interim Measures Agreement - 2008 (PDF) Mowachaht/Muchalaht First Nation Interim Agreement on Forest Opportunities - 2008 (PDF)	

Socio-economic Benefits

Employment

Number of Jobs Created	It is anticipated that Mowachaht Muchalaht will need to hire Cultural Forestry Advisors and technicians to manage the new software. Due to the nature of the program it is anticipated that the individuals hired will be youth and young adults.
Community Employment Rates	Mowachaht Muchalaht has a 29% employment rate, and a 33% unemployment rate.

Business Development

Revenue	This project is not directly connected to a business venture. However, it will enable the Mowachaht Muchalaht to make informed natural resource management decisions across their territory. Training for these individuals has been provided as a part of this project.
Indigenous Share in Project	The interactive 3D maps will be for the sole use of the Mowachaht Muchalaht First Nations and any party they choose to share the resource with.

Cultural Considerations

Supports Cultural Values	Enabling the Mowachaht Muchalaht First Nations to gather accurate information about how natural resource project applications that they receive as referrals relate to their inventory of named places, culturally modified trees, and points of interest support their cultural values.
Promotes Well-being of Community	Providing new employment opportunities for the Cultural Forestry Advisors will benefit those members of the community.
Supports Self-Determination	Empowering the Nations to have the information they need about natural resource management in their traditional territory supports self-determination.

Climate Considerations

No GHG emission savings is expected as a direct result of this project.

Next Steps and Future Opportunities

- Mowachaht Muchalaht First Nations will hire several Cultural Forestry Advisors who have been trained as a part of this initiative as well as technicians to manage the software.
- The Traditional Use Study Database that has been digitised into a 3D geographic database will now be used as a critical tool in the review of natural resource project referrals received.
 - This will provide the Mowachaht Muchalaht First Nations with accurate information to present to the Council of Chiefs for their considerations.
- It is anticipated that the software may be used in other natural resource management applications in the future.

4.1.7 Great Bear Rainforest Essential Oils, Nuxalk and Metlakatla First Nation, Prince Rupert-Bella Coola, BC

Great Bear Rainforest Essential Oils (GBREO) is a social enterprise supported by the Coastal First Nations - Great Bear Initiative. This is a non profit society of eight First Nations on BC's North and Central Coast, with partnerships specifically with the Nuxalk and Metlakatla First Nations. GBREO uses harvested conifer needles gathered in the Great Bear Rainforest to create a non timber forest product (NTFP) to sell on the market.

Essential oils are used as a natural alternative to diffuse scents throughout the home or workspace, and for use in perfumery and personal body products. Because of a large increase in popularity of essential oils and bioproducts, there is an increasing market size for GBREO's materials.

The purpose of this e-commerce website report and marketing strategy was to assess its advertising approach and support increased sales channels including national distributors, direct sales to retailers, corporate and government purchasing departments.

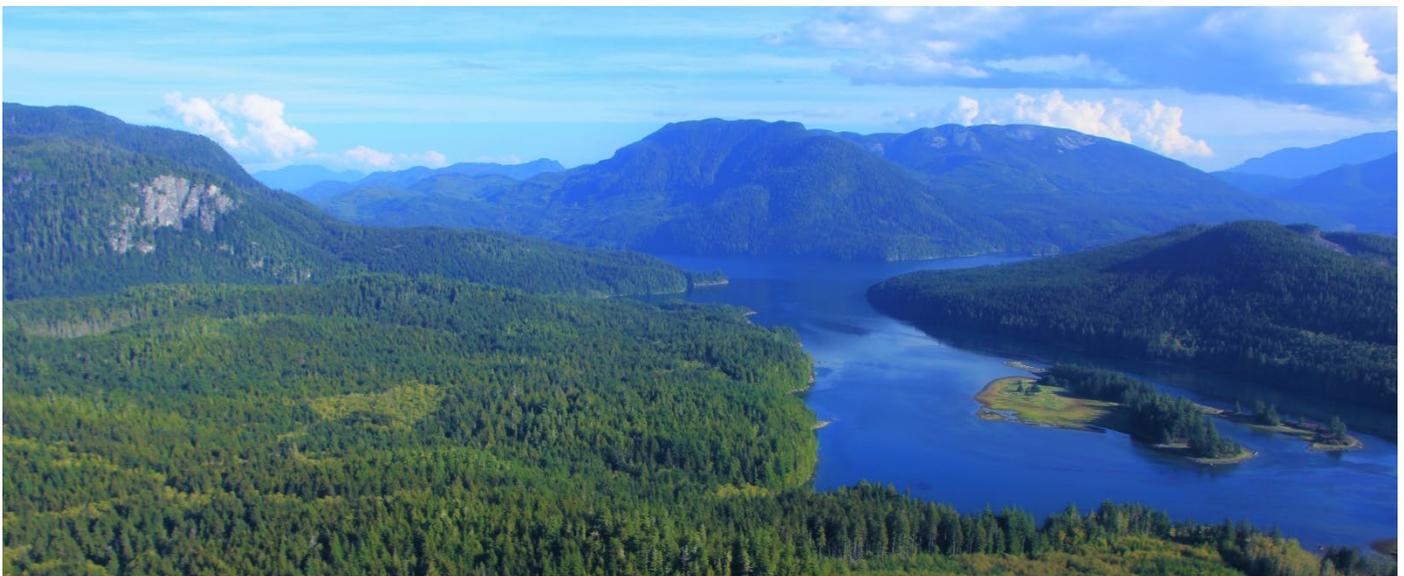
Using Instagram, YouTube, Pinterest and Facebook as social platforms, GBREO hopes to increase brand awareness of their products and support online sales and retail locations. This e-commerce report and marketing strategy provided social media engagement, brand and product goals, and revenue report templates that should allow the project to monitor changes.

Community Priorities

The organizational mission of GBREO, as an Indigenous-owned business, is to responsibly harvest and provide high quality coniferous tree oils from the Great Bear Rainforest. Eventual goals include being a leading provider of sustainable wellness products. The organization's values include sustainability, social responsibility, trust and community connection.

The goal of this e-commerce launch and marketing strategy is to effectively communicate GBREO's values and brand priorities through a successful website and advertising. This marketing strategy seeks ways to diversify its distribution channels, advertise to target audiences and explore ways of increasing sales over time.

These actions will support the GBREO's goals of increasing sales and promoting their brand of sustainably harvested NTFP's which support community goals of employment and development.



Metlakatla Community Context

Population	Registered population on reserve is 90 people as of February 2020. The total registered population of the nation is 992 living throughout British Columbia.	
Main Economic Drivers	The Metlakatla Nation has seen population loss in the past decade, resulting in economic decline. The range of industries include manufacturing and resource development projects.	
Urban/Rural/Remote	Metlakatla is located 5 km north of the remote but urban area of Prince Rupert, BC.	
On/Off Grid	On grid community.	Not currently eligible for funding under the Remote Energy for Rural Community (RERC) Program.
Transportation Infrastructure	The Metlakatla Nation does not have year-round road access to a service centre at Prince Rupert, which results in higher costs for transportation. BC ferries operates a 16-hour trip to nearby Prince Rupert from Port Hardy on Vancouver Island.	
Existing Agreements	<p>Forestry Agreements Metlakatla Forest Consultation and Revenue Sharing Agreement - 2018 Metlakatla First Nation Forestry Interim Measures Agreement - 2003 (PDF, 1.1MB) Amendment – 2008</p> <p>Reconciliation Agreements Coastal First Nations Reconciliation Protocol Amending Agreement (Gitga’at, Haisla [Not a member of Coastal First Nations], Heiltsuk, Kitasoo, Metlakatla, Nuxalk, Wuiknuv) – 2017</p>	

Nuxalk Community Context

Population	Registered population on reserve is 898 people as of February 2020. The total registered population of the nation is 1,739 members living throughout British Columbia.	
Main Economic Drivers	Many Nuxalk peoples living on the reservation take part in manufacturing and construction work in nearby areas, agriculture, forestry, fishing and ecotourism.	
Urban/Rural/Remote	Nuxalk Nation’s territory is remote, it is located near the town of Bella Coola, BC. The entire Bella Coola Valley had a population of 2,000 from the 2016 Census. This region is located on the Central Coast of BC, approximately 13 hours driving from Vancouver.	
On/Off Grid	Off grid community powered by diesel electricity generators.	Eligible for funding under the RERC Program.
Transportation Infrastructure	A paved road connects Williams Lake and Bella Coola, approximately 460 kilometres. Bella Coola is accessible via Pacific Coastal from Vancouver. BC Ferries operates a 10-hour trip from Port Hardy to Bella Coola.	
Existing Agreements	<p>Forestry Agreements Nuxalk Forest Consultation and Revenue Sharing Agreement - 2013 Nuxalk First Nation Interim Agreement on Forest & Range Opportunities - 2007</p> <p>Reconciliation Agreements Coastal First Nations Reconciliation Protocol Amending Agreement (Gitga’at, Haisla [Not a member of Coastal First Nations], Heiltsuk, Kitasoo, Metlakatla, Nuxalk, Wuiknuv) - 2017</p>	



Socio-economic Benefits

Employment

Number of Jobs Created	6 jobs created through marketing and social media support.
Community employment rates	From the 2016 Census, Metlakatla has a 21% unemployment rate, and Nuxalk has a 28% unemployment rate.

Marketing and Sales Development

Indigenous Share in Project	GBREO's project partners include Nunumus management Ltd, Metlakatla Stewardship Society and Coastal First Nations Great Bear Initiative. These project partners are Indigenous operated organizations.
Production Quantity	By promoting through Instagram influencers, Pinterest advertisements, Facebook interactions, and increasing the number of physical sales locations, production can increase as brand awareness and sales increase.
Scalability Potential	The brand can increase scale by increasing the number of online sales and retailers it distributes to. Additionally, social media health and wellness influencers with large followings of between 10,000 to 100,000 people are a powerful channel to partner with and mutually benefit from GBREO's products.
Market Value	<p>\$25 for a 5 ml bottle of essential oils. Roll-on pricing is to be determined.</p> <p>The pricing strategy for GBREO will be to differentiate from similar lines by emphasizing its sustainable extraction methods, origin of brand and products, it's Indigenous partnerships, and the purity of ingredients. This will allow a higher market price while remaining competitive and highly differentiated.</p>

Market Size	<p>The marketing strategy identifies three target audiences for the products, primarily urban consumers of varying ages interested in personal health, wellness and family wellbeing. Identifying and tracking product sales over the next 12 months will specify their target market.</p> <p>This marketing plan targets new distributors including upscale retail stores, duty free shops, and boutique resorts and spas to reach each target market.</p> <p>As this Ecommerce strategy targets a wide range of social media channels including advertising on Facebook, Instagram, Pinterest and YouTube, it will reach a larger target audience contributing to increased- brand awareness and a resultant increase in sales.</p>
Export Potential	<p>Shipping capacity extends throughout Canada and the United States, both to retailers and homes. GBREO has partnered with., a large organization in Vancouver who manage over 2500 retail and over 2500 professional accounts, as well as work with over 120 ecologically responsible brands.</p> <p>The brand is targeting other export channels including Amazon and subscription boxes.</p>

Climate Considerations

Capitalizing on opportunities to develop Non-Timber Forest Products maximises the use of British Columbia’s forest resources. The use of conifer needles gathered locally and sustainably ensures the whole tree is being considered in adding value, while diversifying from solely timber and lumber production. This diversification creates the most economic benefits, employment and sustainable approach in resource extraction.

Next Steps and Future Opportunities

- GBREO will continue to promote its advertising channels through social media use and their online store to promote sales of its products. As awareness of the brand increases, so will potential demand for these locally-sourced bioproducts.
- GBREO plans to distribute to duty free shops, resorts and spas, and upscale retail stores soon, with the eventual goal of distributing to Amazon and third-party subscription boxes.
- This marketing strategy identifies long term branding goals to differentiate this product from market competitors, focussing on telling the story of the Great Bear Rainforest and effectively communicating these values to potential and existing customers.
- This report considers the visual aesthetics of the brand, and next steps will be to implement suggested changes to packaging, advertising and web content.
- GBREO plans to develop a line of roll-on products in 2020 that incorporate Great Bear Rainforest conifer oils and other natural ingredients. This will involve identifying new channels of distribution, acquiring trial and endorsements of new products, educating and promoting new products to incentivize purchases. These roll-on formulas have been tested for safe human use and are approved to go to market based on Canadian cosmetic and product guidelines.
- These marketing steps will lead to an increased number of sales channels and increase revenue through brand diversification and personalisation of the shopping and product experience.

4.1.8 NTFP Scoping and Resource Assessment, Quatsino First Nation, Coal Harbour, BC

The Quatsino First Nation, based in Coal Harbour, BC, is interested in the development of a non-timber forest product (NTFP) based enterprise. The community was engaged to assess community interest and capacity, complete an initial resource assessment of the traditional territory and a pre-feasibility study of potential NTFP businesses.

Extant physical assets currently within the community could support NTFP development, including an industrial kitchen with an oven, fridge, and a large workspace; a walk-in storage cooler; a greenhouse; and a community hall. To complete the resource assessment, a “chance mapping” approach coupled with some modelling were used.

Community Priorities

A goal of the Quatsino people is to teach the younger generations how to gain employment through practicing traditional forest-based activities. The flexible nature of NTFP harvesting work is seen as an asset by members of the Quatsino community as it can allow harvesters to accommodate other cultural, community and family commitments. It can also help individuals that lack a history of regular employment a means to build experience and transition into more conventional employment opportunities.

Many members of the Quatsino community do currently participate in independent small-scale NTFP harvesting. In a survey completed as a part of this project, individuals identified training and/or access to markets as key potential barriers to expanding NTFP production.



Community Context

Population	582 (total), 241 (on reserve)	
Main Economic Drivers	Forestry, fishing, aquaculture, construction, and manufacturing.	
Urban/Rural/Remote	Remote	
On/Off Grid	On grid	Not eligible for RERC funding
Transportation Infrastructure	Accessible by road, airport, and public ferry. Coal Harbour is 245 km from Campbell River, BC and is 475 km and one 1.5-hour public ferry ride from Vancouver, BC.	
Existing Agreements	<p>Forestry Agreements Quatsino Forest Consultation and Revenue Sharing Agreement - 2017 Quatsino First Nation Forest Agreement - 2004 Amendment – 2008</p> <p>Other negotiations Quatsino First Nation Clean Energy Revenue Sharing Agreement (Nahwitti Windpower IPP) - 2016 Quatsino First Nation Clean Energy Revenue Sharing Agreement (Knob Hill Windpower IPP) - 2016</p>	

Socio-economic Benefits

Employment

Number of Jobs Created	Potential for 3-5 full time jobs and 50+ part time harvesters.
Community Employment Rates	From the 2016 Census, Quatsino has a 52% employment rate and an 11% unemployment rate.

Business Development

Indigenous Share in Project	Up to 100%
Scalability Potential	Beyond value added processing, the scalability of this NTFP production is limited
Market Size	Between \$689 million and \$1.6 billion per year for all NTFP's in Canada

Cultural Considerations

Supports Cultural Values	NTFP harvest from the Traditional Territory would support the Quatsino to be out on the land more and be aligned with traditional economic enterprise.
Promotes Well-being of Community	NTFP harvesting can provide flexible employment options that support fulfilment cultural, community, and familial obligations. Additionally, it can support transition back into the workforce for those who lack a consistent employment history.
Supports Self-Determination	By providing employment opportunities within the community it supports greater self-determination by both the Nation and its members.

Climate Considerations

- It is expected that the development of a NTFP enterprise by the Quatsino will have negligible effects on carbon mitigation.

Next Steps and Future Opportunities

- Setting up a successful NTFP business in the Quatsino Traditional Territory will require the following key strategies:
 - Using a value-added focus such as producing cooked jams, bitters, syrups, dried mushrooms, or ready-made meals.
 - Focusing in on the branding of the products and their story based on the history, culture and people who produce the products will distinguish it from other products and enable it to command a higher market value.
 - Using traceability and attribution of individual products to the sites from which they were collected and who they were collected by, like some high-end fair-trade coffee producers and distributors, would also support differentiation in the market place.

- A Quatsino-run company would likely not be able to establish a dominant market position in most or all the NTFPs identified in the resource assessment in their raw, fresh, or unprocessed state.
 - The initial resource inventory does not suggest that high value crops such as Pine Mushrooms are plentiful within the territory.
 - Berry crops such as huckleberries may be of a lower sweetness than other areas due to the high rainfall within the territory.
- Next steps for continuing to develop NTFPs would include:
 - Completing an in-depth resources inventory and management database.
 - Training community members how to harvest and conducting a trial harvest.
 - Development of a marketing plan, completion of a pro-forma and a business plan.
- A minimum viable model option would be for the Quatsino First Nation to provide a buying service to support Quatsino members in beginning to earn an income from their NTFP harvesting.

4.1.9 Mushroom Harvest Market Research, Ulkatcho First Nation, Anahim Lake, BC

This project was a market analysis of domestic and international Pine Mushroom markets and consisted of both market research and competitor analysis. The Ulkatcho First Nation has been harvesting Pine Mushrooms since the 1980s, the harvest of which has been self reported to be a significant contributor to the annual income of over half of the community. The Ulkatcho are currently looking to grow their commercial wild mushroom harvesting enterprise and their access to markets.

In the fall of 2019, a separate project was undertaken by the Ulkatcho 2019 to pilot the purchase, packaging, and selling of Pine Mushrooms harvested from the Ulkatcho territory. This pilot highlighted significant knowledge gaps with respect to market dynamics and import pricing in international markets. The extant mushroom harvesting operations are well into the commercialization stage, but in order to be able to expand the existing business, accessing high value international markets will be critical. To identify which markets currently exist and how the Ulkatcho could take advantage of them a market research study was identified as a first step in expanding the business.

This study was therefore aimed at addressing those gaps. Its findings suggest that successful growth of the Ulkatcho Pine Mushroom enterprise into international markets will depend on:

- Establishing stringent quality control mechanisms that are like those employed by leading competitors in order to establish a reputation that can command higher market prices;
- Developing a long-term marketing strategy that is aligned with the international markets; and
- Increasing market share by partnering with neighbouring First Nations.

Community Priorities

The Pine Mushroom harvest within the Ulkatcho traditional territory allows many community members to generate self-employment income. Although pine mushrooms were not a traditional food source for the community, the harvest depends upon the use of historic cultural trails. Of great cultural significance to the Ulkatcho is a historical trading route known as the Nuxalk-Carrier Grease Trail which is about 450 km long and contains over 120 archaeological sites. Its maintenance, as well as other trails in the territory, is costly but they provide access to many

of the mushroom harvest sites. If able to cover the cost of these trails' maintenance through increased eco-tourism of the area and Pine Mushroom harvesting, there would be multiple benefits to the community.

Community Context

The Ulkatcho First Nation is a member of the Carrier Chilcotin Tribal Council in partnership with the other three Nations – Lhoosk'uz Dene, Lhtako Dene and Toosey, as well as a member of the South Dakelh Nation Alliance.

Population	1,066	
Main Economic Drivers	Forestry, ranching	
Urban/Rural/Remote	Remote	
On/Off Grid	Off grid	Eligible for RERC funding
Transportation Infrastructure	Accessible by road and air. Anahim Lake is 318 km from Williams Lake, BC and is 816 km from Vancouver, BC.	
Existing Agreements	<p>Forestry Agreements</p> <p>Ulkatcho Forest Consultation and Revenue Sharing Agreement - 2019</p> <p>Ulkatcho First Nation Economic Opportunity Agreement - 2007</p> <p>Ulkatcho First Nation Interim Agreement on Forest & Range Opportunities - 2006</p> <p>Ulkatcho First Nation Short Term Mountain Pine Beetle Agreement - 2006</p> <p>Other Agreements</p> <p>Lhoosk'uz Dene / Ulkatcho Economic Development Agreement (Blackwater Mine) - 2020</p> <p>Southern Dakelh Nation Alliance Hubulhsooninats'Uhoot'alh Foundation Framework Agreement - 2018</p>	

Socio-economic Benefits

Employment

Number of Jobs Created	Mushroom harvest has the potential to employ over 100 individuals part time in the community.
Community Employment Rates	From the 2016 Census, Ulkatcho has a 31% employment rate and a 48% unemployment rate.

Business Development

Indigenous Share in Project	West Chilcotin Forest Products is 100% owned by the Ulkatcho First Nation
Production Cost	Variable. Restoring and maintaining trails used to access mushroom patches within the territory will increase production costs
Scalability Potential	It will be important to avoid over-harvesting within the Ulkatcho territory to ensure the supply remains sustainable. Therefore, there is limited scalability in the harvest of raw mushrooms, but there could be scalability in terms of value-added processing of the mushrooms or other NTFP products

Market Value	<p>The NTFP industry represents over a billion dollars annually in Canada.</p> <p>The mushroom market in British Columbia is worth approximately \$10-42 million per year.</p>
Market Size	<p>Approximately 300 NTFPs are produced by approximately 200 small business enterprises in Canada. These include the maple syrup industry, blueberries, Christmas trees and other various products.</p> <p>The market continues to grow, as upper-middle income people are choosing higher quality, ethically and sustainably produced, nutrient rich foods. This niche market is showing an increasing demand globally.</p> <p>Currently, a few competitors are present in the region but with product differentiation, risks including economic conditions, forest management and climate change are reduced.</p>

Cultural Considerations

Supports Cultural Values	<p>Pine Mushroom harvesting from the Traditional Territory supports the Ulkatcho to be out on the land. Additionally, use of traditional trails to access mushroom patches could contribute to their maintenance.</p>
Promotes Well-being of Community	<p>NTFP harvesting can provide flexible employment options that support fulfilment cultural, community, and familial obligations. Additionally, it can support transition back into the workforce for those who lack a consistent employment history.</p>
Supports Self-Determination	<p>By providing employment opportunities within the community it supports greater self-determination by both the Nation and its members.</p>

Climate Considerations

It is expected that the continued development of a Pine Mushroom enterprise by the Ulkatcho will have negligible effects on carbon mitigation.

Next Steps and Future Opportunities

- An immediate next step for the continued development of the Ulkatcho Pine Mushroom business is to develop a robust marketing and sales strategy.
- Market identification and optimization, product development, and branding are some of the most important takeaways from this analysis.
 - The challenges associated with accessing external markets have been identified. The Ulkatcho can now start to move forward with expanding their business.
 - This in-depth market research is also hoped to be of benefit to other Nations that are interested in pursuing a NTFP mushroom harvest project.
- Utilizing additional processing to produce dried mushrooms could extend the period in which the community is earning income from the harvest of mushrooms beyond the current harvest window from June until October.
 - The community currently possesses the infrastructure to produce dried mushrooms.
- There are opportunities to build a synergy with tourism and mushroom harvesting. Investment in trail clearing and maintenance can encourage increased tourism in the community while facilitating access of mushroom harvester to the land base for harvesting.

- Trails like the Grease Trail are of huge cultural importance to the Nation; improvements to and maintenance of this trail would generate economic, cultural and social benefits to the community.

4.2 Indigenous Forest Bioeconomy Program - Coast-wide Projects

4.2.1 Cedar Non-Timber Forest Products Business Assessment

This project discusses the potential use of Red Western Cedar for a variety of non-timber forest products including wood and leaf essential oils, synthetic turf-infill and medical textiles.

Red Western Cedar can be classified as a botanical forest product or a cultural heritage resource. As the Province implements the United Declaration on the Rights of Indigenous Peoples, free, prior and informed consent of a First Nation may be required to use or develop cedar, cedar residuals, bark, waste, rejects or co- and by-products.

Wood and Leaf Essential Oils

Product Overview	Essential oils are derived from the wood or leaf components of trees and other forest species. The resulting oils can be used in high quality soaps, detergents, perfumes and other beauty products. They can be used as natural aroma and topical therapeutics.
Associated Costs	Stream Distillation ranges from \$5000-2,000,000 depending on scale. Non-intensive, low scale Cost of Goods Sold: \$50-\$70/kg Labor, Operations, Marketing \$30-50/kg One tonne feedstock yields 5-8 kg oil Management and Technical Consulting: \$350/CAD
Market Value	All NTFPs in Canada \$689 M-\$1.6 B Cedar Essential Oil Serviceable Market: \$50-100 M Wholesale market value: \$70-140/kg CAD Online Retail: \$200-320/kg USD
Market Growth	2% Compound Annual Growth Rate (CAGR) to 2022
Key partners	<ul style="list-style-type: none"> ● Forest producers ● Regulatory agencies ● First Nations ● Stream distillation ● Wholesale and online retail channels

Synthetic Turf- Infill

Product Overview	<p>Turf is used as a lower maintenance alternative to grass for sports fields and other recreation facilities. Types of turf infill include recycled rubber, virgin rubber, mineral and organic from biomaterials.</p> <p>Customers could purchase cedar-based turf infill for the use of contact and non-contact sports, landscaping and leisure uses.</p> <p>The benefit of this product is a 10-15-year warranty for technical performance. The value of this product includes a reduced injury rate for sports, improved health and environmental impact by replacing petrochemical based rubber turf alternatives, a lower surface temperature and a competitive lifetime cost.</p>
Associated Costs	<p>The feedstock to produce cedar turf infill would cost approximately \$100/Metric Tonne.</p> <p>Initial costs start at \$1 million to proof of concept, and years 2-3 up to \$3 million to first sale.</p>
Market Value	<p>Global market value for turf is \$2.8 B-\$3.5 B projected to 2022, and \$850 M - \$1.2 B</p> <p>Comparable infill products sell for \$500/metric tonnes to \$2500/metric tonne</p>
Market Growth	12% CAGR to 2022
Key Partners	<ul style="list-style-type: none"> ● Feedstock suppliers ● Turf manufacturers ● Municipal governments, parks and recreation, schoolboards ● Leaders in field athletics, urban planners, civil engineers ● Turf systems distributors

Next Steps and Recommendations

Successful and sustainable commercialization of cedar bioproducts may require:

- A market led approach towards Intellectual Property and Technological development.
- An approach to technology development that address long term market needs and value chain imbalances.
- Creating a defensible operating position within at least two sections of the relevant supply and value chain, towards vertical integration with non-construction and non-building segments.
- Regarding the essential oil NTFP markets:
- Despite an apparently high \$/ml or \$/kg, a low volume production model is unlikely to cover direct expenses, due to a low yield per tonne and opportunity costs. To be successful, these opportunities would need to vertically integrate into a high-volume supply chain.



4.2.2 Coastal Indigenous Forest Products Market Scan

This market scan of non-timber and lumber forest products on the coast is a brief summary of data from coastal Indigenous organizations and comparable industries. It discusses each product type, market size and value, current and future potential for coastal Indigenous nations.

Essential Oils

Product overview	<p>Oils can be extracted and concentrated from trees and plants and made into profitable non-timber forest products (NTFPs).</p> <p>Essential oils are used in food products, drinks, perfumes, pharmaceuticals, and cosmetics for personal and home care products.</p>
Market Value	<p>The global essential oils market was valued at \$10.4 B in 2018.</p> <p>By 2026, the Compound Annual Growth Rate (CAGR) of the industry is expected to grow by 10.8% to a global market value of \$20.3 B.</p>
Recommendations and Next Steps in BC	<p>The infrastructure needed for production of essential oils is minimal. This industry is profitable, as the products have market benefit, are lightweight can be easily shipped.</p> <p>This market is profitable for Indigenous communities, with a low cost of entry and minimal training required for business operations, there are many feasible business opportunities in Coastal BC.</p>

Tiny Home Components

Product Overview	Tiny homes provide full-functionality in a small-scale dwelling. These houses minimize the impact of heating, electricity and land use change. Building plans consider the best ways of utilizing small spaces and technologies.
Market Value	Globally, the tiny home market was valued at \$12.9 billion USD in 2017. It is expected to grow at a CAGR of 6.99% until February 2022. This growth is driven by increased construction costs, popularity of tiny homes, ability to relocate these homes, and their rental and leasing opportunities.
Recommendations and Next Steps in BC	<p>The infrastructure required to start producing tiny home components is \$15,000-\$50,000 CAD and includes a small workshop, tools and basic machinery. Trained professionals in carpentry would be beneficial to ensure quality and safety.</p> <p>This market is established and continues to grow, offering potential for coastal BC Indigenous communities.</p>

Artisanal Goods

Product Overview	This NTFP includes wood products created as art or as functional artisanal goods. This includes carvings, totems, masks, baskets, or art on paper products.
Market Value	As an estimate, this market has a total revenue in Canada of \$987 million CAD.
Recommendations and Next Steps in BC	<p>This industry has a low cost of entry. Carving would be less than \$1000 per person, while basket weaving would be less than \$2000.</p> <p>Training and skills are needed to enter this craft.</p> <p>This is a viable business opportunity for some communities.</p>

Wood Products

Product Overview	These products range from cutting beams, lumber tiles, fence components, railway ties, furniture, mass wood or cabinets.
Market Value	<p>Total BC wood products exported to all countries was \$7.7 billion USD.</p> <p>Specific product market capitalization for:</p> <p>Utility poles in the US - \$532 million USD 2016</p> <p>Railway tie market in the US - \$13-26 million USD in 2016</p> <p>Cabinet market in Canada - \$1.5 billion USD in 2018</p>
Recommendations and Next Steps in BC	<p>This variety of value-added wood products has a growing demand both globally and domestically.</p> <p>Cedar shingles and handmade wood furniture offer a low investment business potential which would be straightforward to implement with training.</p>

Clothing

Product Overview	Cedar bark has been used by Indigenous peoples historically to create textiles. Using cedar bark which is stripped from trees before harvest and otherwise considered wood waste, lyocell can be manufactured. Lyocell is durable, versatile, strong and has 50% more moisture absorption than cotton.
Market Value	In 2019, the market size of Cellulose Fiber was \$26 billion USD, and will reach \$53 billion USD in 2025, a CAGR of 9.3% from 2019. This growth is caused by a demand for cellulose based products over petroleum-based products, for biodegradable, sustainable products.
Recommendations and Next Steps in BC	Infrastructure costs and training requirements makes lyocell production from cedar bark a capital-intensive business venture. Due to a current lack of market demand and high start up costs, this market is not currently recommended for investment.

Berry and Herb Applications

Product Overview	This market involves the use of herbs for scent, flavor or therapeutic properties. Herbal medicines can be used as dietary supplements in tablets, capsules, powders, teas, extracts, fresh or dried plants.
Market Value	The market size for these products is between \$5.25-\$104.23 B, depending on the defined scope of the industry. This industry has a growth rate between 5.88-6.2%. This growth is due to greater demand for natural products, an awareness of prevention-based healthcare, increased health and wellness spending and an aging population.
Recommendations and Next Steps in BC	Following harvest, this industry is not capital or infrastructure intensive. Tools to create natural supplements are as low as \$500 for a grinder and capsule packing kit. Medicinal knowledge in which a community feels comfortable sharing and mass producing may be necessary for this business venture. These plants could be harvested from their territory in the wild or farmed at volume. This is a viable opportunity for Indigenous communities interested in sharing their medicinal knowledge and resources.

Animal Products

Product Overview	The animal products industry ranges widely, including meat from deer, caribou, elk, and pelts from mink, muskrat, and beaver. Bones can be used for tools, utensils, oils used for fuels and medicinal purposes, skins for bags and rope.
Market Value	The US market for venison was worth \$367.9 million USD in 2018, and mink pelts produced was worth \$44 million CAD. The pelt industry is declining, and the CAGR of the venison market is 4% from 2019-2025.
Recommendations and Next Steps in BC	The cost to enter this market is minimal, with the highest costs being building for production, guns or traps for catching and a facility to skin and butcher animals. Due to reduced demand for pelts and challenges around disease when consuming wild animals, this option is less viable than others and FPI does not recommend it be pursued by Indigenous communities at this time.

Mushroom Leather

Product Overview	<p>Mushroom leather is strong, flexible, durable and naturally waterproof, while having the same feel as cowhide leather. This plant-based leather takes two weeks to grow to the size of a standard cowhide, 70-80 times faster than animal leather which requires approximately three years.</p> <p>As 100% of mushroom leather can be used after growing, it has significant sustainability benefits.</p>
Market Value	<p>The global synthetic leather market was valued at USD \$29.2 billion in 2019. The global synthetic leather market is expected to grow at a CAGR of 7.8% from 2020 to 2027. This demand is driven by a more affordable product in comparison to animal hide leathers, rising income levels and economic growth, and an increasing demand for cruelty free products.</p>
Recommendations and Next Steps in BC	<p>Cost of production for this business is low, requiring only mushrooms, food for mushrooms, containers and a greenhouse structure.</p> <p>Technical knowledge is essential as experimentation with different fungi, feedstocks, exposures, patterns and dyes are required to get a desired feel and finish of the product.</p> <p>With community interest and available capacity, this venture could be successful but depends on the growth of mushroom leather in the synthetic leathers market.</p>

Next Steps and Recommendations

Based on this analysis of eight industries, FPI scored each based-on market value and future potential business opportunities for coastal BC's Indigenous communities.

The top four viable industries:

1. Mushroom leather
2. Essential oils
3. Berries and herbs
4. Artisanal Goods

4.2.3 Tannin Extraction from Hemlock Bark

This project was to investigate the extraction of tannins from barks of BC tree species. FPI has been working on bark extraction over the last few years and proposed to focus this study on Western Hemlock which showed high tannin content in previous work. This project aimed to find an extraction protocol that could potentially be used by coastal First Nations communities or other parties interested in extracting tannins from bark at a relatively small scale.

Objectives of this project were to:

- Conduct laboratory testing to compare different methods for the extraction of tannin from western hemlock bark.
- Analyze the extracts and compare the extraction yields and tannin concentrations.
- Report results from previous work on tannin quantification from BC tree species.
- Present a summary of identified potential applications for tannin extracts.

Extractability of Tannin from Tree Species

In past projects, FPI worked with many wood species from Eastern and Western Canada. Extracts from the bark of the species already tested for tannin concentration used an alcohol/water maceration (Table 1). Three species stand out from the rest: western hemlock, western larch and black spruce. These species showed similar tannin concentration and could be potential candidates for tannin extraction.

Common Name	Scientific Name	Tannin concentration in extract (mg TAW/g)*	Tannin extraction efficacy (mg TAE/g of bark extracted)
Western larch	<i>Larix occidentalis</i>	292.1	45.3
Western hemlock	<i>Tsuga heterophylla</i>	246.5	41.2
Black spruce	<i>Picea mariana</i>	221.6	44.3
Lodgepole pine	<i>Pinus contorta</i>	116.3	23.6
Aspen	<i>Populus tremuloides</i>	65.3	11.5
Paper birch	<i>Betula papyrifera</i>	59.6	9.4

* concentration shown in mg tannic acid equivalent per gram

Note: Black spruce bark was collected in Quebec, but we should expect similar concentration in BC trees and in other western spruce species such as Sitka, White, and Engelmann spruce. Paper birch was also collected in Quebec, but concentration should be similar in BC.

When considering application towards skin tanning, many other parameters probably need to be accounted for, such as extract color. It is also possible that some specific tannin could be more desirable than others, or that other compounds found in the bark extract could have positive or negative effects. For example, some bark extracts have shown both antimicrobial activity against pathogens and strong antioxidant activity. Interestingly, the western hemlock extract was also one of the best candidates.

A preliminary trial is currently under way with the Vancouver-based company 7Leagues to investigate the application of bark extracts for fish skin tanning. Three samples of bark and three of extracts (hemlock, pine, and aspen) were sent to 7Leagues in January 2020. Results will give an indication about the suitability of the bark extract for this application.

Tannin extract applications

Application	Details
Leather tanning	Impregnation of animal skin with tannin solutions
Wood adhesives	Tannin based adhesives for particleboard and plywood to replace synthetic adhesives
Beverages	Increase tannin concentrations in wine and beer
Foam	Fireproof and insulation foam
Mining	Separation of germanium from copper ore and fluorite from calcite

Application	Details
Wastewater treatment	Absorption of heavy metals and flocculant agent

It is important to keep in mind that the extract product from bark will not be 100% tannin. The presence of the other compounds could make some application unsuitable. The regulatory constraint might be particularly difficult for food and beverage applications. Moreover, it is believed that the tannin can be used as is for the leather and beverage applications only. The other uses require preparation of a more developed product, involving different chemicals such as urea, formaldehyde, isocyanates, or furfuryl alcohol.

Next Steps and Recommendations

- This study confirmed that tannin extraction methods can be simplified to use basic equipment and water as a solvent and still produce a high-quality extract.
 - Higher water temperatures between 50 and 90°C yielded higher amounts of tannin.
 - Drying through boiling and oven drying was also able to produce a viable powder that would be suited to shipping like the much more expensive spray dryer.
- The tannin extraction methods explored in this project could be used to support the creation of a viable enterprise if the extracts are used to produce higher value products that benefit from differentiation in the marketplace. These could include:
 - Sustainable fish leather production such as that being developed by 7Leagues.
 - Use in the production of wine or beer, or related products such as bitters used for cocktails.
- The production methods explored in this project likely are not viable to displace high volume producers of tannin extract.
- Further studies on the extraction process could examine bark grinding, extraction times in water, filtration methods, and other methods of drying the tannin extract into powder form.

4.3 Indigenous Forestry Program - West Coast

4.3.1 Small-scale Sawmill Expansion, Haida Nation, Haida Gwaii, BC

Haida Gwaii has an active forestry industry, with significant round log production which is shipped off the island for export and production. Some small mills exist within the archipelago, and there is interest in increasing the manufacturing capacity to increase jobs and meet the local needs for lumber, thereby reducing transportation costs. This study looked at the potential benefits of investing in an existing mill to increase its capacity with new equipment and create new jobs. The study found that the investment would allow for equipment at the mill to be upgraded, increasing the capacity of the mill and creating new jobs. It is recommended that an operational plan based on the needs of the community to be developed to maximise the benefits for Haida Gwaii.

Community Priorities

The community of Haida Gwaii is interested in the development of local sawmills that can provide wood products for the local community and employment for the island's residents.

Community Context

Population	Haida Nation has approximately 4,775 registered members. There are two main villages, Skidegate Band Council with 1,669 members and Old Masset Village with 3,086 people.	
Main Economic Drivers	Haida Gwaii's economy is focussed on forestry mainly through logging, tourism focussed on sport fishing, Haida culture and ecological experiences, and public services.	
Urban/Rural/Remote	Haida Gwaii is a remote archipelago of 138 islands located approximately 60 nautical miles off the northern Pacific coast of British Columbia.	
On/Off Grid	Off grid communities powered by diesel electricity generators.	Eligible for funding under the Renewable Energy for Remote Communities Program.
Transportation Infrastructure	<p>There are approximately 140 kms of paved and maintained highways on the island, with forest access roads as well. There is no public transportation on the island.</p> <p>BC Ferries runs the inside passage journey from Port Hardy to Haida Gwaii. Alternatively, there is a ferry operating from Prince Rupert to Skidegate.</p> <p>Pacific Coastal operates flights to Masset and Air Canada flies to Sandspit.</p>	
Existing Agreements	<p>Forestry Agreements</p> <p>Haida Interim Forestry Revenue Sharing Agreement (IFRSA) Amending Agreement 3 — 2019 Haida Interim Revenue Sharing Amending Agreement 2 — 2018 Haida Nation Interim Forest Revenue Sharing Agreement — 2008</p> <p>Reconciliation Agreements</p> <p>Haida Kunst'aa guu - Kunts'aayah Reconciliation Protocol Amending Agreement — 2016 Haida Kunst'aa guu - Kunts'aayah Reconciliation Protocol — 2009</p> <p>Other Agreements</p> <p>Haida Nation Indigenous Atmospheric Benefit Agreement — 2019 Haida Gwaii Strategic Land Use Agreement — 2007</p>	

Socio-economic Benefits

Employment

Number of Jobs Created	Six jobs could be created through the operation and expansion of this sawmill.
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Marketing and Sales Development

Scalability Potential	<p>If sawmill capital were to increase, the addition of new equipment would improve the efficiency of the sawmill. This would allow for increased production manufacturing one inch and two-inch boards from side cut pieces and double thickness pieces.</p> <p>A biomass project with lumber waste has potential to scale-up the mill while decreasing reliance on fossil fuels.</p> <p>A value-added wood product manufacturing business at a separate location could provide further opportunity to scale up manufacturing in Haida Gwaii, providing employment and diversifying local businesses. It is recommended that this business focus on a separate line of products from the current mill to maximise diversification.</p>
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Cultural Considerations

Supports Cultural Values	By harvesting and milling Red Western Cedar, Spruce and Hemlock in a sustainable way that aims to maximise the Lumber Recovery Factor and reduce waste, cultural values are supported.
Promotes Well-being of Community	If pursued as a joint venture, the expansion of the sawmill could create approximately 6 jobs. Job creation in addition to an enhanced capacity to fulfill local lumber requirements for construction of homes and other projects can promote community well-being.
Supports Self-Determination	Determination over Haida forest resources, export potential and scalability to develop other related businesses facilitates self-determination.

Climate Considerations

Significant greenhouse gas emissions reductions would result from increased local production of lumber that meets local needs on Haida Gwaii. This would be due to the decreased emissions associated with transportation of raw logs from Haida Gwaii and the transportation of sawn lumber to Haida Gwaii.

Next Steps and Future Opportunities

The following actions are recommended:

- Sawmill operations remain at one site, with one or more small sawmills operating at that site. This would allow for more efficiency through sharing equipment such as log loaders and skid steers. Having one mill in Old Masset and one mill in Skidegate, for example, would be less efficient than consolidating operations in a single location.
- In order to ensure there are benefits to both Masset and Skidegate, a different value-added wood product manufacturing business could be undertaken at the second sawmill site.
- As capital becomes available, equipment that will allow for improved efficiency for lumber and load handling capacity and improved Lumber Recovery Factor (amount of a log that is transformed into sawn lumber) should be considered.
- The proposed sawmill expansion project and potential shingle operation will produce wood and sawdust waste. The current sawmill produces significant milling residue waste through its operations. As this waste will accumulate at both sites and could be utilised, a biomass study should be conducted to determine the feasibility of a Combined Heat and Power (CHP) plant for Haida Gwaii. Residual fibre could be utilised through a CHP unit, while reducing the Haida Nation's heat and power costs.

4.3.2 Sawmill Feasibility Study, Heiltsuk Nation, Bella Bella, BC

The Heiltsuk Economic Development Corporation (HEDC) developed a business plan which seeks to maximise the benefits of their forest resources. Several opportunities were outlined in this plan. The Heiltsuk were joined by FPI to implement this plan, beginning with a feasibility study of a small sawmill to assess operating options and profitability.

This small-scale sawmill would be built and operated by Heiltsuk Coastal Forest Products (HCFP). The plan with HEDC is to start the sawmill on a Yellow Cedar and Red Cedar cut supplying horizontal, board and baton siding, posts and beams needed locally. Clears and timbers could be sold to supplement sawmill operations. Adding dry kilns and a moulding/planing capacity will be considered after the initial start up, when the sawmill is running at capacity.

A location for the sawmill and an adjacent Dryland Sort has been determined. The feasibility study determined that this HEDC small sawmill will be financially successful if the production benchmarks are met.



Community Priorities

This project addresses many community priorities, including maximising forest utilization and providing local employment for members of the Heiltsuk nation and residents of Bella Bella.

The Heiltsuk nation has expressed this project must be financially successful, contribute to the wellbeing and development of the community, with the potential to address housing needs using locally harvested Yellow and Red Cedar, Spruce, Hemlock and Fir.

Community Context

Population	Approximately 1155 people living on the reservation at Bella Bella, with a total registered population of 2,470 as of January 2020.	
Main Economic Drivers	The Heiltsuk nation is currently involved in fisheries management, forestry, and a local freight company and according to the HEDC are looking to further diversify their economic activities.	
Urban/Rural/Remote	Heiltsuk’s traditional territory spans across the central coast of BC, encompassing 35,553 square kilometers. Bella Bella is a remote town located on Campbell Island, 181 km north of Port Hardy on Vancouver Island.	
On/Off Grid	Off grid community powered by diesel electricity generators.	Eligible for funding under the Renewable Energy for Remote Communities Program.

Transportation Infrastructure	<p>Bella Bella includes an airport that operates direct flights from Vancouver through Pacific Coastal.</p> <p>The territory is accessible by boat, BC Ferries operates the Inside Passage route from Port Hardy. The journey is approximately 7 hours.</p> <p>Roads are paved and well connected from the Ferry terminal to the main part of town.</p>
Existing Agreements	<p>Forestry Agreements</p> <p>Heiltsuk Forest Consultation and Revenue Sharing Agreement - 2017</p> <p>Heiltsuk (Bella Bella) Nation Forestry Agreement - 2004</p> <ul style="list-style-type: none"> ○ Amendment - 2005 ○ Amendment - 2009 <p>Reconciliation Agreements</p> <p>Tuígila Agreement for Implementation of Heiltsuk Title, Rights and Self-government - 2019</p> <p>Haílcístut Tripartite Meeting Protocol Agreement - 2018</p> <p>Amending Agreement of the Haílcístut Framework Agreement for Reconciliation - 2017</p> <p>Coastal First Nations Reconciliation Protocol Amending Agreement (Gitga'at, Haisla [Not a member of Coastal First Nations], Heiltsuk, Kitasoo, Metlakatla, Nuxalk, Wuiknuxv) - 2017</p>

Socio-economic Benefits

Employment

Number of Jobs Created	8-9 through the operation of a dryland sort and 3-4 through sawmill operations.
Community Employment Rates	From the 2016 Census, Bella Bella had a 46% employment rate and a 15% unemployment rate.

Business Development

Revenue	Profits generated by selling 35% of the sawmill production leaves the sawmill with a monthly profit which can be reinvested in the sawmill through training of personnel and equipment including a dry kiln and new mobile equipment as required.
Indigenous Share in Project	Partnerships within this sawmill project are with HEDC and HCFP, both owned by Heiltsuk nation.
Production Cost	<p>The cost of production will be revenue generating assuming the sawmill achieves production goals of 5000 foot board meters (fbm) per shift.</p> <p>The sawmill will cost approximately \$425,000 to construct, the cost of a sawmill will be \$364,133 for a Wood Mizer saw expected to last seven years. This quote includes a twin blade edger valued at \$58,793.</p>
Production Quantity	5,000 FBM per shift
Scalability Potential	<p>The following additions are to be made with adequate funds available:</p> <ul style="list-style-type: none"> • Addition of a Resaw (horizontal) to split doubles/multiples into sawmill products • Long Bed for the WoodMizer4000 saw to provide the ability to create long beams and diversify marketability. • Planer head installation would allow for a surfaced finish for use in log homes. • A dryland sort would provide further local employment and operate on a year-round basis to store sawmill inventory.

Market Size	Bella Bella has a large demand for lumber and timber products, primarily from HEDC capital projects. As this is a remote area on the Central Coast of BC accessible by boat, there are many markets nearby that would benefit from the addition of a local sawmill to reduce transportation costs.
Export Potential	Selling a portion of sawmill production to open market will create steady income and reduce reliance on HEDC.
\$/ODT Input	Conventional bioproduct: \$300-\$800 odt

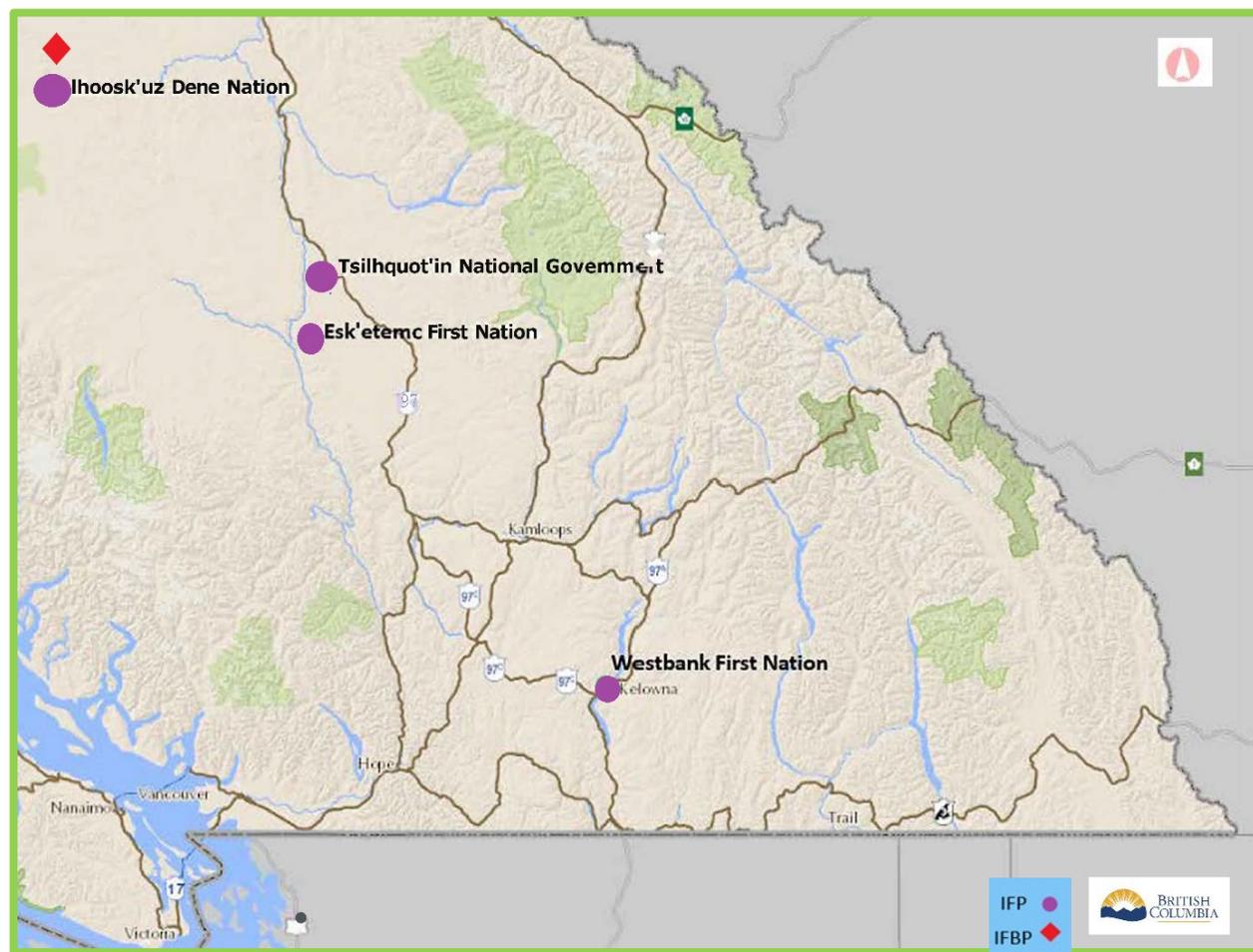
Climate Considerations

- The sawmill will produce 5000fbm of lumber and 13.2m³ of sawmill waste will be generated. Additionally, biomass will be generated through log trimming and pieces of bark. This offers the potential for further development of biomaterials.
- GHG avoidance from reduced transportation associated emissions as local needs can be met with the sawmill.

Next Steps and Future Opportunities

- The HEDC should consider selling a portion of the production on the open market to assure a monthly profit.
- The HEDC should consider a dryland sort, which would employ 8-9 people and handle 180,000m³ of fibre per year.
- Once the sawmill is running at capacity, HEDC and HCFP have strongly considered the addition of dry kilns and a mouldering/planning capacity. This would further expand the potential of the sawmill and contribute to increased opportunities.
- This project offers opportunities to expand use of Heiltsuk nation's forest resources, primarily through utilization of biomass materials generated from the sawmill. With the current and projected conversion factor and biomass produced from the dryland sort from log trimming and bark, ample biomass would be generated.
- The potential for a mill residue bioenergy unit to effectively utilise this residual biomass is explored in 4.1.4. Community ideas and interests should be further developed to reflect their goals within a potential biomass utilisation project.

5. South Projects



5.1 Indigenous Forest Bioeconomy Program - Cariboo

5.1.1 Combined Heat and Power Implementation, Lhoosk'uz Dene, Kluskus, BC

Taking the next steps in implementing bioenergy in the form of a combined heat and power (CHP) system to displace diesel generators in the community of Kluskus, this project included the completion of a Front-End Engineering and Design (FEED) study, a Community Energy Plan, and a training initiative to train members of the Lhoosk'uz Dene to be able to run a CHP unit in their community themselves.

The training initiative took place in Vancouver and trained 11 members of the Lhoosk'uz Dene Nation on how to run and maintain the specific CHP unit that the community plans to purchase. By being contained fully within a re-purposed shipping container, it can be quickly and easily deployed in a community.



Community Priorities

Displacing diesel power generation which is both costly and polluting is the top priority for the community with the overall CHP initiative. However, it is hoped that the collection of the woody material to power the CHP unit can be paired with wildfire mitigation treatments. This project specifically was to move forward with recommendations from previous work completed that did an initial analysis of the viability of using CHP to displace diesel power generation. Training members of the community to be able to run and maintain the unit maximises the positive impacts of the initiative by providing employment to members.

Community Context

Population	This nation has a population of 242 people. Kluskus are a member of the Carrier Chilcotin Tribal Council. 52 members live on the reserve.	
Main Economic Drivers	Natural resource extraction, mainly through mining of gold and silver. Services are limited in this area.	
Urban/Rural/Remote	Remote, located 173 km west of Quesnel.	
On/Off Grid	Off grid community powered by diesel electricity generators.	Not currently eligible for funding under the RERC Program.

Transportation Infrastructure	<p>Kluskus reservation is located approximately 820 km from Vancouver, BC.</p> <p>The closest commercial airport is in Quesnel, 186 km from the community. The closest port is Squamish, located 714 km away.</p>
Existing Agreements	<p>Forestry Agreements</p> <p>Lhoosk'uz Dene Forest Consultation and Revenue Sharing Agreement - 2017</p> <p>Lhoosk'uz Dene Nation Interim Accommodation Agreement - 2006</p> <p>Lhoosk'uz Dene Nation Interim Measures Agreement - 2006</p> <p>Other Agreements</p> <p>Lhoosk'uz Dene / Ulkatcho Economic Development Agreement (Blackwater Mine) - 2020</p> <p>Southern Dakelh Nation Alliance Hubulhsooninats'Uhoot'alh Foundation Framework Agreement - 2018</p>

Socio-economic Benefits

Employment

Number of Jobs Created	It is expected that 2-3 members will be required for the operation and maintenance of the CHP units within the community. More jobs will come from harvesting, transporting, and processing the biomass that will power the system. A total of 11 community members were trained in CHP operation and maintenance as a part of this project.
Community Employment Rates	Due to the small on-reserve population size, employment data is not available from the 2016 census.

Business Development

Revenue	Power generated by the CHP system will supply the community of Klusklus. Previous work has determined that running a CHP system should result in a net cost savings for the community.
Indigenous Share in Project	The CHP system will be owned and operated by the community of Klusklus for their benefit.

Cultural Considerations

Supports Cultural Values	This project does not specifically support cultural values but using renewable biomass as an energy source is in keeping with historical practices.
Promotes Well-being of Community	Providing employment opportunities for community members and reducing fossil fuel dependence promotes the well-being of the community.
Supports Self-Determination	This project supports the community shifting to be self-sustaining using local feedstocks for its heating electrical power generation needs.

Climate Considerations

Burning biomass instead of fossil fuels such as diesel will displace a power generation system with a large carbon footprint with one that is carbon neutral, as the carbon released from burning biomass is re-captured as the trees re-grow. Additionally, if successfully paired with fire treatments, reduction in the severity of wildfire behaviour will also lead to fewer GHG emissions.

Next Steps and Future Opportunities

The Lhoosk'uz Dene plan to move forward with the purchase and installation of the CHP system in Klusklus that community members were trained on in Vancouver in the next project cycle. The community is excited to take this next step in reducing their dependence on diesel and using renewable energy sources. The inclusion of a community energy plan with this initiative will enable the Lhoosk'uz Dene to apply to additional funding sources to support this.

5.2 Indigenous Forestry Program - Cariboo

5.2.1 Train the Trainer, Esk'etemc, Alkali Lake, BC

The Esk'etemc Nation is a major employer for the community, employing 85 of the total 225 Esk'etemc workforce. Several infrastructure projects have been completed for the community with the help of outside contractors working with the local workforce. However, Esk'etemc would like to build internal capacity to be able to deliver its own infrastructure projects. To this end, the Nation partnered with FPIInnovations to deliver a 'Train the Trainer' program so that knowledge can be retained within the community and can be transferred to more members. Zirnhelt Timber Frames completed the training of four community members in the operation and maintenance of the community sawmill and timber framing.

Community Priorities

Increasing employment opportunities for its membership is a priority for the Esk'etemc Nation. To this end the Nation supports educational programs to improve the employability of its members.

Community Context

Esk'etemc is a Secwepmctin speaking group with 19 reserves situated on the Fraser River southwest of Williams Lake. The Esk'etemc offices and most of their people live at Alkali Lake. The community is surrounded by forests that belong to the Esk'etemc community forest (AAC of 70,000 m³), managed by Alkali Resource Management. The timber harvested from the community forest is sold and transported to mills in Williams Lake.

Population	328 (Alkali Lake)	
Main Economic Drivers	Forestry, cattle ranching, construction and small-scale tourism.	
Urban/Rural/Remote	Alkali Lake is a remote community in central BC.	
On/Off Grid	On grid	Not eligible for RERC funding
Transportation Infrastructure	Accessible by road. Community is 52 km from Williams Lake and 517 km from Vancouver.	

Existing Agreements	Forestry Agreements Esk'etemc Forest Consultation and Revenue Sharing Agreement - 2019 Esk'etemc First Nation Forest Tenures Opportunity Agreement - 2011 Esk'etemc First Nation Mountain Pine Beetle Agreement - 2008 Esk'etemc First Nation Mountain Pine Beetle Agreement - 2007 Esk'etemc First Nation Interim Measures Agreement - 2005 Esk'etemc First Nation Forest and/or Range Agreement - 2004 Amendment - 2009
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Socio-economic Benefits

Employment

Number of Jobs Created	Up to 4 local jobs.
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Business Development

Indigenous Share in Project	Alkali Resource Management is 100% owned by Esk'etemc.
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Cultural Considerations

Supports Cultural Values	This project is not explicitly tied to cultural values. However, seeking to maximise the benefits realised by the community with future infrastructure projects is aligned with the community's cultural values.
Promotes Well-being of Community	Employment levels within a community are known to be tied the well-being of both the individual members and the community.
Supports Self-Determination	Expanding local employment opportunities will support Esk'etemc members who wish to live at Alkali Lake to be able to do so well.

Climate Considerations

There is no specific data available to quantify the potential climate benefits of this training initiative. However, fire mitigation activities such as prescribed burning have the potential to decrease the severity of forest fires in the area, which would decrease the amount of carbon released in these events.

Next Steps and Future Opportunities

- Hire the newly trained members to complete timber framing for infrastructure projects in the community and to run the community sawmill.
- Set up training workshops for the newly trained members to pass their skills in timber framing, sawmill operations, and sawmill maintenance on to additional community members.
- Identify top priority skills training that would enable more of the community's needs to be met by community members and implement training programs.

5.2.2 Prescribed Fire Capacity Building, Esk'etemc, Alkali Lake, BC

Following several catastrophic fire seasons, Esk'etemc leadership tasked Alkali Resource Management (100% owned by Esk'etemc) with providing human capacity building in which 20 Esk'etemc be trained to conduct prescribed fires throughout the Cariboo region. To achieve this, an experienced team of Professional Fire Ecologists were hired, and the participants were successfully trained over several days. The participants received a certificate of participation along with a task book to record future training and operational achievements.

Prescribed burning allows vegetation and ladder fuels to be managed to levels that do not contribute to catastrophic stand-destroying fires. When there is less vegetation to provide fuel to fires, and the canopy structure does not facilitate the travel of fires from the ground to tree crowns, fire intensity is decreased. Both scientific and traditional information support that prescribed fire was historically used by indigenous groups in BC, particularly where the natural fire regime consisted of small, low intensity, frequent fires such as in the Cariboo or Southern Interior areas of the province. This land management technique has also been used to promote the growth of food providing species such as berries and maintain grazing opportunities for larger mammals.

Community Priorities

Following intense summer wildfire seasons, wildfire mitigation and control are top community priorities. It is recognized that wildfire mitigation activities are crucial to securing the lives and communities of Indigenous people throughout the province. Increasing the capacity to use traditional land management practices including prescribed burning are of great interest to Esk'etemc as a means of achieving this.

Community Context

See [5.2.1](#) for this information.

Socio-economic Benefits

Employment

Number of Jobs Created	Up to 20 potential local jobs.
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Business Development

Revenue	Specific revenue has not been quantified, but there is potential for contract work throughout the Cariboo for Alkali Resource Management for prescribed burn projects as a result of this training.
Indigenous Share in Project	Alkali Resource Management is 100% owned by Esk'etemc.

Cultural Considerations

Supports Cultural Values	Project supports traditional land management practices and use of Traditional Ecological Knowledge and is aligned with the community's interests.
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Promotes Well-being of Community	Decreasing the severity and intensity of the forest fires would benefit the health and wellness of community members by improving air quality, and reducing stress and trauma experienced by community members during catastrophic fire events.
Supports Self-Determination	Supporting capacity building within the community to manage fire risk to the community supports self-determination.

Climate Considerations

The forests surrounding the community of Alkali Lake are naturally a fire-maintained ecosystem and are under threat because of the fuel buildup due to lack of fire. With the prescribed fire the Esk’etemc hope to build up the resilience of the ecosystem and thus be able to rebound from fire events that change the environment. This approach has a strong connection to the traditional values of the Esk’etemc people. Fire mitigation activities such as prescribed burning should decrease the severity of forest fires in the area, and therefore decrease the amount of carbon released in these events.

Next Steps and Future Opportunities

- The Indigenous Forest Bioeconomy Program has supported a total of four projects this year with Esk’etemc, three of which further the objective of supporting fire resiliency.
- Now that there is capacity in the community to deliver prescribed fire it can be incorporated into wildfire risk mitigation treatments.

5.2.3 Photo Guide for Fire Risk Assessment and LiDAR Data Utilization, Esk’etemc, Alkali Lake, BC

This project was to develop tools that can aid fuels technicians in estimating fuel loads in managed forest areas in the Alkali Lake Resource Management area, with special focus given to the wildland-urban interface and surrounding areas. Ocular field assessments were found to be the most useful and efficient method to assess fuel loads. To support these ocular assessments, FPI developed a photo fuel load guide to aid the training of new workers and ensure consistency in the assessment of fuel loads. Use of this tool should assist fuel managers in prioritizing fuel treatment and recognizing stands with a high potential for volatile fire behaviour.

Community Priorities

Reducing and mitigating the threat of catastrophic wildfires impacting the community of Alkali Lake is a top priority for the Esk’etemc leadership. To this end, the Alkali Lake Resource Management fuel managers work closely with forest technicians and community members in planning and conducting forest fuel treatments.

Community Context

See [5.2.1](#) for this information.

Socio-economic Benefits

Employment

Number of Jobs Created	Up to 5 local jobs.
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Business Development

Indigenous Share in Project	Alkali Resource Management is 100% owned by Esk'etemc.
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Cultural Considerations

Supports Cultural Values	By reducing the severity of forest fires to return to their natural patterns, native plant ecosystems that support cultural values can be protected and restored.
Promotes Well-being of Community	Catastrophic forest fires have extremely negative effects on the well-being of the community at Alkali Lake through stress and trauma caused by evacuation, loss of and damage to property, lingering health impacts caused by forest fire smoke, and loss of resources such as foods or medicines. Reducing the severity of fires and the likelihood of their impacting the community therefore promotes community well-being.
Supports Self-Determination	Use of this tool empowers employees of Alkali Resource Management (including Esk'etemc members) to be able to identify the risk within the forest stands surrounding their community. This allows the community and Alkali Resource Management to be able to develop and implement fuel treatment strategies that protect their community themselves.

Climate Considerations

There is no specific data available to quantify the potential climate benefits of this training initiative. However, fire mitigation activities such as prescribed burning have the potential to decrease the severity of forest fires in the area, which would decrease the amount of carbon released in these events.

Next Steps and Future Opportunities

- The Indigenous Forest Bioeconomy Program has supported a total of four projects this year with Esk'etemc, three of which further the objective of supporting fire resiliency.
- The photo fuel guide will be used by the employees of Alkali Lake Resource Management to assess the wildfire risk of forest stands adjacent to the community and incorporate this information into their community wildfire planning.
- Knowing which stands have the highest risk allows them to be prioritised for treatment.

5.2.4 The Forest Will Burn Awareness Video, Lhoosk’uz, Esk’etemc, Kwadacha, BC

Wildfire behaviour is increasing in intensity across BC as a result of climate change, forest disturbances such as the mountain pine beetle outbreak, and previous fire management regimes that have led to a build up of fuel on the land base. Many Indigenous communities in BC exist within the wild-land urban interface including the communities of Kluskus, Alkali Lake, and Fort Ware home to the Lhoosk’uz, Esk’etemc, and Kwadacha. There is a need to spread awareness about the specific danger being faced by communities at this interface, as well as how it can be mitigated through fuel assessments and treatment. There is also an opportunity to use the forest biomass generated by the fuel reduction initiatives to power biomass energy units that replace diesel generators.

Community Priorities

Protecting the local community from catastrophic forest fire events are a priority for the Kwadacha, Lhoosk’uz, and Esk’etemc. Raising awareness both within their communities and across the province are one of the primary objectives for this awareness video.

Esk’etemc Community Context

See [5.2.1](#) for this information.

Lhoosk’uz Community Context

See [5.1.1](#) for this information.

Kwadacha Community Context

Population	Kwadacha First Nation has 332 registered members, with a population of 560.	
Main Economic Drivers	Forestry, mining, oil and gas have been influential in Fort Ware. The Nation is interested in diversifying their economy by increasing timber harvesting, tourism through guiding and trapping, and through agricultural development in greenhouses.	
Urban/Rural/Remote	Remote	
On/Off Grid	Off grid powered by diesel generators.	Eligible for funding under the RERC Fraser Basin funds.
Transportation Infrastructure	Kwadacha Territory, also known as Fort Ware, is located north of Fort St. John, 23 hours from Victoria.	

Existing Agreements

Forestry Agreements

[Kwadacha Nation Forest Consultation and Revenue Sharing Agreement](#) - 2017
[Kwadacha Nation, Tsay Keh Dene First Nation, & McLeod Lake Indian Band Forest Tenure Opportunity Agreement](#) - 2012

Other Agreements

[Kaska Dena Council Strategic Engagement Agreement \(Daylu Dena Council, Dease River FN, Kwadacha FN\)](#) - 2018
[Kwadacha Nation Final Agreement \(BC Hydro\)](#) - 2008
[Interim](#) - 2006
[Amendment](#) - 2008

Socio-economic Benefits

Cultural Considerations

Supports Cultural Values	By reducing the severity of forest fires to return to their natural patterns, native plant ecosystems that support cultural values can be protected and restored. Mitigating the risk of catastrophic wildfires can also protect important cultural sites.
Promotes Well-Being of Community	Decreasing the severity and intensity of the forest fires would benefit the health and wellness of community members by improving air quality, and reducing stress and trauma experienced by community members during catastrophic fire events.
Supports Self-Determination	This film serves as an awareness tool for Indigenous communities. By raising awareness within communities and providing examples of risk reduction strategies that could protect them this project supports self-determination.

Climate Considerations

This project does not have any direct effect on GHG emissions. However, as its focus is increasing awareness about the danger posed to remote indigenous communities by wildfire, it is hoped that it will support other indigenous communities to mitigate that risk. If successfully mitigated, then there should be a decrease in catastrophic wildfire behaviour which would result in a reduction of GHG emissions.

Next Steps and Future Opportunities

- The Forests will Burn video will be shared with Nations across BC to raise awareness about the different fuel management tools available to them for dealing with the threat to their communities from wildfire.
- What happens after film viewings will depend on the individual community depending on their needs, fire risk, and practicable options.
- Esk'etemc has this year completed three different wildfire mitigation projects, and some of the next steps for that community will be driven by those projects.

5.2.5 Chipping Trial, Lhoosk'uz Dene, Kluskus, BC

The small community of Kluskus is powered by two 2018 diesel generators, with capacities of 140 kW and 75 kW. The Lhoosk'uz Dene First Nation would like to switch to biomass electricity and heat generation.

In 2018, a technical and economic analysis was conducted with FPI for a suitable biomass combined heat and power (CHP) unit for the community. This feasibility analysis suggested that a 40 kW Volter CHP unit would meet the community's electricity needs. Recommendations included ensuring a proper wood chip quality to the Finnish Volter CHP unit.

FPIInnovations investigated claims that a Finnish disk chipper could produce appropriate wood chips for use in the CHP unit. This trial was run in various comparative scenarios using different biomass input sources.

Community Priorities

The Lhoosk'uz Dene First Nation has expressed the goal of switching from diesel generated power to a biomass-based electricity and heat source, such as a CHP unit.

Community Context

See [5.1.1](#) for this information.

Employment

Number of Jobs Created	1-2; dependant upon the selected chipper and scale of production.
Community Employment Rates	Due to the small on-reserve population size, employment data is not available from the 2016 census.

To ensure maximum efficiency and operation of the Volter CHP unit, the following wood chip quality specifications must be met:

Fuel	Wood chips from forest, plantation or similar
Fuel Moisture	<18%, optimum moisture content is <15%
Fuel Particle Size	<3, -15 mm <5%

Feedstocks Used

- Mixed size (small and large) Douglas-fir slabs (sawmilling residuals)
- Small size Douglas-fir slabs (sawmilling residuals)
- Large size Douglas-fir slabs (sawmilling residuals)
- Softwood stem tops (logging residuals)
- Poplar logs
- Poplar branches

Chippers Used

Chipper Unit	Price (CAD)	Tested Productivity Range
Heizohack 6-300VM self driven chipper with screen	\$100,000	1.4m ³ /h (small size slabs) -6m ³ /h (sawmilling tops)
Pezzolato PTO drum chipper with screen	\$325,000	5.5m ³ /h (poplar branches) -11.6m ³ /h (poplar logs)
Yunkkari JH250 PTO disk chipper without screen	\$25,000	1.8m ³ /h (poplar branches) -3.9m ³ /h (poplar logs)

Next Steps and Future Opportunities

- This trial determined that if chippers are regularly maintained, all tested chippers can produce wood chips that meet the specifications of the recommended Volter CHP unit.
- The Yunkkari chipper is appropriate for the energy needs of Kluskus when considering cost and productivity, however will require the added expense of purchasing a tractor.
- If Kluskus requires a self-driven chipper, the Heizohack is the most appropriate option when considering price and productivity.
- The Pezzolato chipper will produce much a higher volume of wood chips, however will cost much more than the Yunkkari chipper. A detailed business case is necessary to determine the viability of an industrial level investment.

5.2.6 Value-added Cant Mill Project, T̓silhqot̓'in National Government, Cariboo Region

The T̓silhqot̓'in National Government (TNG) owns a sawmill facility that operational for a short period of time at Hanceville. The sawmill facility itself has not been operational since 2012, but the facility has been used as a log yard/marshalling area since 2012.

The project entailed looking at several options that the community could pursue to re-start the mill and ensure that it would be a viable business venture.

Community Priorities

The TNG is seeking a better understanding of what would be required to have the mill fully operational again, to both provide opportunities for local employment and become financially profitable to support other ventures.

Community Context

The TNG is an association of autonomous bands including T̓sideldel First Nation, Tl'etinqox Government, ?Esdilagh First Nation Government, Xeni Gwet'in First Nations Government, Yunešit'in Government, and Tl'esqox First Nation.

Population	TNG 3,747 (697 T̓sideldel, 1,597 Tl'etinqox, 206 ?Esdilagh, 433 Xeni Gwet'in, 470 Yunešit'in, and 344 Tl'esqox)
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Main Economic Drivers	Forestry has been the main economic driver for the area while other activities include ranching and mining exploration. Current economic activities underway within communities include greenhouse food production, fencing, forest harvesting, silviculture, wildfire fighting, small sawmill.	
Urban/Rural/Remote	Rural; the communities represented by the TNG are located within a 200 km vicinity of Williams Lake, BC.	
On/Off Grid	Xeni Gwet'in First Nations Government are currently off the grid communities. Yunešit'in is on the grid but also has solar power for the school. Anaham is on the grid.	Xeni Gwet'in First Nation is eligible for RERC funding.
Transportation Infrastructure	Accessible by road; all five communities are within 200 km of Williams Lake, BC and 750 km of Vancouver, BC.	
Existing Agreements	<p>Completed Agreements</p> <p>Gwets'en Nilt'i Pathways Agreement - August 2019</p> <p>Nengay Deni Accord Letter of Commitment - Signed Oct. 31, 2017</p> <p>Nengay Deni Accord (The People's Accord) - Feb. 11, 2016</p> <p>Other Agreements</p> <p>Tsilhqot'in Moose Co-Management Agreement - 2018</p> <p>Tsilhqot'in Collaborative Emergency Management Agreement - A tripartite agreement between Canada, BC and the TNG committing all three governments to work together to identify best practices and build the capacity of the TNG communities in emergency management - 2018</p> <p>Tsilhqot'in Strategic Engagement Agreement - An agreement for shared decision-making Respecting Land and Resource Management (2017 - 2020 Agreement Renewal) - March 31, 2017; extended to March 31st, 2021</p> <p>Tsilhqot'in Nation Letter of Intent - Sept. 24, 2015</p> <p>Tsilhqot'in Nation Letter of Understanding - Sept. 10, 2014</p> <p>Update - April 2, 2015</p>	

Socio-economic Benefits

Employment

Number of Jobs Created	10 potential local jobs.
Community Employment Rates	According to the 2016 census, TNG has a 31% employment rate and a 35% unemployment rate.

Cultural Considerations

Supports Cultural Values	By enhancing overall stewardship of the lands this project supports cultural values. These are also further supported through the creation of work that is a 'closer to home model' where individuals do not have to travel or move away from their community – this allows members to be part of the community and participates in cultural activities such as hunting, fishing, medicine gathering in their traditional territory and access to local leadership and Elders.
Promotes Well-being of Community	Providing employment opportunities helps support community well-being and enhances social well being in all aspects.

Supports Self-Determination	Providing employment opportunities helps support self-determination of community members and the Nation as a whole.
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Climate Considerations

If the TNG can use local fibre at its mill in Hanceville to produce lumber in local projects, the reduced transportation emissions would reduce GHG emissions. Additionally, high end lumber is recommended as the product for this mill, and is a long-lived wood product that stores sequestered carbon in the built environment.

Next Steps and Future Opportunities

This study found that:

- It is possible to operate the mill economically if it focuses on high grade logs and lumber cuts to keep margins high.
- By either finding customers for the generated biomass or by producing bioproducts from the waste materials the mill could become profitable.
- Operating a small-scale cant mill was not found to be profitable.
- The only scenario where the mil was found to be profitable was one that focused on the production of higher-grade cuts including clear lumber, timbers, as well as lower grade fencing panels and rough side lumber. This scenario was projected to employ 5 people for 200 days/year.

Next steps:

- The TNG has decided against pursuing a re-start of the mill in Hanceville, but will incorporate the learnings from this project into its operations at a different mill within one of its communities.

5.3 Indigenous Forestry Program - Okanagan

5.3.1 Ntityix Resources Sawmill, Westbank First Nation, Kelowna, BC

Ntityix Development Corporation (NDC) is exploring the development of a small sawmill and retail operation. NDC is owned and guided by Westbank First Nation, managing forestry, construction, retail, real estate and professional services. This opportunity offers the Nation a development opportunity with a new market demand to fulfill local lumber and timber needs. This project was a feasibility assessment that focused on ways for this sawmill to better utilize NDC’s log supply.

Community Priorities

The community has priorities to create job opportunities, diversify their economy and maximise the use of its forest resource.

Westbank Community Context

Population	As of February 2020, there are 891 registered members of the Westbank First Nation, with 430 living among its five reservations.
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Main Economic Drivers	A range of activities due to the proximity to Kelowna, industry comprises of agriculture and forestry. Construction of residential units and retail projects has occupied a large part of the economic activity over the past decade.
Urban/Rural/Remote	Urban
On/Off Grid	On grid
Transportation Infrastructure	Westbank First Nation is a 4-hour drive from Vancouver, BC and a five-minute drive to Kelowna, BC. Kelowna also has an international airport.
Existing Agreements	Forestry Agreements Westbank Forest Consultation and Revenue Sharing Agreement - 2017 Westbank First Nation Mountain Pine Beetle Agreement - 2011 (PDF) Westbank First Nation Forest Tenure Opportunity Agreement - 2011 (PDF, 6.2MB) Westbank First Nation Interim Measures Agreement (extension) - 2005 (PDF) Westbank First Nation Okanagan Mountain Park Fire Salvage Agreement - 2003 (PDF) Westbank First Nation Self Government Agreement – 2004

Socio-economic Benefits

Employment

Number of Jobs Created	3 potential operational jobs, increasing to 5 as capital and production increases.
Community Employment Rates	From the 2016 census, Westbank has a 54% employment rate and an 8% unemployment rate.

Business Development

Indigenous Share in Project	Ntityix Resources is an Indigenous run operation of the Westbank First Nation and would contract regarding building, operation and sales of the sawmill.
Scalability Potential	<p>There is potential success in operating retail sales out of the sawmill which would expand the local market.</p> <p>The addition of a dry kiln and moulder/planing capacity could be added after the sawmill establishes itself and capital is available for addition.</p>
Market Size	Products are targeted to the local Kelowna and broader British Columbian market.

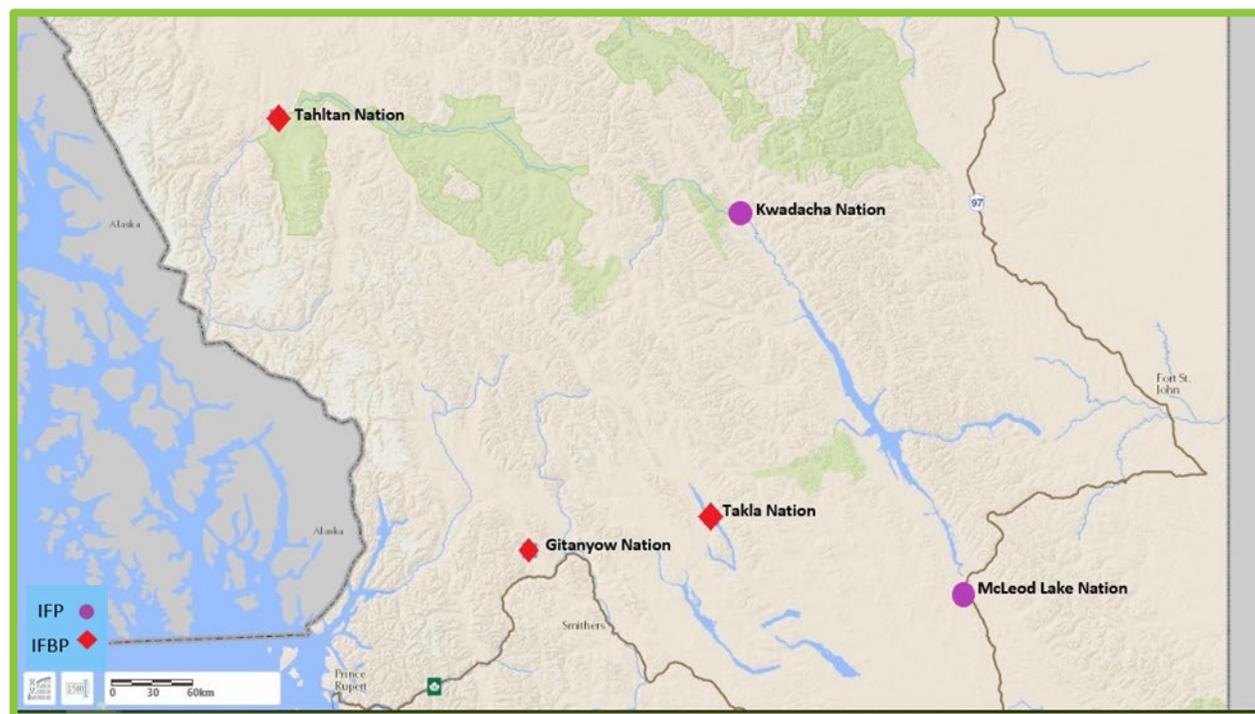
Climate Considerations

With a surplus of biomass from sawmill operations, a decreased amount of rainfall and a higher annual temperature in the Kelowna region, Ntityix will need to assess its plan to deal with excess wood. Piling this sawmill waste may act as additional fire fuel, which would have negative impacts during forest fire season. With an effective plan to deal with biomass, this challenge could quickly become an opportunity for better use of Westbank’s forest resources and job growth.

Next Steps and Future Opportunities

- To effectively manage the sawmill waste and maximise fibre utilisation, a biomass project is recommended to be considered.
- A biomass project would address the problem of excess lumber and waste, while further diversifying the mill, offering increased job opportunities and community development.
- There is potential to use this residual waste in a pellet plant.
- A retail opportunity could be a viable way of reaching the local market.
- Applying for start-up grants is recommended to offset costs and reduce the risk of the sawmill project as it grows in capacity and increases its capital.
- Ntityix Resources should consider a partner that has local knowledge and a sawmill experience to assist in facility construction.

6. North Projects



6.1 Indigenous Forest Bioeconomy Program – Skeena

6.1.1 Mushroom NTFP Company Business Plan, Gitanyow, BC

The Gitanyow Nation has requested to redevelop a business plan to produce high-quality Non-Timber Forest Products (NTFP) from the Gitanyow Lax'yip territory.

Non-Timber Forest Products (NTFPs) are forest resources harvested for human use or consumption, other than those used for lumber, pulp and paper. These include plant-based products, mushrooms, wild game meat, honey from forest-based bees, essential oils and other products. A growing market value and demand for natural products has contributed to a growth of small NTFP businesses.

Gitanyow Nation was interested in identifying viable NTFP business opportunities in the growth and harvest of pine mushrooms and other NTFPs. The Gitanyow Nation Food company (GNF Food Co.) is a Gitanyow owned business which will purchase NTFPs harvested by community members, process them and sell the resulting products. These will be packaged and sold to consumers, retailers, restaurants, manufacturers and suppliers or through wholesale exports.

Community Priorities

The community's goals include expanding value-added activities to make a better use of the forest resource, to benefit the local community and reflect Indigenous cultural values and self-determination within this project. The vision of the GNF Food Co. is to revitalise Gitanyow land-based economies to increase the Nation's self determination and wellbeing.

Community Context

Population	857 registered members, with approximately half living on the reservation.	
Main Economic Drivers	Forestry, with expansion occurring in tourism, resource extraction, silviculture and restoration, NTFP's and cultural education.	
Urban/Rural/Remote	Remote	
On/Off Grid	On grid, single phase power	Not eligible for RERC funding
Transportation Infrastructure	Accessible by road. Gitanyow is 505 km from Campbell River, BC and is 1,281 km from Vancouver, BC.	
Existing Agreements	<p>Reconciliation Agreements Gitanyow Recognition & Reconciliation Agreement - 2016</p> <p>Forestry Agreements Gitanyow Forest Consultation and Revenue Sharing Agreement - 2016 Gitanyow Hereditary Chiefs Forestry Agreement - 2006</p>	

Socio-economic Benefits

Number of Jobs Created	Potential for 3 full time and up to 20 part time jobs including one general manager, one harvest manager, one harvest manager assistant and a range of part time, seasonal contractors to pick, clean and package products.
Community Employment Context	Gitanyow has a 28% employment rate and a 49% unemployment rate.

Business Development

Indigenous Share in Project	This business is owned and operated by the Gitanyow First Nation.
Production Quantity	Average daily production of materials varies based on the product, seasonal availability and abundance of harvest.
Scalability Potential	As capital becomes increasingly available to reinvest in the company, training of community members and an increased purchasing capacity of harvested NTFPs will be possible.
Market Value	<p>The NTFP industry represents over a billion dollars annually in Canada.</p> <p>The mushroom market in British Columbia is worth approximately \$10-42 million per year.</p>
Market Size	<p>Approximately 300 NTFPs are produced by approximately 200 small business enterprises in Canada. These include the maple syrup industry, blueberries, Christmas trees and other various products.</p> <p>The market continues to grow, as upper-middle income people are choosing higher quality, ethically and sustainably produced, nutrient rich foods. This niche market is showing an increasing demand globally.</p> <p>Currently, a few competitors are present in the region but with product differentiation, risks including economic conditions, forest management and climate change are reduced.</p>

Cultural Considerations

Supports Cultural Values	NTFPs have long provided food, medicine, tools, and clothing to Gitanyow and are a significant cultural and spiritual component of Indigenous values.
Promotes Well-being of Community	NTFPs have an increasing economic potential to create small business, community employment and overall wellbeing.
Supports Self-Determination	Sustainable, culturally aligned NTFPs can honor traditional values, support inter-generational transfer of knowledge, and increase self-determination over a First Nations resources and economic activities.

Climate Considerations

This report considers the impact of temperature and precipitation increases to seasonal harvest availability of NTFPs. Looking at projected changes, it was determined that climate change will not pose a significant risk to the availability of target species.

Species shifts may occur given these projected changes, which may require a flexibility in the target species and NTFPs sold by GFN Food Co.



Next Steps and Future Opportunities

The short-term goal of GFN Food Co. is to operate an NTFP buying station, purchase a limited range of locally produced NTFPs in volume, grade and pack each product, and sell them to a major NTFP food company. Over the next 3-5 years, goals include developing a product line and markets while building skillsets and community capacity.

The long-term goals of the GFN Food Co. include being a well-known supplier of quality non-timber forest food products, utilising a majority of NTFP foods in the territory, and marketing under their signature brand. Their vision is to generate sustainable economic activity in the community and produce profits for the Nation.

GFN Food Co. could increase the percentage of value in NTFPs produced within the community. By shifting the percentage of sorting, handling and processing revenue back to the community, there would be an increase in employment, specialized training and profitability of the business.

Following the delivery and review of this report by the Gitanyow economic development staff, Chief and Council, and community, the following key steps would be required to move the process forward:

- Hiring a business consultant to assist with accessing required capital and line-of-credit resources, conducting business formation and access initial markets.
- Accessing external funding to cover initial start up costs.
- Completing human resources, capacity and skills development assessments.
- Working with Gitanyow community and leadership to design and develop culturally appropriate NTFP regulations within the Gitanyow Lax'yip.
- Beginning location design, purchases and building physical infrastructure for Year 1 production.
- Completing staff and community member capacity development and training, preparatory to the initial production season.

6.1.2 Biomass CHP Study, Tahltan Nation, Telegraph Creek, BC

This project was a technical and economic study for implementing a forest biomass-powered combined heat and power (CHP) solution. Current and future energy needs (heat and power) of the community were assessed, as well as the amount and quality of biomass available for this application during a site visit to Telegraph Creek. A scan of currently available CHP technologies was then completed to identify what would be technically appropriate and commercially available for the community. Using this information, three CHP options and appropriate biomass fuel supply chain were identified and recommended to the community.

The options recommended were the use of 40 kW CHP units, installed in either sets of two, four, or six. No scenario would fully remove the use of diesel generators as these are needed to provide backup and peak load capacity such as during the winter months. However, the use of the diesel generators would be greatly reduced. The feasibility of the recommended CHP options was analyzed including a sensitivity/scenario analysis around key parameters (e.g. total capacity, capital and operational costs, biomass fuel costs). This initial analysis found that all proposed CHP options were financially viable, with the lowest energy costs coming from the installation of six CHP units, but the lowest installation costs coming from the installation of two CHP units.



Community Priorities

The Tahltan Band Council approached the Government of BC and FPI to undertake a technical and economic study for a technically appropriate, economically feasible, and commercially available biomass CHP solution in the Telegraph Creek community. It is hoped that the CHP solution will replace diesel generated electricity in the community and the associated pollution, reduce greenhouse gas (GHG) emissions, provide permanent local employment in forestry and green energy, and reduce the fire risk surrounding the community.

Community Context

Population	~ 390	
Main Economic Drivers	Mining, forestry and fishing. Tahltan Nation Development Corporation is the business arm of the Tahltan Nation and supports local resource development. They have a heavy construction division with a large fleet of heavy equipment, and a camp services division.	
Urban/Rural/Remote	Telegraph Creek; remote community in NW of BC	
On/Off Grid	Off grid community powered by four diesel electricity generators.	Eligible for funding under the RERC Program.
Transportation Infrastructure	Accessible by road (final 112 km are gravel), air and water. Community is 969 km from Prince George and 1,743 km from Vancouver.	
Existing Agreements	<p>Reconciliation Agreements</p> <p>Klappan Plan - 2019</p> <p>Klappan Plan Decision-Making and Management Board Terms of Reference - 2017</p> <p>Tahltan Central Government Shared Decision-making Agreement - 2013</p> <p>Other Agreements</p> <p>Government-to-Government and Northwest Transmission Line Negotiation Framework Agreement (Between Tahltan Central Council, BC Hydro and BC Government) - 2011</p>	

Socio-economic Benefits

Employment

Number of Jobs Created	15 potential local jobs.
Community Employment Context	Tahltan has an estimated 20% unemployment rate on reserve in Telegraph Creek. It should be noted that most of those who are not working have personal circumstances that prevent their full participation in the workforce, such as those studying at college or university, Elders, handicapped, and single mothers. Tahltan is very proud to have achieved a near 100% employment rate for their people.

Business Development

Revenue	\$275,000 to \$1,100,000 in annual cost savings (2 generators without heat savings to 6 generators with heat savings)
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Indigenous Share in Project	Up to 100%
Production Cost	\$0.21/kWh to \$0.52/kWh (diesel is \$0.96/kWh)
Production Quantity	630 MWh to 1,470 MWh
Scalability Potential	Can scale from 2 generators up to 6 (with or without heat savings)
\$/ODT Input	\$500-870 savings/ODT input

Cultural Considerations

Supports Cultural Values	Renewable biomass-based energy sources are in line with historic cultural practices.
Promotes Well-being of Community	If the sourcing of the biomass used to power the CHP generators is paired with fuel treatments, the reduction in risk to the community from catastrophic wildfire would promote community welfare.
Supports Self-Determination	This project supports the community shifting to be self-sustaining for most of its electricity needs.

Climate Considerations

Scenarios	Scenario 1 2 CHP Units	Scenario 2 4 CHP Units	Scenario 3 6 CHP Units
Diesel substituted with biomass (liters)	252,288	448,512	588,672
Propane substituted with biomass (liters)	121,760	216,463	588,672
GHG emission savings from diesel substitution (tonnes)	704	1,215	1,642
GHG emission savings from propane substitution (tonnes)	188	333	438
Total GHG emission savings (tonnes)	891	1,585	2,080

Next Steps and Future Opportunities

- All three scenarios (two, four, or six 40 kW CHP units) appear viable next to current energy costs in the community.
- If Tahltan wished to pursue CHP, the recommended next step would be to complete a detailed engineering study to provide more specific costs for site preparation, interconnecting, permitting, etc.
 - It is recommended that personnel be sent to Vancouver in 2020/21 for training when a CHP unit will be operating there if the community wishes to move forward with the CHP project.
- Some of the greatest identified risks to the success of this project are potential roadblocks from BCHydro who the sole power provider to the community is currently.

- It will be critical to ensure that BCHydro is a partner in this project from the beginning. Presently, BCHydro is aware of this study and is willing to participate in refining its scope toward its implementation.
- Looking at options to add heat customers, such as a greenhouse or mechanical shop would further reduce the cost of producing electricity with the CHP units.
- Another viable add-on to for this project could be to integrate a mechanized firewood operation which may be able to produce firewood for the community below current local market price.
- At this time Tahltan wishes to put the project on hold but may be interested in implementing next steps in the future. The feasibility study positions them well for this.

6.2 Indigenous Forest Bioeconomy Program - Omineca

6.2.1 SIP Panel, Business Case, Takla Nation, Takla Landing/Prince George, BC

The Sasuchan Development Corporation (SDC) is the economic development arm of the Takla Nation. FPIInnovations (FPI) conducted a feasibility study to examine the viability of building a structural insulated panel (SIP) manufacturing facility in Prince George. This plant could create employment and training for Takla Nation Members and provide ready to assemble panels for energy efficient cabin and home construction.

This study determined that the capital investment for a SIP manufacturing facility is too high to be profitable at this stage. If SDC starts with cabin manufacturing, crews can be established prior to more advanced engineered wood product production. At this point, SDC could market cabin sales outside of the Takla Nation’s territory. An increased production volume would allow SDC the capacity to consider buying bulk panels and cutting them to size. As skillset and production volume increases, SIP panels can be considered for profitable manufacturing.

Community Priorities

The goals of the SDC include creating economic wealth, sustainable employment and business opportunities for the Takla Nation while operating in a way that protects the land, the people and the culture.

The goals of this project include addressing housing needs for the Takla Nation and constructing homes which meet and exceed 2030 building codes. These homes will be energy neutral, producing as much energy as they consume.

Community Context

Population	845	
Main Economic Drivers	Forestry, tourism, outdoor recreation (Takla Landing); forestry, industry, services (Prince George)	
Urban/Rural/Remote	Remote population at Takla Landing; significant urban population living in Prince George	
On/Off Grid	On grid	Not eligible for Remote Energy for Rural Community (RERC) funding.

Transportation Infrastructure	Accessible by road, partially gravel forest service road. Community is 355 km from Prince George and 1,131 km from Vancouver.
Existing Agreements	<p>Forestry Agreements</p> <p>Carrier Sekani Interim Forestry Revenue Sharing Agreement – 2017</p> <p>Takla Nation Forest Consultation and Revenue Sharing Agreement - 2015</p> <p>Takla Nation Interim Agreement on Forest & Range Opportunities - 2009 (PDF, 1.5MB)</p> <p>Takla Nation Interim Agreement on Forest & Range Opportunities - 2007 (PDF)</p> <p>Takla Nation Interim Agreement on Forest & Range Opportunities - 2006 (PDF)</p> <p>Reconciliation Agreements</p> <p>Carrier Sekani Pathway Forward 2.0 Agreement - 2020</p> <p>Carrier Sekani Whubats’ut’en Nus Whetee (Interim Pathway Forward) Agreement - 2017</p> <p>Other Agreements</p> <p>Carrier Sekani Tribal Council Environmental and Socio-Cultural Agreement - 2015</p> <p>Carrier Sekani Tribal Council Collaboration Agreement - 2015</p>

Socio-economic benefits

Employment

Number of Jobs Created	Potential for 5 regular full-time employees in addition to part time drafting, purchasing, bookkeeping and sales employees.
Community Employment Context	Takla Nation has a 27% employment rate and a 43% unemployment rate.

Business Development

Revenue	Until sales volumes can increase to 500,000 square feet of SIPs per year, the costs of equipment, rental space and labour are not profitable. At sales volumes exceeding 500,000 square feet per year, the total expenses would be \$2,981,650 and the net income will be \$3,018,350, leading to a small profit of \$36,700.
Indigenous Share in Project	Sasuchan Development Corp. is 100% owned by the Takla Nation and operates for profit at an arm’s length from the Nation.
Production Cost	<ul style="list-style-type: none"> At the higher end, the cost of a SIP manufacturer equipment is estimated at \$750,000 and at the lower end, an estimated cost of \$300,000. The plant would require two forklifts, various small tools, storage and moving equipment costing an estimated \$250,000. Certification costs are approximately \$250,000. Labour costs are an estimated \$330,000 per year at maximum capacity. Initial training costs is \$30,000 which will allow for safe equipment operation and proper construction. Total material cost to construct SIPs using oriented strand boards and expanded polystyrene are \$3.03/square foot. Rental costs for a 10,000 square foot manufacturing facility will be \$60,000/year, plus utilities will be \$75,000 per year.
Production Quantity	A small automated plant can produce about 500 square feet of product per hour, or 1 million square feet of SIP per year.
Scalability Potential	As production volume can increase over time, SDC can move towards manufacturing their own SIPs.

Market Value	A 563 square foot Energy Positive Cabin is being assessed for its market value. Bulk panels are currently valued at \$6 to \$7 per square foot. Finished panels are estimated at \$10 to \$12 per square foot. Market value varies based on the type of outer material, the type and thickness of insulating foam.
Market Size	This study conducted a market scan and determined there are twelve competitors in the British Columbia, Alberta, Saskatchewan and Washington State regions.
Export Potential	These cabins will meet local and nearby community housing needs, with the potential to export SIP panels once SDC reaches this level of business development.

Cultural Considerations

Supports Cultural Values	This business will operate in a sustainable way that protects Takla land, people and culture.
Promotes Well-being of Community	This business venture will create five full time jobs and several part time jobs, with the potential for growth as production increases.
Supports Self-Determination	The construction of net-zero, culturally relevant cabins will meet community housing needs while creating jobs.

Climate Considerations

These cabins are intended to be net-zero buildings, which are energy neutral by producing as much energy as is consumed. This is achieved with well designed insulation, such as with SIP panels, which reduce energy loss that normally occurs through studs. A reduction of air leakage also contributes to a net-zero house. A typical home experiences a 40% loss of heat due to air leakage, while SIP houses achieve much lower values. Energy creation also contributes to net zero building. By heating these cabins with wood stoves, the main source will be non-carbon generating. Small solar panels and batteries will power LED light fixtures.

Next Steps and Future Opportunities

- Given the initial low anticipated volume of production, the manufacturing costs of \$15 to \$30 per square foot cannot be justified, despite job creation for the community.
- This study determined the most viable business option is to purchase premade, finished SIP panels. The SDC could train the Nation in building the foundation, installation and finishing of the cabins. As capacity increases to 150,000 to 200,000 square feet of panel per year, SIP Panel manufacturing may be more profitable.
- Other potential business models may include buying unfinished panels and adding value by cutting doors, windows and panels to size for cabin construction This reduces costs for equipment manufacturing and certification.
- The next steps for the Takla nation include selecting a SIP manufacturer that offers training on product construction and has a competitive pricing model. The Takla nation can then begin building quality, airtight cabins and houses to increase construction capacity for a SIP manufacturing facility in the future.

6.3 Indigenous Forestry Program - Omineca

6.3.1 Operational Diagnostic and Benchmark Testing, McLeod Lake Indian Band, McLeod Lake, BC

Duz Cho Logging Ltd. (DCLL) is 100% owned by the McLeod Lake Indian Band and was created over 20 years ago to create employment opportunities for Band members. For this project, a standard evaluation of DCLL's logging operations was done to assess efficiency and viability. DCLL has contracts with the lumber mills in Mackenzie, BC to deliver saw logs and pulp logs. These mills include Canfor, Conifex, Mackenzie Pulp, East Fraser Fiber, and the McLeod Lake Indian Band's own sawmill.

Community Priorities

It is becoming increasingly difficult to generate a profit from logging in the interior, and DCLL management feel that they are not operating at an optimum level. The priority for the community with this assessment is to ensure that DCLL remains a viable operation and continues to provide employment for the community.

Community Context

Population	560	
Main Economic Drivers	Logging, mining, milling, and construction.	
Urban/Rural/Remote	McLeod Lake; remote community in NE of BC	
On/Off Grid	On grid	Not eligible for RERC funding.
Transportation Infrastructure	Accessible by road. Community is 138 km from Prince George and 920 km from Vancouver.	
Existing Agreements	<p>Completed Agreements McLeod Lake Indian Band Treaty No. 8 Adhesion and Settlement Agreement Act - 2000</p> <p>Forestry Agreements McLeod Lake Indian Band Economic Development Agreement - 2010</p> <p>Other Agreements McLeod Lake Government to Government Agreement - 2017 McLeod Lake Site C Tripartite Land Agreement - 2017 McLeod Lake Economic and Community Development Agreement - 2010</p>	



Socio-economic Benefits

Employment

Impact on Local Jobs	25 jobs will be maintained.
Community Employment Context	McLeod Lake First Nation has a 78% employment rate and a 16% unemployment rate.

Business Development

Specific figures for further business development were not included in the scope of work for this project. It is not expected that this project will result in significant growth of DCLL as the review focused on ensuring current operating levels can be sustained into the future.

Cultural Considerations

Supports Cultural Values	Beyond providing employment for members of the McLeod Lake Indian Band within their traditional territory this project is not directly tied to cultural values.
Promotes Well-being of Community	This project will support the maintenance of 25 full time jobs, with the potential for growth as production increases.

Supports Self-Determination

DCLL is owned and operated by the McLeod Lake Indian Band. By having their own forest harvesting company, the McLeod Lake Indian Band is better able to directly benefit from forest harvesting within their traditional territory. Maintaining this skill force enables them also to be more directly involved in forest management decision making.

Climate Considerations

Improving the efficiency of machine and harvest operations will decrease the amount of GHG emissions associated with each cubic metre of wood harvested.

Next Steps and Future Opportunities

Key recommendations from this assessment include:

- Clarifying the roles and responsibilities of individual employees.
- Holding a weekly managers' meeting.
- Measuring machine/operator productivity to be better able to manage staff and equipment resources.
- Implementing more regular quality control checks.
- Installing and using fuel meters.
- Carefully considering which clients are worth working for.

If these recommendations are implemented than the long-term viability of DCLL should be improved and it should be able to continue to provide quality employment for community members for years to come.