BDO Zone Rating: 'A'

Bioeconomy Development Opportunity Zone Risk Rating

The Trois-Rivières, QC Bioeconomy Development Opportunity Zone is rated 'A'. There are significant quantities of pulpwood and forest residue available from public forests with a likely supply guarantee. A robust forest industry can provide a reliable supply chain.

'A'

Rating Parameters:

Category	Rated Quantity	Delivered Cost	BDO Zone Size
Forest Residues	115,000 dmt/yr	$135-$155/dmt	150 km driving distance from Trois-Rivières
Pulpwood	110,000 dmt/yr	$125-$140/dmt	
Sawmill Residuals	250,000 dmt/yr	$40-$160/dmt	

BDO Zone Assets

- **475,000 dmt/yr of woody biomass available at low-risk**
- **Strong forestry and wood industry sectors with a long history of performance**
- **Access to a large number of potential suppliers, including sawmills and logging contractors**
- **Despite the potential to process a significant amount of roundwood, sawmills within the Zone are currently utilizing only 68% of the available volume**

BDO Zone Liabilities

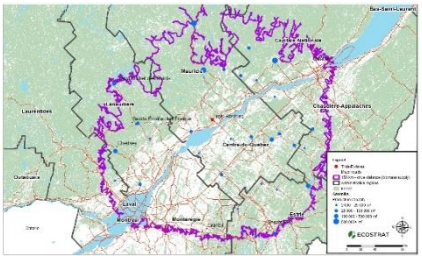
- **The significant distance from the proponent to the feedstock suppliers poses a high risk**
- **Forest Residues supply chains are not developed and require capital investment to scale up**
- **Ownership of logging equipment poses risk due to increased cost of equipment and an aging logging workforce**
- **Delivered costs for Sawmill Residuals could increase by 10-15% if there is a new large entrant that utilizes only this feedstock**

BDO Zone Risk Rating

The Trois-Rivières, Qc Bioeconomy Development Opportunity Zone is rated 'A', or *very high quality*.

Risk Rating Grades are defined as follows: AAA (*highest quality*), AA (*very high quality*), A (*high quality*), BBB (*good quality*).

Trois-Rivières, QC BDO Zone



Scoring and Ratings Methodology

In assessing the biomass supply chain risk for the Bioeconomy Development Opportunity (BDO) Zone in Trois-Rivières, Quebec (QC), 73 Risk Indicators from the Canadian Standards for Biomass Supply Chain Risk (BSCR) were applied. These BDO Zone Risk Indicators are the subset of BSCR Risk Indicators applicable to gauging feedstock risk within a BDO Zone.

Feedstock quantity is expressed in dry metric tons per year (dmt/yr). While feedstock cost is expressed in Canadian (CAN) dollars, delivered to Trois-Rivières. Maximum transport distance is based on a 150 km driving distance from this municipality.

The BDO Zone rating is based on an aggregation of the scores assigned to each BDO Zone Risk Indicator (RI) assessed in this report. First, each BDO Zone Risk Indicator is given a **Raw RI** score based on the research and analysis conducted on the feedstock supply chain in the region. Raw RI Scores are scaled between 1 (*low risk*) and 10 (*high risk*).

Next, each Risk Indicator is discounted, or "notched", based on the degree to which the uncertainty drivers are deemed addressable, and whether there is a reasonable expectation that mitigation measures could be put into place within the price parameters for this rating.

The **Notched Salience score** corresponds to the likelihood of each Risk Indicator's described risk materializing given the implementation of reasonable mitigation measures. To arrive at the Notched Salience score, Raw RI scores are reduced based on the efficacy of the likely mitigation measures. If applicable, notching occurs at one of 3 levels: 25%, 50%, or 75%.

Finally, the potential impact of each Risk Indicator on the supply chain is assessed and scored on a 10-point **Impact Level** scale, as either *low (3.33), moderate (6.66), or high (9.99).* Impact level scores are based on assumptions that key measures were implemented to mitigate uncertainty drivers in the BDO Zone but failed to do so.

The **Loaded RI** score for each Risk Indicator is then calculated as the product of Notched Salience and Impact Level scores. For example, if the Risk Indicator 'Competitor Price and Price Sensitivity' is scored at a Raw Score of 4, a Notched Salience of 2, and the Impact Level is high (i.e., 9.99). The final Loaded RI score for this risk indicator is $2 \times 9.99 = 19.98$ (out of 100).

Loaded RI scores of 33.33 or less are deemed *low risk*; scores greater than 33.33 and less than 66.66 are deemed *moderate risk*; and those that score 66.66 to 100 are deemed *high risk*.

The total risk rating for the BDO Zone is the average of all Loaded RI scores. The BDO Zone score for Trois-Rivières, QC is ***16.49 out of 100, resulting in an 'A' designation.*** All scoring and rationale for each Risk Indicator is provided in Appendix A.

Analyst Notes

The forestry and wood processing industry sectors in the Trois-Rivières BDO Zone is one of the major industries within the region. The majority of timberlands (71%) in the Zone are privately owned, the rest (29%) owned by the government and known as "Crown lands".

Substantial quantities of unutilized woody biomass feedstock were identified within 150 km driving distance from Trois-Rivières, the municipality identified as the center point of the Zone. A **total of 475,000 dmt/yr of available woody biomass feedstock was identified**; 250,000 dmt/yr from Sawmill Residuals (wood chips, sawdust/shavings, and bark), 115,000 dmt/yr from Forest Residues, and 110,000 dmt/yr from Pulpwood.

In terms of suppliers, 34 sawmills were identified within the Zone, as well as numerous logging companies and harvesting contractors. Sawmills are estimated to generate 750,000 dmt/yr of Sawmill Residuals, with 250,000 dmt/yr currently available. However, if a new entrant exclusively relies on this feedstock, it could significantly disrupt the market equilibrium.

In 2021, only 68% of the entire available volume of roundwood was processed. The projected consumption of roundwood from these sawmills is 2,045,000 m^3/yr of softwood and 490,000 m^3/yr of hardwood. Logging operations have decreased in recent years due to increased harvesting costs and sawmill closures. Overall, the forest industry in the Zone remains well-developed, with some scaling up required should the demand for Pulpwood and Forest Residues rise in the coming years.

Forest Residues are a by-product of timber harvesting operations. Based on conservative industry standards, we estimate that 115,000 dmt/yr of Forest Residues is available in the Trois-Rivières BDO Zone.

We identified 43 facilities located within a 200 km driving distance of Trois-Rivières that utilize woody biomass, primarily pulp and paper mills, cogeneration, pellet mills, and panelboard mills. As the estimates provided in this report take into account available quantities after current consumption, the existence of a well-developed market for woody biomass is a positive indicator.

In the province of Quebec, the Forest Ministry performs an annual allowable cut (AAC) calculation. The AAC is a quantitative estimation that helps to establish sustainable forest management standards and monitor their implementation over time so that the quantity of wood harvested in the forest never exceeds the quantity of wood generated by the forest over a five-year period.

The Trois-Rivières BDO Zone affects 10 administrative regions in Quebec: Lanaudière, Laurentides, Mauricie, Capitales-Nationale, Chaudières-Appalaches, Centre-du-Québec, Montérégie, Laval, Montréal and Estrie. The AAC of Crown lands located within the Zone is estimated at 426,500 m^3/yr of softwood and 307,500 m^3/yr of hardwood for the period 2018-2023. For the period 2023-2028, the estimated AAC of Crown lands located within the Zone is consistent for softwood at 426,500 m^3/yr, with a small 3% decrease for hardwood, at 301,500 m^3/yr.

As for any other forestlands that are not public, such as private forests, the AAC is significantly higher than the

annual harvested volume. Therefore, these non-public forests located within the Zone represent significant sources of feedstock.

The technically available volume of forest residuals in private forests is determined based on the allowable annual cut (AAC) of roundwood, which undergoes multiple reduction factors. As stated in Appendix C, our analysis indicates that approximately 16.5% of the total quantity of forest residues associated with the AAC of roundwood could potentially be available for recovery by the bioenergy sector. It is important to note that these estimations are subject to variations based on factors such as availability, market conditions, and technological advancements. Also, the conservation movement is becoming increasingly popular with private landowners, which limits active forest management and therefore woody biomass availability.

The delivered price for Sawmill Residuals within the BDO Zone ranges from $40 to $160 per dmt; chips average $160, sawdust/shavings $105 and bark $40. The delivered price for Pulpwood ranges from $125 to $140 per dmt depending on the region where pulpwood is sourced. Forest Residues is estimated to have a delivered pricing ranges between $135 to $155 per dmt depending on the distance it is recovered from the facility.

Over the past decade, from 2013 to 2023, prices of sawmill residuals have remained mostly stable, helping pulp and paper mills recover from the forest crisis that occurred between 2008 and 2010, as well as from the market decline for pulp and paper products. However, in 2023, prices suddenly soared due to several factors, including a higher demand for Sawmills Residuals in the bioenergy sector, a new large pulp and paper mill in the North of Quebec, and less feedstock availability resulting from reduced harvesting operations. These factors created a lower offer/demand ratio, leading to the sharp increase in prices.

Salient Risk Indicators

We identified ownership of logging equipment as one of the most salient risk indicators. The logging industry in the region has historically been dominated by small, family-owned firms that have traditionally owned their logging equipment. However, the cost of new logging equipment has been steadily increasing over the years, creating financial challenges for these small firms to make new purchases. Adding to these difficulties is the fact that the logging workforce is aging, and younger generations show limited interest in the logging business. Consequently, many small logging operations are opting to cease operations rather than invest in expensive new equipment.

Also, risks related to demand for competitors' products are considered significant. We anticipate an increase in the demand for Forest Residuals and Pulpwood by new mills in the bioenergy sector. The potential development of new renewable fuels industries, such as Sustainable Aviation Fuel, Renewable Diesel, Renewable Hydrogen, and Bio Energy with Carbon Capture and Storage (BECCS), may also put pressure of woody biomass availability. These markets are being propelled by climate change-related policies and have the potential to consume significant amounts of woody biomass if developed within the BDO Zone.

The BDO Zone contains 71% privately owned forestlands, which poses a higher risk for obtaining roundwood and forest residue compared to public forests. This is due to two reasons: Firstly, the Quebec government guarantees roundwood volumes for public forests, and secondly, private forests are often managed for recreational and conservation purposes instead of timber production.

Technical Contacts

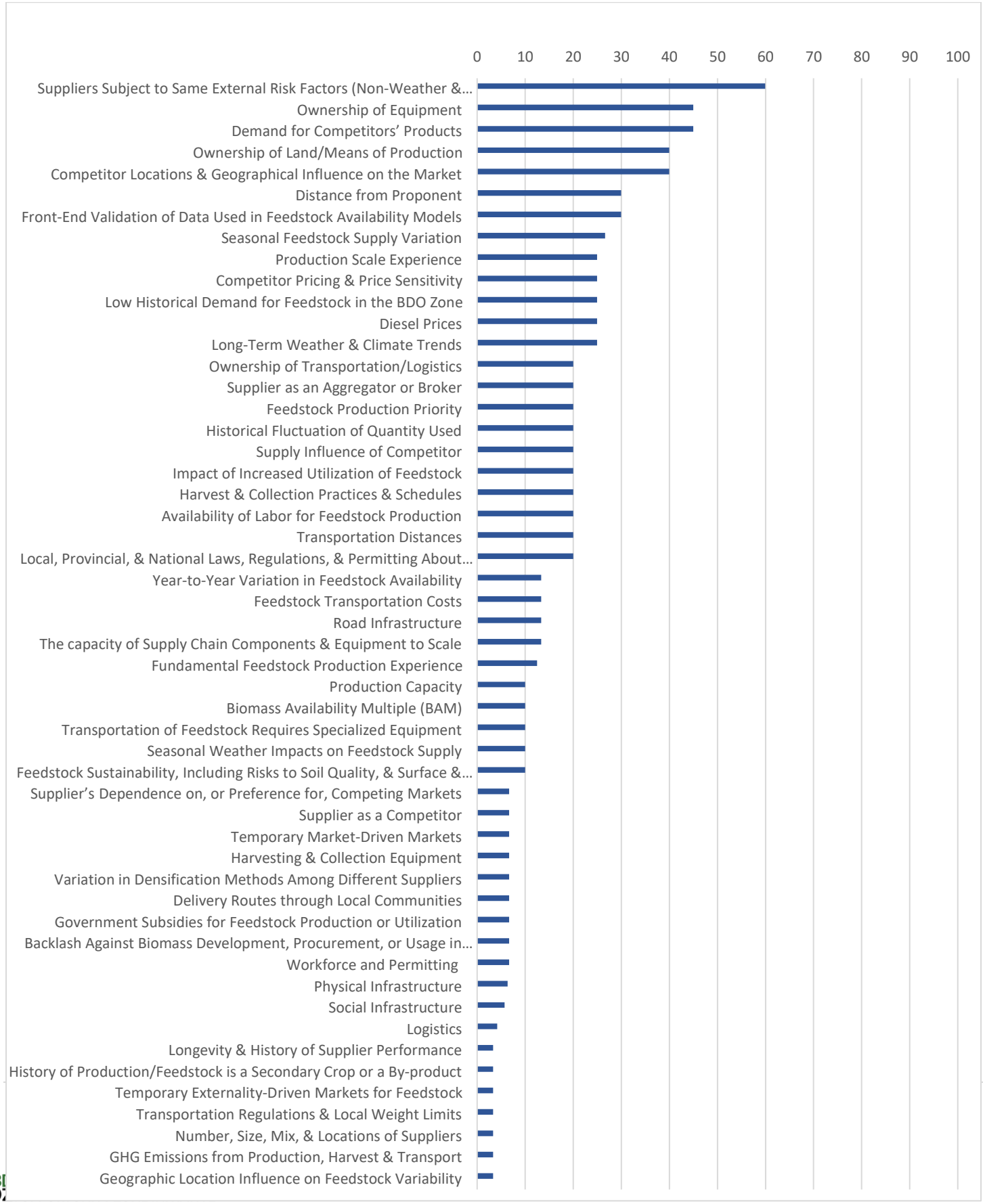
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BDO Zone Rating: **'A'**



	Feedstock Supply Chain Risk Indicators	Raw RI Score	Notched Salience	Impact Level	Loaded RI Score
	Category 1: Supplier Risk				
1.1	Longevity & History of Supplier Performance	1	1.0	3.33	3.33
1.2	Production Capacity	1	1.0	9.99	9.99
1.3	Supplier's Dependence on, or Preference for, Competing Markets	2	2.0	3.33	6.66
1.4	Supplier as a Competitor	2	2.0	3.33	6.66
1.5	Ownership of Land / Means of Production	6	6.0	6.66	39.96
1.6	Ownership of Equipment	9	6.8	6.66	44.96
1.7	Ownership of Transportation/Logistics	2	2.0	9.99	19.98
1.8	Supplier as an Aggregator or Broker	6	3.0	6.66	19.98
1.9	Feedstock as a Secondary Transformation	6	3.0	9.99	29.97
1.10	Fundamental Feedstock Production Experience	5	1.3	9.99	12.49
1.11	Production Scale Experience	5	2.5	9.99	24.98
1.12	Feedstock Production Priority	4	2.0	9.99	19.98
	Category 2: Competitor Risk				
2.1	Competitor Locations and Geographical Influence on the Market	4	4.0	9.99	39.96
2.2	Historical Fluctuation on Quantity Used	6	6.0	3.33	19.98
2.3	Competitor Pricing and Price Sensitivity	5	2.5	9.99	24.98
2.4	Supply Influence of Competitor	6	3.0	6.66	19.98
2.5	Temporary Market-Driven Markets	2	2.0	3.33	6.66
2.6	Demand for Competitors' Products	6	4.5	9.99	44.96
	Category 3: Supply Chain Risk				
3.1	Biomass Availability Multiple (BAM)	1	1.0	9.99	9.99
3.2	Impact of Increased Utilization of Feedstock	2	2.0	9.99	19.98
3.3	Seasonal Feedstock Supply Variation	8	4.0	6.66	26.64
3.4	Year-to-Year Variation in Feedstock Availability	4	2.0	6.66	13.32
3.6	Front-End Validation of Data used in Feedstock Availability Models	3	3.0	9.99	29.97
3.7	Low Historical Demand for Feedstock in the BDO Zone	5	2.5	9.99	24.98
3.8	History of Production/Feedstock in a New/Secondary Crop or a By-Product	1	1.0	3.33	3.33
3.9	Diesel Prices	5	3.8	6.66	24.98
	Harvest & Collection Practices & Schedules	6	3.0	6.66	19.98
3.10	Harvesting and Collection Equipment	2	2.0	3.33	6.66
3.11	Temporary Externality-Driven Markets for Feedstock	1	1.0	3.33	3.33
3.12	Variation in Densification among Different Suppliers	2	2.0	3.33	6.66
3.13	Availability of Labour for Feedstock Production	6	3.0	6.66	19.98
3.14	Feedstock Transportation Costs	4	4.0	3.33	13.32
3.15	Transportation Distances	3	3.0	6.66	19.98
3.16	Transportation of Feedstock Requires Specialized Equipment	3	3.0	3.33	9.99
3.17	Delivery through Local Communities	2	2.0	3.33	6.66
3.18	Transportation Regulations & Local Weight Limits	1	1.0	3.33	3.33
3.19	Road Infrastructure	2	2.0	6.66	13.32
3.20	Number, Size, Mix, and Locations of Suppliers	1	1.0	3.33	3.33
3.21	Suppliers Subject to Same External Risk Factors	8	6.0	9.99	59.94
3.22	Seasonal Weather Impacts on Feedstock Supply	3	1.5	6.66	9.99
3.23	Long-Term Weather and Climate Trends	5	2.5	9.99	24.98
3.24	Government Subsidies for Feedstock Production or Utilization	2	2.0	3.33	6.66
3.25	Local, Provincial, and National Laws, Regulations, and Permitting pertaining to Biomass	4	2.0	9.99	19.98
3.26	Backlash against Biomass Development, Procurement or Usage in the Region	2	2.0	3.33	6.66
3.27	Feedstock Sustainability, including risks to soil quality and surface and groundwaters.	1	1.0	9.99	9.99
3.28	GHG Emissions from Production, Harvest and Transport	1	1.0	3.33	3.33
3.29	Geographic Location Influence on Feedstock Variability	1	1.0	3.33	3.33
3.30	Capacity of Supply Chain Components and Equipment to Scale	4	2.0	6.66	13.32
	Category 4: Infrastructure				
4.1	Physical Infrastructure	1.9	1.9	3.33	6.33
4.2	Logistics	1.25	1.3	3.33	4.16
4.3	Social Infrastructure	1.71	1.7	3.33	5.69
4.4	Workforce and Permitting	2	2.0	3.33	6.66
				Average	**16.46**


BIOECONOMY DEVELOPMENT OPPORTUNITY ZONE PROGRAM
CERTIFIED 'A'

APPENDIX A: RISK INDICATOR SCORING METRICS

CATEGORY 1: SUPPLIER RISK

1.1. Longevity & History of Supplier Performance

Rationale: Number of years in business is a positive indicator of future solvency. Historical performance is an indicator of future performance.	
Raw RI Score: The majority of sawmills in the BDO Zone have been operating for over 15 years. Furthermore, there has been a slight increase in Sawmill Residuals production from these mills since 2017, which further strengthens their positive track record in terms of historical performance. Moreover, the region itself has a notable history of strong forestry performance. The Trois-Rivières BDO Zone extends across ten administrative regions in Quebec, encompassing privately and publicly owned lands. The majority of forest lands in the Zone, accounting for 71% of the area, are privately owned, while the remaining 29% are publicly owned Crown lands. The private forests are primarily located in the southern part of the Zone, in close proximity to major municipalities, the road network, and the St. Lawrence River. These forests have a rich heritage of harvesting operations dating back to the 19th century, when they were extensively managed to meet the demand for timber in urban construction projects. Crown lands in Quebec are divided into management units to improve the efficiency of forest management. The Trois-Rivières BDO Zone affects six different management units (031-71, 034-51, 035-71, 041-51, 051-51 and 062-71), and the majority of Crown lands in the Zone are located in the northern part, at least 75 km from Trois-Rivières. Some of the Crown lands in the Zone are situated on the south side of the St. Lawrence River. These lands have also been managed by the forest industry dating back to the 19th century. Today, only a fraction of private forests in the Zone are managed for timber production. The rest are primarily utilized for maple syrup production, hunting, conservation easement, or recreational-tourist activities. On the other hand, Crown lands within the Zone are still managed for timber production by various companies. The Mauricie region is the most affected by the Zone, ranking 2nd out of 13 regions in terms of importance to the forest industry. The Lanaudière region ranks 10th while the Capitale-Nationale and Chaudière-Appalaches region comes in at 11th and 12th places, respectively. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment. De-risking measures are not necessary for risk indicators with Raw RI Scores of 1, as they are already the lowest risk.	**Score 1.0**
Impact Level: RI Impact level is deemed *low*.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

1.2. Production Capacity

Rationale: Supplier production capacity can be a strong indicator of long-term credit worthiness and future solvency. Higher production capacities denote strength of operational elements, including cash flows, which are important to future solvency.

Raw RI Score: **Score 1**

Sawmill Residuals: Within the Trois-Rivières BDO Zone, there are 34 sawmills processing 2,045,000 m^3/yr of softwood and 490,000 m^3/yr of hardwood. However, projected consumption rates are only 68% and 67% for softwood and hardwood, respectively, with only 7 large sawmills consuming over 100,000 m^3/yr located within the Zone.

Larger sawmills exhibit greater resilience to fluctuations in the lumber market compared to smaller sawmills due to their integration with pulp and paper mills or other secondary wood product industries. This integration allows them to diversify their revenue streams. Additionally, larger sawmills typically oversee and carry out harvesting operations, which allows them to recover Forest Residues or harvest Pulpwood when there is a market demand for these products. In our classification, we consider a sawmill to be large when its projected consumption exceeds 100,000 m^3 per year. Within the Supply basin, there are 7 large sawmills that account for nearly 80% of the total sawlog consumption among the 34 sawmills in the area.

Presently, the sawmills generate approximately 750,000 dry metric tons per year (dmt/yr) of Sawmill Residuals. A new operator could potentially access approximately 250,000 dmt/yr of Sawmill Residuals, assuming a 50% capture rate and a BAM ratio of 1.5x, and the following residual types: 170,500 dmt/yr of softwood chips, 55,500 dmt/yr of softwood sawdust/shavings, 70,500 dmt/yr of softwood bark, 43,000 dmt/yr of hardwood chips, 17,000 dmt/yr of hardwood sawdust/shavings, and 18,500 dmt/yr of hardwood bark. This presents a significant opportunity for a new operator to leverage available resources in the Trois-Rivières BDO Zone.

Forest Residues: In the Trois-Rivières BDO Zone, there is an estimated 65,000 dmt/yr of recoverable Forest Residues on Crown lands and 170,000 dmt/yr on private forest lands. However, 89% and 56%, respectively, are located over 100 km driving distance from Trois-Rivières, we applied a BAM ratio of 2x. This is not deemed to be an unacceptable distance for the area.

Pulpwood: The Trois-Rivières BDO Zone has an estimated 17,458 dmt/yr of available pulpwood on Crown lands, including 1,806 dmt/yr of softwood, 3,388 dmt/yr of poplars, and 12,264 dmt/yr of hardwood, with 90% located over 100 km from Trois-Rivières. On private forests, the estimated available pulpwood is 93,930 dmt/yr, including 13,321 dmt/yr of softwood, 10,099 dmt/yr of poplars, and 70,510 dmt/yr of hardwood, with 68% located over 100 km from Trois-Rivières.

Raw RI Score is 1 out of 10.

Notched Salience: No adjustment. **Score 1.0**

Impact Level: RI Impact level is deemed *high*.	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 9.99**

1.3. Suppliers' Dependence on, or Preference for, Competing Markets

Rationale: Suppliers may have a vested interest in or preference for supplying specific competitors for biomass feedstock. Preferences may be due to historical, long-term, or personal relationships, less stringent feedstock quality requirements, more flexible operating hours by competing markets, or suppliers' dependences on competing markets to accept or purchase other products/by-products. Consequently, during periods of feedstock shortage, such suppliers may be more likely to allocate the scarce supply to a competitor, resulting in supply disruptions for the Proponent.	
Raw RI Score: The BDO Zone boasts a substantial number of sawmills that have confirmed the availability of project-ready feedstock. While some sawmills have their residuals under short-term contracts, our research and outreach suggest that suppliers are open to business and willing to negotiate pricing, particularly if a new operator can help optimize their operations and reduce the overall supply cost of roundwood. Additionally, to our knowledge, with the exception of short-term contract arrangements, there are no direct dependencies between sawmills and sawmill residual consumers. In other words, a new bio-project would have equal access to sawmill residuals, given it can outbid the current market pricing and is conveniently located. Raw RI Score is 2.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

1.4. Supplier as a Competitor

Rationale: The risks of feedstock costs going up and availability going down increase if a supplier is also a competitor to the Proponent. In times of feedstock shortage, the risk that supply commitments will not be met increases.	
Raw RI Score: **Sawmills Residuals:** Many sawmills in the Trois-Rivières BDO Zone utilize a portion of their Sawmill Residuals, mainly bark, for their internal operations. However, a significantly larger portion of these residuals remains underutilized and could be available for sale. One large sawmill is expected to use all of its residuals for pellet production in the near future. However, we do not expect other sawmills to follow and develop pellet mills. That is because,	**Score 2**

generally, the sawmilling industry lacks investment funds and technical know-how to develop facilities producing non-traditional forest products, such as wood pellets.

Forest Residues and Pulpwood: In the Trois-Rivières BDO Zone, suppliers typically do not compete for Forest Residues and Pulpwood. However, a large pulp and paper mill identified as one of the 43 competitors harvests significant quantities of Pulpwood within the Zone, representing the biggest risk to new operators in securing available Pulpwood. As for Forest Residues, demand is low, and very little is currently being collected, but there is a potential new player that could change this situation fast, resulting in problems securing this feedstock.

Raw RI Score is 2 out of 10.

Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

1.5. Ownership of Land/Means of Production

Rationale: Suppliers that own land where feedstock is produced, or a production facility, tend to have better control of supply chains and present lower degrees of supply risk.	
Raw RI Score: 71% of the forest in the BDO Zone is under private ownership. Procuring roundwood and Forest Residue from private lands in Quebec is associated with higher risk than procuring roundwood from public forests. Firstly, in case of public forests, the Quebec government guarantees roundwood volumes. Secondly, private forests are not always managed for timber production but rather for recreational and conservation purposes. In fact, the conservation movement in Quebec has increased in importance in recent years, and larger number of individuals buy woodlots for recreational purposes.	**Score 6**

Raw RI Score is 6 out of 10.

Notched Salience: No adjustment.	**Score 6.0**
Impact Level: RI Impact level is moderate.	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 39.96**

1.6. Ownership of Equipment

Rationale: In most cases, suppliers that own or lease equipment for harvest, collection, and processing feedstock are lower risk than those who do not. For example, third-party harvesting equipment may not be available when required. Short harvest windows may be missed if a farmer and contractor cannot schedule harvest times that are convenient and quantity shortages can result.	
Raw RI Score: The logging industry in the region has historically been dominated by small, family-owned firms that have traditionally owned their logging equipment. However, the cost of new logging equipment has been steadily increasing over the years, creating financial challenges for these small firms to make new purchases. Adding to these difficulties is the fact that the logging workforce is aging, and younger generations show limited interest in the logging business. Consequently, many small logging operations are opting to cease operations rather than invest in expensive new equipment. Raw RI Score is 9 out of 10.	**Score 9**
Notched Salience: A new bio-project can mitigate the risks related to the lack of logging equipment in the market by purchasing its own equipment. In fact, some sawmills in the region have been choosing this route already. Raw RI is notched down by 25%.	**Score 6.75**
Impact Level: RI Impact level is deemed *medium.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 44.95**

1.7. Ownership of Transportation/Logistics

Rationale: In most cases, suppliers that own or lease equipment necessary to transport biomass from forest or field are lower risk than those who do not. However, in some circumstances, reliance on third parties to transport biomass is a common practice and does not contribute to risk.	
Raw RI Score: Due to the relatively large forest industry, we think there is enough logging trucks and trailers to scale-up deliveries by 110,000 dmt/yr of pulpwood this BDO Zone is rated for. If a significant increase in demand for Forest Residues occurred, the transport infrastructure would have to be significantly scaled up. In light of this report's rated capacity of 115,000 dmt/yr for forest residue, and based on the assumption that each walking floor can transport 13 dmt/load, a total of 8,850 loads are required. Considering an average transportation distance of 100km, which encompasses 2 hours of travel time, as well as an additional 2 hours for loading and unloading, and an estimated 1 hour for potential forest road challenges, each trip requires approximately 5 hours. Therefore, it can be inferred that each walking floor can make an average of 2 trips per day. To accommodate the required number of loads, approximately 15 trailers are needed, factoring in a 48-week operation period accounting for spring break-up. Given the total number of 34 sawmills,	**Score 2**

the additional trailer demand per sawmill is estimated to be 0.5. Therefore, due to the large forest industry presence, the transportation equipment scale-up is not considered a significant risk. Raw RI Score is 2 out of 10.	
Notched Salience: No Adjustment	**Score 2.0**
Impact Level: Data on the actual number of transportation equipment, such as the number of chip vans, were unavailable. Therefore, we relied on anecdotal information, increasing the uncertainty in the Raw RI score. RI Impact level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 29.97.	**Score 19.98**

1.8. Supplier as an Aggregator

Rationale: Aggregators may effectively provide supply chain redundancy, eliminating the risk and complexity of dealing with multiple sources of supply by combining supplies into a single master contact. Aggregators can add much needed stability in BDO Zones by increasing offtake stability for both suppliers and markets. An aggregator can be a more reliable long-term offtake for suppliers by virtue of having multiple markets and can be a more reliable long-term supplier for markets by having access to multiple suppliers. Further, when a single supplier breaches, the aggregator can source from another.	
Raw RI Score: The Trois-Rivières BDO Zone currently lacks biomass aggregators, but some entrepreneurs are recovering Forest Residues to produce chips for small biomass boilers in commercial buildings. The Forest Ministry is conducting a study to determine the optimal locations for Biomass Valorization Centers (BVC) throughout Quebec, which would transform and condition Forest Residues into feedstock that can be used by bio-based plants at a lower cost. It's possible that at least one BVC will be implemented within the Zone in the next five years. While the absence of biomass aggregators suggests a moderate risk associated with feedstock supply, the potential establishment of BVCs could significantly reduce this risk. Raw RI Score is 6 out of 10.	**Score 6**
Notched Salience: The potential establishment of BVCs could significantly reduce this risk. Raw RI is notched down by 50%. Notched Salience is 3.0.	**Score 3.0**
Impact Level: RI Impact level is deemed moderate.	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 19.98.	**Score 19.98**

1.9. Distance from Proponent

Rationale: The greater the distance from a supplier to a plant, the more exposure to weather and fuel cost risks, and the greater the competitive pressure (to breach) that a closer competitor can exert.	
Raw RI Score: The analysis of the feedstock supply curve reveals that a mere 13.5% of the total feedstock is available within a 75 km driving distance from Trois-Rivières (Figure F-1, Appendix F). Although some suppliers have transported bark over distances exceeding 300 km, the relative scarcity of feedstock within a 75 km driving distance exposes the supply chain to increased risks. That being said, the risk is somewhat diminished by the fact that most biomass in the region moves distances above 75 km. Raw RI Score is 6 out of 10.	**Score 6**
Notched Salience: Incentivizing suppliers with higher prices for feedstock can effectively mitigate this risk. Additionally, although likely more costly, a satellite yard aggregating biomass sourced from larger distances, can mitigate this risk as well. Raw RI score is notched down by 50%. Notched Salience is 3.0	**Score 3.0**
Impact Level: The distance between the supplier and the proposed bio-project is a significant variable that can influence the viability of feedstock access. RI Impact level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 29.97.	**Score 29.97**

1.10. Fundamental Feedstock Production Experience

Rationale: Risk is higher when a supplier has limited experience with harvesting/processing and/or collecting biomass. Where experience is lacking, the Proponent should show that steps have been taken to ensure proper training, knowledge dissemination, and monitoring.	
Raw RI Score: In the Trois-Rivières BDO Zone, the supply of Pulpwood and Sawmill Residuals is well-established, as evidenced by the available inventory, annual harvesting rates, and the absorption of these materials by current markets. However, the current supply of Forest Residues is limited, as it is rarely collected and processed. Raw RI Score is 5 out of 10.	**Score 5**
Notched Salience: In the Trois-Rivières BDO Zone, Pulpwood is abundant and less costly than Forest Residues. Therefore, it is likely that a new bio-project will utilize Pulpwood before turning to Forest Residues, allowing the supply chain to gradually scale up as demand for Forest Residues increases. Raw RI is notched down by 75%.	**Score 1.25**
Impact Level: The experience of feedstock production can have a significant influence on projects requiring large quantities of feedstock. Having experienced suppliers and producers in the supply chain can help to ensure a reliable and stable supply of feedstock, while less experienced suppliers may face challenges in meeting the demand for feedstock RI Impact level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 12.48**

1.11 Production Scale Experience

Rationale: Scale-up entails risk. Risk is higher when a supplier has limited experience with the production of the quantity of feedstock required.	
Raw RI Score:	**Score** 5
Sawmill Residuals: Our analysis indicates that the sawmills in the region generate approximately 750,000 dmt/yr of Sawmill Residuals, out of which 250,000 dmt/yr is available for use by a new bio-based project. This feedstock is a by-product of existing sawmill operations, which eliminates any concerns about scale-up risks. Furthermore, the local sawmills have been operating for several decades, indicating significant production-scale experience. These factors make Sawmill Residuals a reliable and feasible feedstock for a new bio-based project. **Forest Residues:** Our analysis reveals that the limited infrastructure for the collection and processing of Forest Residues in the region is due to a lack of significant demand. Despite the Mauricie Region having the largest quantity of Forest Residues available according to data from the Forest Ministry, the limited demand poses a significant scale-up risk for Forest Residues production. **Pulpwood:** Our analysis indicates that the logging infrastructure in the region is robust and healthy, as evidenced by the ongoing success of local sawmilling, pellet, and pulp and paper industries. The high selling price of lumber products in North America during the pandemic has led to significant revenue growth for sawmills, consolidating their operational structure. In addition to the fact that the region has significant experience and expertise in logging, we believe that the risks related to pulpwood harvesting and transport scale-up are low. We found that important quantities of pulpwood, especially from hardwood species, are available on privately-owned forests outside the northern limit of the BDO Zone, but within the Mauricie region. These factors make Pulpwood a promising feedstock for a new bio-based project in the region. Raw RI Score is 4 out of 10.	
Notched Salience: The presence of a few large companies in the area that have the ability to acquire capital and purchase necessary equipment for Forest Residues processing and transportation in the short term reduces the risks associated with Forest Residues production. We anticipate that these large companies will participate in the Forest Residues recovery effort even more if the bio-fuel plant under development in La Tuque officially starts production. Raw RI is notched down 50%. Notched Salience is 2.5.	**Score 2.5**
Impact Level: RI Impact level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 12.49.	**Score 24.98**

1.12. Feedstock Production Priority

Rationale: When biomass feedstock is a secondary or non-core line of business, or when it is a by-product or a residual from a more valuable primary product, then suppliers may not put in sufficient effort for consistent production. Risk of breach increases when production and/or delivery of feedstock compromises a supplier's ability to make a primary product.	
Raw RI Score: Sawmill Residuals are a by-product of lumber and other wood products manufacturing, and as such, their feedstock production priority risk is relatively low. Forest Residues, on the other hand, is currently in low demand in the BDO Zone, resulting in limited infrastructure for its collection, processing, and transportation. While some loggers have expressed interest in producing Forest Residues, others have indicated that they are not interested, likely due to the lower risk associated with the roundwood production business model. As a result, the production priority risk related to Forest Residues is high. Pulpwood, which is an integral part of forest stands in mixed forests, is harvested annually in large quantities within the Zone. Most of the Pulpwood is harvested on Crown lands by sawmills and pulp and paper mills that have a guaranteed supply, while the rest comes from private forests. Our analysis indicates that the technically available quantity of pulpwood is mostly located on Crown lands in sectors, marketed by the Lumber marketing office (BMMB), that have not found buyers. If the demand for Pulpwood increases, we expect that the entirety of pulpwood available within the Zone will be harvested annually. Therefore, we consider the production priority risk associated with Pulpwood harvesting to be relatively low. Raw RI Score is 5 out of 10.	**Score 4**
Notched Salience: In the Trois-Rivières BDO Zone, Pulpwood is less costly than Forest Residues but is comparatively in short supply. It is likely that a new bio-project will utilize Pulpwood before turning to Forest Residues, allowing the supply chain to scale up as demand for Forest Residues increases gradually. Raw RI is notched down by 50%. Notched Salience is 2.5.	**Score 2.0**
Impact Level: RI Impact level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 24.98.	**Score 19.98**

CATEGORY 2: COMPETITOR RISK

2.1. Competitor Locations and Geographical Influence on the Market

Rationale: Competitors' locations relative to a Proponent plant can affect the viability of procuring feedstock and its cost. Accurate and detailed competitor mapping provides an understanding of the geographical influence a competitor may have, including competitive advantages such as short hauling.	
Raw RI Score: Our analysis reveals the presence of 43 competitors for woody biomass feedstock within a 200 km driving distance from Trois-Rivières, forming the "competition zone." These competitors comprise 23 pulp and paper mills, 12 cogeneration and biofuels mills, 7 panelboard mills, and 1 pole producer, consuming approximately 4,115,000 dmt of woody biomass (including Pulpwood, Forest Residues, and Sawmill Residuals) per year, with only a fraction sourced from the BDO Zone. Significant competition exists within a relatively short distance of Trois-Rivieres. A slight reduction in feedstock availability for these competing entities can result in feedstock price pressure within the Zone. However, 24 of these competitors are situated over 100 km away from Trois-Rivières, with limited influence on the BDO Zone, except for one large pulp and paper mill located 126 km away, harvesting substantial quantities of Pulpwood. Furthermore, our analysis considers existing competition, and despite this, we estimate the availability of 475,000 dmt/yr of feedstock for potential projects. Based on our findings, we believe that while there is competition for woody biomass feedstock in the region, it is relatively low in terms of its impact on potential projects within the BDO Zone. Raw RI Score is 4 out of 10.	**Score 4**
Notched Salience: No adjustment.	**Score 4.0**
Impact Level: Our analysis indicates that the present competition for feedstock in the region has a relatively low impact on potential feedstock availability for new bio-projects, based on our thorough review of competitors. However, we recognize that in situations where a few large competitors have a significant impact on the local market for feedstock, the impact on a new bio-project could be substantial. Such a scenario could result in reduced availability of feedstock, higher prices, or both, which could adversely impact the financial viability of a new project. RI Impact level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 19.98.	**Score 39.96**

2.2. Historical Fluctuation of Quantity Used

Rationale: Clear understanding of key competitors' consumption of each type of feedstock utilized by the Proponent is essential to quantifying the risks associated with each competitor. Understanding historical trends of feedstock utilization can provide valuable information about feedstock price elasticity during shortages and insights into events impacting future supply conditions. It can also enable more accurate estimates of the sensitivity of feedstock availability to potential future consumption levels or to the impact of external events (e.g., weather events, structural economic changes, seasonality, or policy change).	
Raw RI Score: **Sawmill Residual:** No historical data on Sawmill Residual consumption exist, introducing risk to the supply chain. **Forest Residues:** Our analysis suggests that Forest Residues has historically seen limited consumption in the BDO Zone, making the lack of historical data on its consumption not a significant risk for potential feedstock sources for bio-projects in the region. **Pulpwood:** Although we do not have historical consumption data at the facility level for Pulpwood, we were able to use historical pulpwood harvest removal data provided by the Forest Ministry for each region to assess the consumption of this feedstock source. We believe that the risk related to historical pulpwood consumption is low, and the stability of the historical pulpwood harvest removal data is a positive factor for potential bio-projects in the region. Raw RI Score is 6 out of 10.	**Score 6**
Notched Salience: No adjustment.	**Score 6.0**
Impact Level: The lack of historical data introduces a high degree of uncertainty. However, this uncertainty has already been accounted for in the Raw RI score. Therefore, we deem the Impact Level low.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 19.98.	**Score 19.98**

2.3. Competitor Pricing and Price Sensitivity

Rationale: Understanding how much competitors pay for different feedstock types is an essential step in determining competitiveness of Proponent. Historical prices paid by competitors provide insight into their procurement behaviors and ability/willingness to pay premiums for feedstock and exert pressure on Proponent's suppliers during times of feedstock shortage. Competitors who are able to offer higher prices for feedstock during feedstock shortages can pose significant risks to Proponent.

Raw RI Score: Our analysis indicates that current delivered pricing for the assessed types of feedstocks within the BDO Zone is approximately $135-$155/dmt for Forest Residues, $125-$140 /dmt for Pulpwood, and $40-$160/dmt for Sawmill Residuals. Our historical pricing analysis has shown that the price for Sawmill Residuals has been relatively stable over the last decade, until the beginning of 2023 when prices suddenly surged. For instance, in 2022, the provincial average price for chips (before delivery costs) was $80, while in 2023, the average price has risen to $135. Similarly, the prices for Pulpwood and Sawmill Residuals have steadily increased over the last two decades. Several studies have been conducted by the Forest Ministry on this subject, and these studies are publicly available online. Raw RI Score is 5 out of 10.	**Score 5**
Notched Salience: Securing supply contracts can significantly mitigate the risk. Raw RI is notched down 50%	**Score 2.5**
Impact Level: There is a high degree of uncertainty related to our understanding of competitors' price sensitivity. RI Impact level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 13.32.	**Score 24.96**

2.4. Supply Influence of Competitor

Rationale: In some cases, competitors may be able to exert high degrees of pressure on local suppliers, effectively enabling them to control feedstock, especially during shortages. This control can derive from long previous relationships between suppliers and competitors, from verbal or "understood" agreements, or from a competitor being able to assist suppliers in times of surplus by maintaining large inventories that enable suppliers to continue supplying when other markets impose quotas. Understanding and planning around such soft risk factors is important. If such relationships exist in the Proponent's procurement area, they may indicate an increased risk of feedstock shortage or pricing changes.	
Raw RI Score: In the past, some pulp and paper mills in Quebec would use an "all-or-nothing" tactic to compel sawmills to provide all of their residuals at a low price. This involved pressuring sawmills to comply or risk losing business altogether. However, this approach was challenged when sawmills formed an association to negotiate residual prices at a provincial level. Nowadays, residual prices among sawmills tend to remain steady thanks to the establishment of "provincial-average" prices negotiated annually between the association and pulp and paper mills. Nonetheless, prices may vary from one region to another depending on demand and market fluctuations. However, an "all-or-nothing" approach is still used by some cogeneration plants, cement factories, and a large panelboard mill in Quebec to obtain feedstock from sorting centers. While the risk associated with this historical tactic is currently low for potential bio-projects in the BDO Zone, it could be reintroduced in response to the entry of a new bio-project in the market. Hence, we consider this approach to be a moderate factor for potential bio-projects in the region. Although	**Score 6**

the future use of this practice is unpredictable, it is essential for potential investors to be aware of the risk and consider strategies to minimize its potential impact. Raw RI Score is 6 out of 10.	
Notched Salience: Negotiating long term supply contracts with suppliers can significantly mitigate the risk. Raw RI is notched down by 50%. Notched Salience is 3.0.	**Notched Score 3**
Impact Level: Risks related to competitors' influence over suppliers are limited to Sawmill Residual, and do not affect Pulpwood and Forest Residues. RI Impact level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 19.98**

2.5. Temporary Market-Driven Markets

Rationale: Alternative, non-traditional, market-driven competitors for feedstock can increase feedstock demand in unusual circumstances.	
Raw RI Score: Our analysis suggests that there are seasonal markets for wood fiber in the BDO Zone, including firewood, densified logs and mulch. While these markets do exist, we believe that they are relatively insignificant in comparison to the overall quantity of feedstock available in the region. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 9.99.	**Score 6.66**

2.6. Demand for Competitors' Products

Rationale: Increased demand for competitor's product can cause greater demand for feedstock by the competitor. For example, greater demand for biofuels due to a clean fuels policy can cause increased biofuel production by the competitor, thereby increasing demand for feedstock.	
Raw RI Score: Based on our analysis, we anticipate significant growth in several markets for woody biomass feedstock in the coming decade, with the wood pellet market being a prime example. We have identified multiple proposed facilities within a 200 km driving distance of Trois-Rivières that plan to consume woody biomass, as outlined in Appendix F. The global demand for wood pellets is expected to increase in the next ten years, particularly in Europe and East Asia. In the last five years, several pellet mills have started operations in Quebec, with most of them exporting their pellets to the European market, which has experienced substantial growth over the last decade. With five pellet mills currently operating in the BDO Zone,	**Score 6**

we expect that the demand for woody biomass from pellet mills will continue to rise, whether through expansion of existing mills or the development of new ones.

Overall, we believe that the growth of the woody biomass feedstock market will significantly impact the competitive landscape in the BDO Zone. The increasing demand for woody biomass feedstock, particularly in the wood pellet market, is expected to drive investment and innovation in the region.

Raw RI Score is 6 out of 10.

Notched Salience: There is a likely window of opportunity for a new bio-project to enter the market before these untested industries fully develop, and potentially threaten the supply chain. Raw RI is notched down by 25%. Notched Salience is 4.5	**Score 4.5**
Impact Level: Once all industries reviewed here mature, the impact in the woody biomass supply chain in the BDO Zone is expected to be significant. RI Impact level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 59.94.	**Score 44.96**

CATEGORY 3: SUPPLY CHAIN RISK

3.1. Biomass Availability Multiple (BAM)

Rationale: Biomass Availability Multiple (BAM) indicates the degree of redundancy in a Proponent's supply chain. BAM is the ratio of biomass feedstock available to a project, at costs, timing, and in quality feasible for the Proponent, divided by the project's feedstock requirements. BAM is a strong indicator of supply chain resilience when stressed by supply shortage and/or supplier breach.	
Raw RI Score: Based on the available information, the Trois-Rivières BDO Zone's sawmills produce a significant amount of softwood and hardwood lumber, totaling 2,045,000 m^3/yr and 490,000 m^3/yr, respectively. However, the projected consumption rates for softwood and hardwood are only 68% and 67%, respectively, which indicates a high level of oversupply risk. Furthermore, only seven large sawmills located within the Zone consume over 100,000 m^3/yr, implying a potential concentration risk. Presently, all 34 sawmills generate approximately 750,000 dmt/yr of Sawmill Residuals. A new buyer could potentially access about 375,000 dmt/yr of Sawmill Residuals, based on a 50% capture rate assumption provided by local experts. The available residual types are 170,500 dmt/yr of softwood chips, 55,500 dmt/yr of softwood sawdust/shavings, 70,500 dmt/yr of softwood bark, 43,000 dmt/yr of hardwood chips, 17,000 dmt/yr of hardwood sawdust/shavings, and 18,000 dmt/yr of hardwood bark. Moreover, to mitigate supply risks, a Biomass Availability Multiple (BAM) of 1.5x is applied, resulting in an availability of 250,000 dmt/yr. Based on our estimates, there are 170,000 dmt/yr of recoverable Forest Residues on Crown lands and 65,000 dmt/yr on private forests within the Trois-Rivières BDO Zone, which total to 235,000 dmt/yr of recoverable Forest Residues. To ensure a low-risk supply and account for feedstock redundancy, a Biomass Availability Multiple (BAM) of 2x is applied, resulting in an estimated availability of 115,000 dmt/yr of Forest Residue.	**Score 1**

The Trois-Rivières BDO Zone has an estimated technically available pulpwood of 17,458 dmt/yr on Crown lands, which includes 1806 dmt/yr of softwood, 3,388 dmt/yr of poplars, and 12,264 dmt/yr of hardwood. On private forests, the estimated technically available pulpwood is 93,980 dmt/yr, including 13,321 dmt/yr of softwood, 10,099 dmt/yr of poplars, and 70,510 dmt/yr of hardwood. Therefore, the total technical pulpwood availability is 111,388 dmt/yr. It is important to note that the technical availability already accounts for the necessary growth-to-drain ratio to ensure sustainability. Since the Biomass Availability Multiple is calculated to indicated quantities of feedstock available at low-risk, Raw RI Score is 1 out of 10.	
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: Feedstock redundancy, or BAM, is an important variable when assessing feedstock supply feasibility, and its level can impact the supply chain significantly. RI Impact level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 9.99**

3.2. Impact of Increased Utilization of Feedstock

Rationale: Feedstock utilization in the Trois-Rivières BDO Zone can change over time. Existing consumers of feedstock can expand operations or new facilities can enter the market. Increased utilization puts additional pressure on feedstock and can lead to higher prices, feedstock disruptions, shortages, or supplier breach.	
Raw RI Score: The Forest Ministry's efforts to implement the National Lumber Production Strategy at the provincial level, as well as the implementation of BVCs in various regions, are expected to result in an increase in the harvest of Pulpwood and Forest Residuals over the next two decades. As the bioenergy sector's demand for feedstock increases, this increase in woody biomass availability is likely to be absorbed. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 19.98**

3.3. Seasonal Feedstock Supply Variation

Rationale: Biomass supply can present significant seasonal supply variations; combined with limitations associated with longer-distance transportation and storage, can lead to regional biomass supply imbalances and manifest in shortages and higher costs for Proponents.	
Raw RI Score: The supply of feedstock is subject to significant variations depending on the season of the year. The availability of Sawmill Residuals, Forest Residues, and Pulpwood is directly influenced by harvesting operations, seasonal changes, and natural disturbances. These factors contribute to notable fluctuations in the accessibility of feedstock in the forest. For instance, heavy rainfall or major snow events can lead to temporary delays in logging activities, thereby impacting the production of Sawmill Residuals, Forest Residues, and Pulpwood. Additionally, periods of drought increase the risk of major fires, which not only restrict access to the forests for feedstock harvesting but also result in a reduced quantity of available feedstock due to burn damage. Based on our assessment, seasonal variations can have significant impacts on feedstock supply. However, it is important to note that delays in accessing the forest due to natural disturbances are typically limited. Feedstock suppliers, such as sawmills, usually manage their inventory while considering the associated risks associated with natural disturbances. As a result, we consider this to be a moderate risk. Raw RI Score is 3 out of 10.	**Score 8**
Notched Salience: Sufficient inventory would help to mitigate most of the risk associated with delays in feedstock production brought on by seasonality. Raw RI Score is notched down by 50%. Notched Salience is 1.5.	**Score 4.0**
Impact Level: RI Impact level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 4.99.	**Score 26.64**

3.4. Year-to-Year Variation in Feedstock Availability

Rationale: Biomass can have significant fluctuations in year-to-year supply due to variability in yield from biomass harvesting operations.	
Raw RI Score: The production of Sawmill Residuals is intricately connected to lumber production, which has witnessed fluctuations in recent decades due to changes in the housing industry. However, in the BDO Zone, we expect lumber production to remain stable in the coming years, with a slight increase driven by the high demand for new houses in Quebec and North America. According to data from the Forest Ministry, Sawmill Residuals production within the Supply basin of the Trois-Rivières BDO Zone has slightly increased between 2017 and 2021. Comparing the production levels of 2017 to subsequent years, there was an increase of 7%, 9%, 7%, and 10% in 2018, 2019, 2020, and 2021, respectively. Therefore, recent historical data indicates continual production growth, as opposed to variation in production. However, it is important to acknowledge the potential for year-to-year fluctuations in Sawmill Residue production as a result of changing lumber markets. The lumber market is known for its	**Score 4**

cyclical nature, which can lead to a reduction in the availability of Sawmill Residuals. In simple terms, when the lumber market experiences volatility, it directly impacts the availability and pricing of Sawmill Residuals. Despite these challenges, sawmills situated in the BDO Zone have demonstrated remarkable resilience to the cyclical nature of the lumber market and have consistently maintained their production levels.

In terms of Forest Residues generation, it is closely tied to roundwood harvesting. We anticipate an increase in roundwood harvesting within the BDO Zone over the next decade, which should result in a greater availability of Forest Residues. While there has been an increase in net Pulpwood growth in the past decade, it is important to note that this growth is primarily driven by hardwood species. Sawmills and pulp and paper mills still highly prefer softwood species. Therefore, we assess the risk associated with year-to-year variation in Forest Residues and Pulpwood availability to be low.

Raw RI Score is 4 out of 10.

Notched Salience: Potential variation in the availability and pricing of Sawmill Residuals can be mitigated through substitution with Pulpwood and Forest Residue. Raw RI Score is notched down by 50%.	**Score 2.0**
Impact Level: Our analysis of lumber production variation was conducted at a high level through interviews with local experts. Therefore, there is a degree of uncertainty in our assessment of Sawmill Residual year-to-year production variability. RI Impact level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 13.32**

3.5. Front-End Validation of Data Used in Feedstock Availability Models

Rationale: Feedstock supply models can be complex. Lack of clarity about model assumptions and baseline data can result in confusion on the part of the capital markets and drive financing costs for biomass projects. The adequacy and credibility of assumptions and baseline data is paramount to credible model outputs.

Raw RI Score: The risk of inaccuracies in estimating Sawmill Residual availability is low because our estimates are based on data from the Forest Ministry and conversion factors that have been validated by industry experts. We also validate our estimates at the facility-scale with some sawmills and at the Zone scale with the Forest Ministry. The procedure used for these estimations is presented in Appendix B. For Forest Residues, our estimates are based on a comprehensive study conducted in 2021 for the Government of Quebec. The procedure used for these estimations is described in Appendix C. While our Pulpwood availability estimates are based on high-level data from the Forest Ministry and the "Forest Chief Bureau (BFEC)," these sources may not fully account for all variables. Therefore, some degree of error is inherent in the model used for the estimates. However, feedback from sawmill operators and other forestry organizations indicates that the model tends to underestimate the actual availability of Pulpwood in the region, which helps to mitigate some of the modelling inaccuracies from a feedstock availability perspective.	**Score 3**

Raw RI Score is 2 out of 10.

Notched Salience: No adjustment.	**Score 3.0**
Impact Level: Because most of our conclusions in this assessment are based on woody biomass availability modelling, errors in our assumptions can have significant impact to supply chain risk. RI Impact level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 29.97.	**Score 29.97**

3.6. Low Historical Demand for Feedstock in the BDO Zone

Rationale: If the Proponent does not have a history of developing, large-scale feedstock procurement, suppliers may not have sufficient expertise in feedstock production to ensure reliable supply, especially early on.	
Raw RI Score: Sawmill Residuals and Pulpwood have a long history of extensive utilization in the BDO Zone, spanning over a century. Therefore, from a historical demand perspective, there is no significant risk associated with these feedstock types. However, Forest Residues has not traditionally been utilized in large quantities, making the risks associated with this risk indicator.	**Score** 5

Raw RI Score is 5 out of 10.

Notched Salience: In the initial years of the project, Pulpwood is likely to be the primary feedstock source as Forest Residues supply chains are scaled up. As they expand, the risks associated with the historical lack of demand for Forest Residues should decrease. Raw RI is notched down by 50%. Notched Salience is 2.5.	**Score 2.5**
Impact Level: The lack of historical demand for large-scale feedstock production in the BDO Zone suggests a potential lack of experience and expertise within the supply chain. This factor could have a significant impact on the overall supply chain. RI Impact level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 12.49.	**Score 24.96**

3.7. History of Production/Feedstock is a Secondary Crop or a Byproduct

Rationale: If the feedstock is a new/secondary crop or a by-product, suppliers may either lack sufficient experience to mitigate risk or be unable to react to such risk, and producers may be less likely to prioritize production. If the feedstock is a secondary crop, then production can be subject to variables beyond suppliers' control.	
Raw RI Score: Sawmill Residual, Pulpwood, and Forest Residues has been generated as a by-product of timber logging and sawmilling operations for over a century. We do not anticipate any risks related to this RI. Raw RI Score is 1 out of 10.	**Score** 1
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: RI Impact level is deemed low.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

3.8. Diesel Prices

Rationale: Diesel, oil, and PPI can impact feedstock cost of harvest and collection over time. Sensitivities to worst case scenarios should be run.	
Raw RI Score: Regional data from Statistics Canada database show that diesel prices are volatile and hard to predict, especially in light of recent global events. Diesel prices are currently on a slight downward slope and seem to be stabilizing, after peaking in July 2022 (Figure F-2, Appendix F). Raw RI Score is 5 out of 10.	**Score 5**
Notched Salience: Some of the risks associated with volatile fuel prices could be mitigated by a project engaging in, and favoring, contracts with suppliers located closer to Trois-Rivières, reducing transportation costs. Raw RI Score is notched down by 25%. Notched Salience is 3.75.	**Score 3.75**
Impact Level: RI Impact level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 24.98.	**Score 24.98**

3.9. Harvest & Collection Practices & Schedules

Rationale: Differences in harvest timing and practices can create risks for both the quantity and quality of the feedstock. For example, feedstock harvested by different suppliers in different windows can undergo varying levels of exposure to sun, wind, and moisture, leading to variations in delivered feedstock quality.	
Raw RI Score: The supply chain in the BDO Zone benefits from established and robust harvest, collection, and scheduling practices. Foresters and fiber producers have implemented standardized	**Score 6**

procedures for forest management practices and timber harvest, ensuring the efficient and reliable delivery of raw materials to downstream processing facilities.

However, unforeseen factors such as inclement weather or extended periods of impassable roads can introduce risks to the supply chain. These disruptions can impact the timely delivery of raw materials and cause delays in downstream processing operations.

Additionally, the humidity content of Forest Residues can vary depending on the length of time this biomass has been left to decay on the side of the roads. This can affect the quality of the raw materials and ultimately impact the quality of the finished product. Therefore, it is important for foresters and fiber producers to closely monitor the moisture content of Forest Residues and ensure they are properly stored and handled to prevent degradation.

Raw RI Score is 6 out of 10.

Notched Salience: Maintaining a sufficient feedstock inventory will mitigate the risk of feedstock shortages caused by unforeseen factors such as inclement weather or extended periods of impassable roads. Raw RI Score is notched down by 50%. Notched Salience is 3.	**Score 3.0**
Impact Level: RI Impact level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 19.98.	**Score 19.98**

3.10. Harvesting & Collection Equipment

Rationale: Different types of harvesting and collection equipment suppliers use can significantly impact the quality and availability of feedstock. The use of different types and combinations of harvesting, collection, and processing equipment can lead to non-homogeneous feedstock. In addition, equipment not designed specifically for biomass cultivation, harvesting, and collection can increase feedstock quality risks.

The type of equipment should be specified for the sake of product consistency and risk reduction.

Raw RI Score: The equipment employed for harvesting and collection in the BDO Zone adheres to industry standards. Additionally, the presence of numerous professional harvesters and the implementation of established silviculture practices further diminish the likelihood of substandard or improper equipment being utilized. While suppliers may need to make investments in new equipment to accommodate the production of feedstock, the delivered cost of $135-$155/dmt for Forest Residues and $125-$140/dmt for Pulpwood already factors in the amortization of these investments made by the suppliers. Consequently, the higher delivery costs themselves already account for the associated investment risks.	**Score 2**

Raw RI Score is 2 out of 10.

Notched Salience: No adjustment.	**Score 2.0**

Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 6.66**

3.11. Temporary Externality-Driven Markets for Feedstock

Rationale: Alternative, non-traditional, externality-driven competitors for feedstock can drive feedstock demand (and cost) in unusual circumstances.	
Raw RI Score: We have identified the firewood, densified logs and mulch markets as the only alternative and/or non-traditional markets within the Zone. However, we do not consider these markets significant competitors for feedstock, as they do not consume large quantities. We have not identified any other temporary externality-driven markets for Sawmill Residuals, Forest Residues, or Pulpwood feedstocks. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

3.12. Variations in Densification Methods Among Different Suppliers

Rationale: The shape and density of the unit in which feedstock is supplied can impact feedstock cost and quality.	
Raw RI Score: There is little variation in densification methods across suppliers. Although the quality of feedstock can vary depending on the source and stage of processing, harvesting and collection methods are generally industry standard. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

3.13. Availability of Labor for Feedstock Production

Rationale: Skilled labor shortages can be difficult to remedy in the short term. Availability of suitable labor in an area can impact the ability to procure sufficient feedstock quantities on schedule. Labor risks are higher for facilities where supply chains are not yet active; or for Proponent's for whom large feedstock requirements, or development of new (or expanded) supply chains, demand significant additions to the local labor force.	
Raw RI Score: The province of Quebec currently experiences a very low unemployment rate, which poses a challenge in finding skilled workers. The limited pool of available individuals in the region further intensifies the labor shortage. However, there are targeted forest sector training programs specifically designed for the Trois-Rivières area. This initiative is a positive step towards addressing the shortage of skilled labor in the region. In our assessment, the development of the feedstock supply chain within the Trois-Rivières BDO Zone should be integrated with the existing roundwood supply chain of the forest industry for several reasons including labor. This integration would ensure that trained employees involved in feedstock production become an integral part of the forestry sector. This integration would mitigate the risks associated with their migration towards higher-value product sectors given the diverse opportunities available within the Trois-Rivières BDO Zone. Raw RI Score is 6 out of 10.	**Score 6**
Notched Salience: Labor shortage issues caused by the pandemic are expected to stabilize by the time the proponent's facility goes online. However, this strategy carries a moderate risk, as labor shortages may persist due to unforeseeable circumstances or changes in the economic landscape. To mitigate this risk, the proponent must offer competitive wages and attractive working conditions to secure an adequate workforce. For these reasons, Raw RI Score is notched by 50%. Notched Salience is 3.0.	**Score 3**
Impact Level: RI Impact Level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 9.99.	**Score 19.98**

3.14. Feedstock Transportation Costs

Rationale: Transportation can be one of the most significant cost components of biomass supply chains. The average transportation cost and percentage of total feedstock cost attributable to transportation should be known.	
Raw RI Score: Transportation costs for woody biomass feedstocks are primarily driven by fuel, distance, and labor costs. Fuel costs have experienced considerable upsurge in 2022 and are difficult to predict in the long-term. Transportation costs for woody biomass feedstocks are primarily influenced by fuel, distance, and labor costs. Fuel costs have significantly increased in 2022, resulting in an average transportation cost increase from $5.50 to $7.20 per loaded mile or $4.50 per loaded kilometer. Assuming a load	**Score 4**

of 17 dry metric tons of biomass and an average trucking distance of 90 km, the average cost of transporting biomass is approximately $25/dmt.

As a result, transportation costs constitute between 16% and 20% of total Pulpwood and Forest Residue delivered costs, and between 12% and 63% of Sawmill Residual delivered costs. Specifically, transportation costs make up 12% for wood chips and 62% for bark.

Raw RI Score is 5 out of 10.

Notched Salience: No adjustment.	**Score 4**
Impact Level: RI Impact Level is deemed *low*.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 24.98.	**Score 13.32**

3.15. Transportation Distances

Rationale: Transport distances of 50-100 km for biomass feedstocks are typical but larger distances can be common. When the average transport distance from suppliers to the Proponent is high, the supply chain is subject to greater sensitivities to risks, such as increases in diesel cost, weather impacts, mechanical breakdown, and the demand for feedstock from competitors closer to the source.

Understanding average transport distance can help flag higher-risk suppliers where transport distance materially exceeds the average.

Raw RI Score: Based on our analysis of the feedstock supply curve, it appears that only 13.5% of the total feedstock is available within a 75 km driving distance from Trois-Rivières. However, it is noteworthy that biomass in the region travels distances significantly larger than that; for example, some suppliers in the region have transported bark over distances exceeding 300 km. Consequently, we do not perceive the relative scarcity of feedstock within 75 km as a significant risk at present.	**Score 3**

Raw RI Score is 3 out of 10.

Notched Salience: No adjustment.	**Score 3.0**
Impact Level: RI Impact level is deemed *moderate*.	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 29.97.	**Score 29.97**

3.16. Transportation of Feedstock Requires Specialized Equipment

Rationale: Requirements for specialized transport equipment can increase supply chain risk. Where there is low availability in required transportation equipment, equipment owners have increased leverage over transportation prices and supply chain resiliency can be lower.	
Raw RI Score: The forestry and wood processing industry in the Trois-Rivières BDO Zone is well-established, and as a result, it's highly likely that standardized equipment is in use. The consistency of feedstocks transported over the past few years further indicates the standardization of equipment. Open-top and live-bottom trailers are the most frequently used for transporting feedstock, while dump trucks are only used when other trailer types are unavailable, as they can transport smaller volumes and are more prone to breakdowns. Facilities that accept feedstock transported by live-bottom or dump trailers do not require a self-unloading ramp, which could potentially provide an advantage. The risk related to specialized transportation equipment is low for Sawmill Residuals and Pulpwood but may be somewhat higher for Forest Residue, as Forest Residue supply chains are not fully developed in the region. Raw RI Score is 3 out of 10.	**Score 3**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 9.99**

3.17. Delivery Routes through Local Communities

Rationale: Biomass transportation can become a nuisance to local communities, especially if large numbers of trucks pass through residential and school areas. Local communities often have the power to force regulations regarding truck transport, impeding a Proponent's ability to transport feedstock. This risk is greater in greenfield projects than operational ones.	
Raw RI Score: For several decades, the forestry and wood industry has been a prominent sector in the Trois-Rivières BDO Zone, employing multiple generations of the workforce. As a result, well-established delivery routes have been developed, which are integral to the local communities in the Zone. Additionally, Trois-Rivières has several potential industrial sites that could mitigate the associated risks by being located outside the main residential area. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

3.18. Transportation Regulations & Local Weight Limits

Rationale: In many regions, transportation is regulated based on seasonal road conditions. These regulations (e.g., "frost laws") often take the form of weight restrictions or limits on the number of trucks allowed on roads. Such regulations can impede the Project's ability to source sufficient feedstock or increase the cost of doing so at certain times of the year.	
Raw RI Score: Considering the volume and mass of timber currently transported in the Trois-Rivières BDO Zone, we deem it highly unlikely that transportation regulations could hinder feedstock acquisition or transportation. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score Unnotched 1.0**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

3.19. Road Infrastructure

Rationale: Feedstock cost and availability can be a function of the accessibility of road infrastructure**.** Problems with road networks will translate directly to risks to feedstock supply.	
Raw RI Score: Our assessment indicates that the road network in the Trois-Rivières BDO Zone is sufficient to support the forestry and wood industry sectors. Industrial sites are usually situated near major roads, which provide access to other regional destinations. Additionally, the forest and timberland road networks are well-developed due to the significant amounts of timber that are harvested and moved within the Zone. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: It is likely that all feedstock for a new project will move exclusively by roads. Therefore, the impact of road infrastructure is significant. RI Impact Level is deemed *medium.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 13.32**

3.20. Number, Size, Mix, & Locations of Suppliers

Rationale: In general, a portfolio of multiple suppliers of various sizes is important for ensuring steady and uninterrupted feedstock supply with minimal price fluctuations. If a small number of large suppliers provide a high proportion of total feedstock, a disruption or supplier breach will have a greater impact on the supply chain. In such cases, the risk of disruption is lower, but the impact of those disruptions is higher. Conversely, a large number of small suppliers is less likely to have the capacity to withstand internal disruptions and may be more likely to breach. Here, the risk

of disruption is higher, but the likely impact is lower. The number of suppliers and the ratio of small to large suppliers should be optimized. There is no pre-determined number or optimal ratio of suppliers—either too many or too few can pose higher degrees of risk.	
Raw RI Score: We identified a total of 34 suppliers in the Trois-Rivières BDO Zone. Among them, only 3 sawmills generate more than 100,000 dmt of Residues per year, while 3 sawmills generate between 30,000 to 65,000 dmt/yr, and 6 sawmills generate between 10,000 to 30,000 dmt/yr. The remaining 22 suppliers generate less than 10,000 dmt/yr. Based on our analysis a new operator's portfolio could easily include ten different suppliers. To facilitate the recovery of Forest Residues and Pulpwood, the involvement of new operators in the area is crucial. It is expected that the majority of these operators will be sourced from the forestry sector, as the recovery operations need to be seamlessly integrated into the existing roundwood supply chain. However, it should be emphasized that additional operators and specialized equipment are required to ensure a sufficient supply of feedstock for potential bio-based projects. Considering the current demand for feedstock, it is worth noting that Forest Residues and Pulpwood account for less than 50% of the available feedstock in the BDO Zone. Therefore, the associated risk with this indicator is considered low. However, if the demand for feedstock increases to a level where Forest Residues and Pulpwood constitute more than 50% of the total feedstock available in the Zone, the risk will be reassessed accordingly. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: RI Impact Level is deemed *low*.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

3.21. Suppliers Subject to Same External Risk Factors (Non-Weather & Equipment Based)

Rationale: When a single risk event can impact the feedstock production ability of all (or most) suppliers, then feedstock risk is higher and supply chain resiliency is lower. Resilience is maximized when biomass supply chains exhibit diversity in their locations, production practices, and other elements of supply chain structure such that the impact of single, high-risk events have varying impacts on suppliers.	
Raw RI Score: Suppliers operating in the Trois-Rivières BDO Zone are exposed to various common external risks. Economic conditions have a significant impact on the performance of the forest products industry, with the industry performing better during good times and worse during bad times. Solid wood products, such as softwood lumber, are crucial raw materials for new construction and are closely linked to the housing market. Similarly, wood furniture, particularly wood cabinets, is closely tied to the housing market, while packaging materials like corrugated boxes, bags, and fiber drums depend on finished goods shipments. Therefore, the pulp and paper sector closely track the overall economy (Dahal et al., 2013). Logging in the Zone is also subject to macroeconomic factors, such as the housing market. Downturns in the market can threaten sawmill viability, which, in turn, can impact the harvest of sawtimber and Forest Residues. In addition, increased prices of natural gas could generate risks. Facilities may resort to burning their own residuals, mainly sawdust and bark/hog fuel, making them less available and more expensive for potential projects. As a result, it is important for new operators in the Trois-Rivières BDO Zone to be aware of these external risks and take them into account when developing their business plans. Raw RI Score is 8 out of 10.	**Score 8**
Notched Salience: Sufficient inventory levels moderately mitigates this risk. Raw RI Score is notched down by 25%. Notched Salience is 3.75.	**Score 6.0**
Impact Level: Although unlikely, major economic shifts can have significant impact on the entire forest products industry in the BDO Zone. RI Impact Level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 37.46.	**Score 59.94**

3.22. Seasonal Weather Impacts on Feedstock Supply

Rationale: Seasonal weather impacts are defined as deriving from natural weather variations (e.g., spring thaws, rainy seasons, or dry seasons) as opposed to singular weather events (like fires, droughts, or hurricanes). Seasonal weather changes can be a significant risk factor affecting feedstock availability, quality, and price.	
Raw RI Score: In the Trois-Rivières BDO Zone, temporary disruptions may occur during periods of heavy rain or snowfall, making it difficult for fiber producers to access and clear trees from timberland, which can cause dirt roads to become impassable. Consequently, all sources of feedstock production may experience variations. These disruptions are usually temporary and typically do not last more than a few weeks. Additionally, seasonal delays in Forest Residues and pulpwood generation are possible, especially in the spring.	**Score 3**

Raw RI Score is 3 out of 10.	
Notched Salience: Since seasonal delays typically last days or weeks, having a modest but well-maintained feedstock reserve on site would significantly reduce the risk. Raw RI Score is notched by 50%. Notched Salience is 1.5.	**Score 1.5**
Impact Level: RI Impact Level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 9.99.	**Score 9.99**

3.23. Long-Term Weather and Climate Trends

Rationale: In certain regions, climate trends and significant potential changes to future weather patterns can create feedstock risk.	
Raw RI Score: Climate change is expected to have severe impacts on the Trois-Rivières BDO Zone, with floods and droughts likely to become more frequent and severe. Hardwood species of pulpwood are expected to be the most impacted by drought. Additionally, wildfires pose a significant threat to the feedstock supply chain within the Zone, as they can destroy inventory and disrupt transportation. Spruce budworm infestations are also a major concern for the forests in the Zone, as they have already impacted other regions in the province of Quebec. Although it is uncertain when the forests in the Zone will be impacted, an increase in feedstock availability may result from the infestations. While the impacts of climate change are unpredictable, historical data show no significant variations in harvest removals or feedstock growth from year to year. Despite this, it is crucial to prepare for potential future risks and take appropriate measures to mitigate them. Raw RI Score is 5 out of 10.	**Score 5**
Notched Salience: Maintaining Sufficient inventory levels is a mitigates against supply disruptions caused by long term weather and climate trends. Raw RI is notched down by 50%. Notched Salience is 2.5.	**Score 2.5**
Impact Level: There is a great deal of uncertainty related to climate change and its effect on the BDO Zone. RI Impact Level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 24.98.	**Score 24.98**

3.24. Government Subsidies for Feedstock Production or Utilization

Rationale: Feedstock that is directly subsidized through government programs can pose greater long-term risk than feedstock that is not. Subsidies may be subject to amendment or repeal, sometimes with minimal notice. NOTE: This risk indicator refers to direct feedstock subsides only; it does not apply to government subsidies that pertain indirectly to the operations of the Proponent, such as Loan Guarantees, or to the markets for products produced by the Proponent.	
Raw RI Score: As far as our knowledge extends, the only available subsidies to incentivize feedstock production in the Trois-Rivières BDO Zone are offered through the Sustainable Forest Management	**Score 2**

Program. A new operator could utilize funds from this program to establish a business and develop/improve a biomass supply chain (such as implementing a BVC). With that being said, government funding is not a primary source of support for suppliers in the Zone to produce feedstock.

Raw RI Score is 2.

Notched Salience: No adjustment.	**Score 2.0**
Impact Level: Raw RI Impact level is deemed *low*.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 6.66**

3.25. Local, Provincial, & National Laws, Regulations, & Permitting Pertaining to Biomass

Rationale: Feedstock production directly dependent on local, provincial, or national laws or government regulations can pose greater long-term risk than feedstock that is not, since laws and regulations may be subject to amendment or repeal.

If utilization of biomass requires specific permits (e.g., percentage removal of Forest Residues or corn stover, allowable cut limits, air emission, storage permits, rights-of-way, overweight permits for trucks, cross-border permitting for shipment of biomass, chain of custody, or certification of sustainability), the likelihood of obtaining such permits and/or complying with permitting requirements should be examined.

Raw RI Score: We have found no local or provincial laws or regulations that would prohibit or limit biomass removal from the forests in the Trois-Rivières BDO Zone, apart from the calculation of allowable annual cut (AAC) performed for Crown lands and private forests. While there may be some municipal laws governing forestry operations on private lands, they are not expected to significantly impact woody biomass availability for a new operator. However, there is a risk that with higher demand for biomass, and specifically Forest Residue, regulations can change. Such scenario can have a significant influence on the availability of feedstock. Raw RI Score is 4 out of 10.	**Score 4**
Notched Salience: Any future regulations will likely pertain to Forest Residues. Therefore, risks related to regulations can be mitigated through substitution with other feedstocks, such as Sawmill Residuals and Pulpwood. Raw RI Score is notched down by 50%.	**Score 2.0**
Impact Level: Regulations can have significant impact on the availability of biomass. There is a high degree of uncertainty pertaining to future regulations around Forest Residue. RI Impact Level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 19.98**

3.26. Backlash Against Biomass Development, Procurement or Usage in the Region

Rationale: Public backlash against biomass development in the Proponent region can directly impact Proponent's ability to procure, transport, trans-load, store, or utilize feedstock by affecting local policies, regulations, and Proponent's ability to obtain necessary permitting.	
Raw RI Score: During our analysis, we discovered no negative public perception or opposition towards new bio-based projects in the Trois-Rivières BDO Zone. In fact, the region of Mauricie is known as an innovation driver in the province of Quebec. However, in general, there is a negative opinion regarding the use of pulpwood for energy production. Cutting down entire stands of forests that contain mostly pulpwood, which may have no economic value but do have ecological value, for energy purposes is not supported in Quebec. Finally, the conservation movement is gaining popularity among private landowners who view forestry operations as counterproductive to fighting climate change. Raw RI Score is 1 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact Level is deemed *low*.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 6.66**

3.27. Feedstock Sustainability, Including Risks to Soil Quality, & Surface & Groundwaters

Rationale: Public concerns about the sustainability of feedstock production can jeopardize biomass feedstock operations. Sustainability certification schemes should be utilized where applicable to ensure that feedstock comes from sustainable sources.

Soil sustainability can be defined as the management of soil in a way that does not exert any negative or irreparable effects on the soil or any other systems. There is a diversity of approaches to soil sustainability in jurisdictional guidelines for biomass harvesting and production. Different feedstock types have unique thresholds at which feedstock removal causes significant negative consequences on the soil.

Excessive nutrient runoff from biomass feedstock production can accumulate in surface waters and result in algal blooms and hypoxia, which can lead to habitat loss for aquatic species higher up the food chain and alter aquatic ecosystem food webs. Damage to aquatic ecosystems can cause a social and regulatory backlash. Water intake issues can also increase risk.

Raw RI Score: All Crown lands within the Trois-Rivières BDO Zone are certified by either the Sustainable Forestry Certification (SFC) or the Sustainable Forestry Initiative (SFI), ensuring that forest management on these lands adheres to the highest criteria for sustainable harvest, watercourse protection, soil conservation, and more. Private forests within the Zone are also regulated by the Sustainable Forest Management Program, which sets guidelines for responsible forest management. Therefore, the harvest of roundwood from which Sawmill's Residuals are derived and pulpwood represents low risk. Regarding the recovery of Forest Residues, it is essential to ensure that the increased utilization of this biomass will not negatively impact forest health, and that all removals are conducted in compliance with local and provincial regulations. Fortunately, organizations in the province of Quebec have partnered with Natural Resources Canada to develop a tool that describes healthy practices for the removal of Forest Residues[1]. By adhering to the recommended guidelines and regulations, the increase in woody biomass availability can be harnessed without causing harm to forest health. This will ensure that the bioenergy sector can continue to grow sustainably, while also supporting the economy and the well-being of local communities. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: Sustainability concerns are significant to bio-projects. RI Impact Level is deemed *high.*	**Score 9.99**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 19.98.	**Score 9.99**

3.28. GHG Emissions from Production, Harvest, & Transport

Rationale: Understanding a project's overall emissions and the carbon intensity throughout the feedstock supply chain is essential to reducing risks related to carbon pricing mechanisms and related regulations. Greenhouse gas (GHG) emissions from production, harvest, and transportation can be a significant challenge to Proponent claims of carbon neutrality for biomass projects. Carbon emissions from harvested soils, as well as emissions from harvesting machinery or delivery trucks, can make it difficult to achievement net-zero GHG emissions. If a Proponent's financial model relies on carbon neutrality/GHG regulatory pricing frameworks, it is essential to investigate the feedstock's carbon emission status.

[1] This tool (in French) is available at this link: https://visionbiomassequebec.org/wp-content/uploads/2019/07/Guide-saines-pratiques_Re%CC%81colte-de-biomasse-forestie%CC%80re.pdf

Raw RI Score: If we assume that: 1) trucks average 6.5 miles per gallon[2]; 2) all feedstocks must be transported 100 miles; 3) trucks can carry 22 tons per delivery; 4) facility intake requirement is 100,000 tons per year; and 5) 19.64 pounds of CO_2 are emitted per gallon of fuel used[3], approximately 2,060 tons of CO_2 would be emitted per year in feedstock transport. However, the average CO_2 carbon sequestration for pine trees is approximately 11 tons per acre of new tree growth[4], meaning only 187 acres of new trees would have to be grown yearly to sequester all the carbon emitted from feedstock transportation. Therefore, given the forestry industry scale in the Trois-Rivières BDO Zone, net positive carbon sequestration in relation to transport is likely. GHG emissions stemming from feedstock production and harvest are more difficult to model and will depend on the size of the intake of a new plant in the Zone. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

3.29. Geographic Location Influence on Feedstock Variability

Rationale: Feedstock from different regions may differ in quality due to variations in soil quality, topography, harvest practices, weather, fertilizer applied, etc.	
Raw RI Score: The geographical location of the Trois-Rivières BDO Zone does not have a significant impact on feedstock variability. Although there may be topographic variations throughout the forests, it is not expected to affect the current heterogeneity of the feedstock categories. The most significant differences in feedstock characteristics will likely be the humidity content and the presence of impurities, such as sand and rocks, which may be present within the feedstock. The majority of Sawmill Residuals and Forest Residue available in this BDO Zone primarily consists of softwood species, including Fir, Spruces, and Pines. These species have distinct quality specifications for their use in bio-based products. However, in terms of feedstock variability, there is relatively limited diversity within this zone for these species. Conversely, the bulk of pulpwood feedstock comprises hardwoods, which encompass various species with varying quality specifications. Nonetheless, we believe feedstock variability risks pertaining to hardwoods are also low. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**

[2] Arrow Truck: https://www.arrowtruck.com/blog/2016/06/21/manage-your-semi-trucks-fuel-use-with-these-tips/.
[3] US Energy Information Administration: http://www.patagoniaalliance.org/wp-content/uploads/2014/08/How-much-carbon-dioxide-is-produced-by-burning-gasoline-and-diesel-fuel-FAQ-U.S.-Energy-Information-Administration-EIA.pdf.
[4] GoTree Quotes: https://www.gotreequotes.com/how-much-co2-do-trees-absorb/.

Impact Level: RI Impact Level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

3.30. Capacity of Supply Chain Components & Equipment to Scale

Rationale: Scale-up risk increases if supply chain components or underlying feedstock infrastructure necessary for these components cannot scale to handle Proponent feedstock requirements and throughput capacity. Capacity to scale should be demonstrated.	
Raw RI Score: To scale up the supply chain equipment in the Trois-Rivières BDO Zone for potential bio-projects utilizing Forest Residues feedstock, significant capital investments would be required from potential suppliers. The scaling-up process would primarily involve acquiring wood processing equipment such as grinders, chippers and possibly dryers, rather than transportation equipment, as the hauling capacity in the region is already robust. Establishing one or more Biomass Valorization Centers (BVCs) would be a great starting point. The equipment scale-up is not a significant risk for sawmill residuals or pulpwood supply. Raw RI Score is 4 out of 10.	**Score 4**
Notched Salience: A bio-project that plans to utilize Forest Residues is expected to also use Pulpwood as a feedstock, due to lower cost in the BDO Zone. In the initial years of the project, Pulpwood is likely to be the primary feedstock source as the supply chain is scaled up. As the supply chain expands, risks associated with Forest Residues production equipment scale-up will decrease. Raw RI Score is notched down by 50%. Notched Salience is 2.0	**Score 2**
Impact Level: RI Impact Level is deemed *moderate.*	**Score 6.66**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 13.32**

CATEGORY 4.0: INFRASTRUCTURE RISKS

4.1 Risk Factor: Physical Infrastructure

4.1.1 Land Parcel

Raw RI Score: There is suitable land available in varying parcel sizes within existing industrial parks that include – (1) 31,400 m^2 Micro Sciences Industrial Park; (2) 2,700,000 m^2 Carrefour 40-55 Industrial Park; (3) 2,700,000 m^2 Hautes-Forges Industrial Park; (4) 840,333 m^2 J.Real-Desrosiers Industrial Park; (5) 617,500 m^2 Dessureault Industrial Park; (6) 782,000 m^2 Gilles-Beaudoin Industrial Park; (7) 450,000 m^2 Thomas-Bellemare Industrial Park; (8) 7,000 ha Parc industriel et portuaire de Becancour ; (9) 1,021,933 m^2 Parc industriel La Prade. Raw RI Score is 1 out of 10.	**Score 1**

Notched Salience: No adjustment.	**Score 1.0**
Impact Level: RI Impact level is deemed *low*.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

4.1.2 City Ownership

Raw RI Score: The city owns the industrial sites referenced above and has a history of supporting new development. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

4.1.3 Industrial Land Use Zone

Raw RI Score: Approved land use and zoning within existing industrial parks is in place for medium and heavy industrial development. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.1.4 Natural Gas Line

Raw RI Score: Trois-Rivières has an extensive network of natural gas storage facilities and distribution network sufficient to supply new industrial development. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**

Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.1.5 Electrical

Raw RI Score: Trois-Rivières has an extensive network of electrical distribution systems sufficient to supply new industrial development. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.1.6 Fresh Water Supply

Raw RI Score: Water is available at 60-100 lb/in^2, 410-690 kPa and 300 mm pressure; existing water permits are in place. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.1.7 Sewage Disposal Trunk Line

Raw RI Score: Sanitary sewage treatment facilities are located in Trois-Rivières. Industrial operations that generate unacceptable contaminants are required to pretreat such waste before putting the effluent into the municipal sewer system. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed low.	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.1.8 Drainage and Stormwater Management

Raw RI Score: The stormwater drainage system in Trois-Rivières consists of a network of pipes, culverts, infiltration systems and detention basins to manage the stormwater runoff efficiently. Raw RI Score is 3 out of 10.	**Score 3**
Notched Salience: No adjustment.	**Score 3.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 9.99.	**Score 9.99**

4.1.9 Available ICT (Information & Communication Technology) Services

Raw RI Score: Fibre optic network and cable internet services are available and can be tailored to the needs of individual industries. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.1.10 Landfill and Disposal Markets

Raw RI Score: Solid waste disposal facilities are located within the region, including a toxic/hazardous waste facility. Industry is responsible for their solid waste management including hauling to waste disposal facilities. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.2 Risk Factor: Logistics

4.2.1 Road and Highway Access and Intersection

Raw RI Score: Trois-Rivières is located at the crossroads of major highways and provides quick access to major cities in Quebec, Ontario, the United States and Eastern Canada. All industrial parks have direct access to Highway 40, while some of them have access to Highways 20, 30 and 54. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.2.2 Ocean/River Access

Raw RI Score: The Port of Trois-Rivières and Port of Becancour are the largest ports in Quebec, with constantly growing traffic, and lie close to the industrial parks. Each year, the Port of Trois-Rivières welcomes 55,000 trucks, 1,000 train cars and more than 200 merchant and cruise ships from 100 ports located in more than 40 countries. The annual handling of the port is 3 million metric tons of goods such as solid and liquid bulk, containers, cereals and general cargo. Recently, the port was upgraded as part of the Cap sur 2020 modernization plan with investments of more than $132 million; for the addition of new exterior storage areas, new hangars, repair/addition of new berths, and increase in rail capacity. Currently, $40 million is allocated to increase its storage capacity and efficiency. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

4.2.3 Railway Service

Raw RI Score: Businesses in Trois-Rivières have direct access to major continental networks of Canadian National and Canadian Pacific through the Quebec-Gatineau Railways. Raw RI Score is 1 out of 10.	**Score 1**

Notched Salience: No adjustment.	**Score 1.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

4.2.4 Accessibility to Airport

Raw RI Score: Trois-Rivières airport lies close to the industrial parks, and has one of the largest runways in Quebec, with a length of 2.75 km, equipped with high-intensity approach lights with ARCAL and PAPI systems at both ends, that can accommodate all types of aircraft. It mainly accommodates charter flights, business flights and freight transport. The airport terminal will begin renovation and expansion in 2023. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

4.3 Risk Factor: Social Infrastructure

4.3.1 Healthcare Facilities

Raw RI Score: Trois-Rivières has good healthcare facilities in the region. Centre hospitalier régional de Trois-Rivières is the main hospital in Trois-Rivières and offers a wide range of medical services including emergency care, surgery, cardiology and oncology. Other facilities in the region are- Clinique médicale de Trois-Rivières, Centre de santé et de services sociaux de Trois-Rivières, Centre de Santé Dentaire Bélanger et Associés and Clinique Chirurgicale de Trois-Rivières. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.3.2 Educational Facilities

Raw RI Score: There is a wide range of educational institutions and programs available in the region. Trois-Rivières has 28 primary schools and 7 public/private secondary schools in French/ English. The University of Quebec at Trois-Rivières is attended by 14,500 students every year. The University offers 280 programs, 40 of which are exclusive to Quebec and to the specific needs of its industries. Mauricie Campus- Faculty of Medicine of the University of Montreal produces medical graduates. At the college level, there is the Cégep de Trois-Rivières, a public establishment, as well as the Collège Laflèche, a private institution. At the professional level, students have access to the professional training centers Bel-Avenir and Qualitech. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.3.3 Transportation Facilities

Raw RI Score: The Trois-Rivières industrial-port zone has good network with all possible means of transport within a radius of less than 15 km: ship, train, plane and truck. The intermodal transport infrastructure deployment project costs up to $50 million and provides easy access to all cities in Quebec, Ontario and Eastern Canada. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.3.4 Recreational Facilities

Raw RI Score: There is a wide variety of recreational amenities in Trois-Rivières including parks, biking, swimming, playgrounds, galleries, theaters, tennis courts, golf courses, sportsplex, hiking trails, rivers, kayaking, fishing, skating rinks etc. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score**

	2.0
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.3.5 Cultural Facilities

Raw RI Score: There is a wide variety of cultural amenities in Trois-Rivières including art galleries, museums, theatres/film, music and festivals. Trois-Rivières is a leading cultural city with its Maison de la culture, the magnificent J.-Antonio-Thompson hall and the Cogeco amphitheater, where workshops and shows are conducted throughout the year. Trois-Rivières is famous for hosting events like DansEncore International Festival, the Trois-Rivières Grand Prix, International Poetry Festival etc. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.3.6. Public Safety Facilities

Raw RI Score: The crime index in Trois-Rivières is 17.07, and the safety index is 82.93, making it a very safe place to live. Raw RI Score is 1 out of 10.	**Score 1**
Notched Salience: No adjustment.	**Score 1.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

4.3.7 Housing

Raw RI Score: There is a wide variety of housing (rental and ownership) available within Trois-Rivières. The average value of a housing unit in Trois-Rivières is $285,000, and the rent of 1 BHK is $625, compared to the housing price of $368,138, and $862 rent in Quebec City. Out of the 30,544 housing units in total, 16,988 of them are occupied by owners, 5,596 by the renters and 7,960 units are vacant. Raw RI Score is 1 out of 10.	**Score 1**

Notched Salience: No adjustment.	**Score 1.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 3.33.	**Score 3.33**

4.4 Risk Factor: Workforce and Permitting

4.4.1 Labour Availability

Raw RI Score: There is a strong labour market for new industrial development. According to Statistics Canada 2022, there are more than 126,795 workers living within a radius of 25 Km from the city of Trois-Rivières. 79% of the labour force work in the Service sector (60,700 people); 20% in Health care and social assistance (15,000 people); 15% in Wholesale and retail trade (11,400 people); 11% in Manufacturing (8,500 people); 9% in Educational services (6,800 people); 6.0% in Construction (4,300 people); and 4% in Transport and storage (3,200 people). In 2022, the Employment rate is 54.7%, Unemployment rate is 3.4% and the Activity rate is 57.7%. The median age in the region is 46, and the population aged 15 and over is 86.6%. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.4.2 Labour Cost

Raw RI Score: The minimum wage rate in Quebec is $13.50 per hour for most workers. According to Statistics Canada 2020, the average hourly wage for all occupations in the Trois-Rivières metropolitan area was $24.29 with an average total income of $46,440. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.4.3 Training Programs / Community College

Raw RI Score: There is a wide range of educational institutions and programs available in the region. Trois-Rivieres provides high-quality education with a university, two vocational training centers and two college institutions. The University of Quebec at Trois-Rivières is attended by 14,500 students every year. The University offers 280 programs, 40 of which are exclusive to Quebec and to the specific needs of its industries. Mauricie Campus- Faculty of Medicine of the University of Montreal produces medical graduates. At the college level, there is the Cégep de Trois-Rivières, a public establishment, as well as the Collège Laflèche, a private institution. At the professional level, students have access to the professional training centers Bel-Avenir and Qualitech. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

4.4.4 Permit Process

Raw RI Score: Permitting process is well described on the Trois-Rivières Municipal Website. The city has a history of welcoming economic development and supporting timely processing. Raw RI Score is 2 out of 10.	**Score 2**
Notched Salience: No adjustment.	**Score 2.0**
Impact Level: RI Impact level is deemed *low.*	**Score 3.33**
Loaded RI Score: Loaded RI Score (Notched Salience × Impact Level) is 6.66.	**Score 6.66**

APPENDIX B: MODEL FOR SAWMILL RESIDUAL GENERATION

Sawmills

The following is the procedure used and associated assumptions made to estimate Sawmill Residuals generation:

1. Based on data available online from the Forest Ministry website, all sawmills within a 150 km drive-distance from Trois-Rivières were listed as well as their respective production capacity (m^3/yr) by category of dominant wood type (softwood and hardwood);

2. The projected consumption of roundwood was calculated for each sawmill using the utilization factor[5] corresponding to the region where they are located;

   Utilization factors used per region:

Mauricie	69%
Centre-du-Quebec	53%
Lanaudière	53%
Laurentides	62%
Outaouais	42%
Estrie	83%
Chaudières-Appalaches	76%
Capitale-Nationale	84%

3. Sawmill Residuals production was obtained by converting the projected consumption of roundwood (cubic meters per year) to weight (dry metric tons per year) using the following factors:

   - Yield production of chips by sawmills for softwood (dmt/m^3) = 0.167
   - Yield production of chips by sawmills for hardwood (dmt/m^3) = 0.174
   - Yield production of sawdust-shavings for softwood / production of chips of softwood (dmt) = 33%
   - Yield production of sawdust-shavings for hardwood / production of chips of hardwood (dmt) = 40%
   - Yield production of bark for softwood / production of chips of softwood (dmt) = 41%
   - Yield production of bark for hardwood / production of chips of hardwood (dmt) = 43%

   The factors above represent provincial average calculated from data provided by the Forest Ministry in a document untitled: "Compilation des données issues des registres forestiers 2021".

[5] The utilization factor is calculated every year by the Forest Ministry for each region. It represents the % of roundwood consumption (m^3/yr) over the production capacity (m^3/yr) of all the sawmills located in the same region.

APPENDIX C: MODEL FOR FOREST RESIDUES GENERATION

The procedure to estimate the quantity of Forest Residues that is technically available on public and private forest within the Trois-Rivières BDO Zone comes from a study done by the firm WSP in 2021[6].

Forest Residues correspond only to branches and crowns of harvested trees. Roots and stumps are not accounted for since it is not permitted, for conservation reasons, in the province of Quebec to harvest this biomass.

There are different operating methods for harvesting Forest Residues. First of all, for whole-tree harvesting sites, it is then a question of recovering the Forest Residues in the delimbing and piling areas located at the edge of the road, which is the fastest and least expensive type of recovery operation.

For cut-to-length timber harvesting sites, the recovery operation consists of sending a forestry carrier to the cutting area to recover the residual forest biomass. This type of residual forest biomass harvesting operation is longer and more expensive than whole-tree harvesting operations.

Tailings are usually shredded or crushed before loading into trucks for transport. For maximum profitability, harvesting Residues should be done quickly after a short drying period: we must prevent rot from reducing the value of the Residues.

For Crown lands

To calculate the quantity of Forest Residues that is theoretically available within the BDO Zone, this procedure uses data from the "Bureau du Forestier en Chef (BFEC)" which are calculated every 5 years based on the annual allowable cut (AAC). Then, based on the Bios software from FPInnovations, a 43% reduction factor was applied to account for the fact that it is impossible to harvest the sum of all branches and tree-crowns following harvesting operations. Indeed, depending on various factors such as the harvesting method (whole-tree vs. cut-to-length), the type of species, the type of biomass that is recovered (branches, tree-crowns, foliage) and the loading method applied, it is estimated that only 57% of all Forest Residues can technically be recovered. Finally, to estimate the net quantity of Forest Residues technically available, this procedure substrates the quantity of Forest Residues that is harvested annually per region. In 2021, the 5-year average regarding the harvest of Forest Residues on public land corresponded to 6,7% of all technically available Forest Residues.

For private forests

To determine the technically available quantity of forest residues on private forests, we employed a conversion process. Firstly, we converted the allowable annual cut (AAC) of roundwood associated with private forests within the BDO zone from cubic meters per year (m^3/yr) to green metric tons per year (gmt/yr) using a conversion factor of 49.5%. This factor is representative of the conversion rate used for Crown lands.

Next, we converted the green metric tons (gmt/yr) to dry metric tons (dmt/yr) using a conversion factor of 0.5. This allowed us to obtain the quantity of roundwood in a dry and standardized form.

[6] WSP. 2021. *Inventaire de la biomasse disponible pour produire de la bioénergie et portrait de la production de la bioénergie sur le territoire québécois,* Rapport réalisé par WSP Canada Inc., pour le compte du Ministère de l'Énergie et des Ressources naturelles. Réf. WSP : 201-03354-00. 277 pages et tableaux, figures, cartes et annexes.

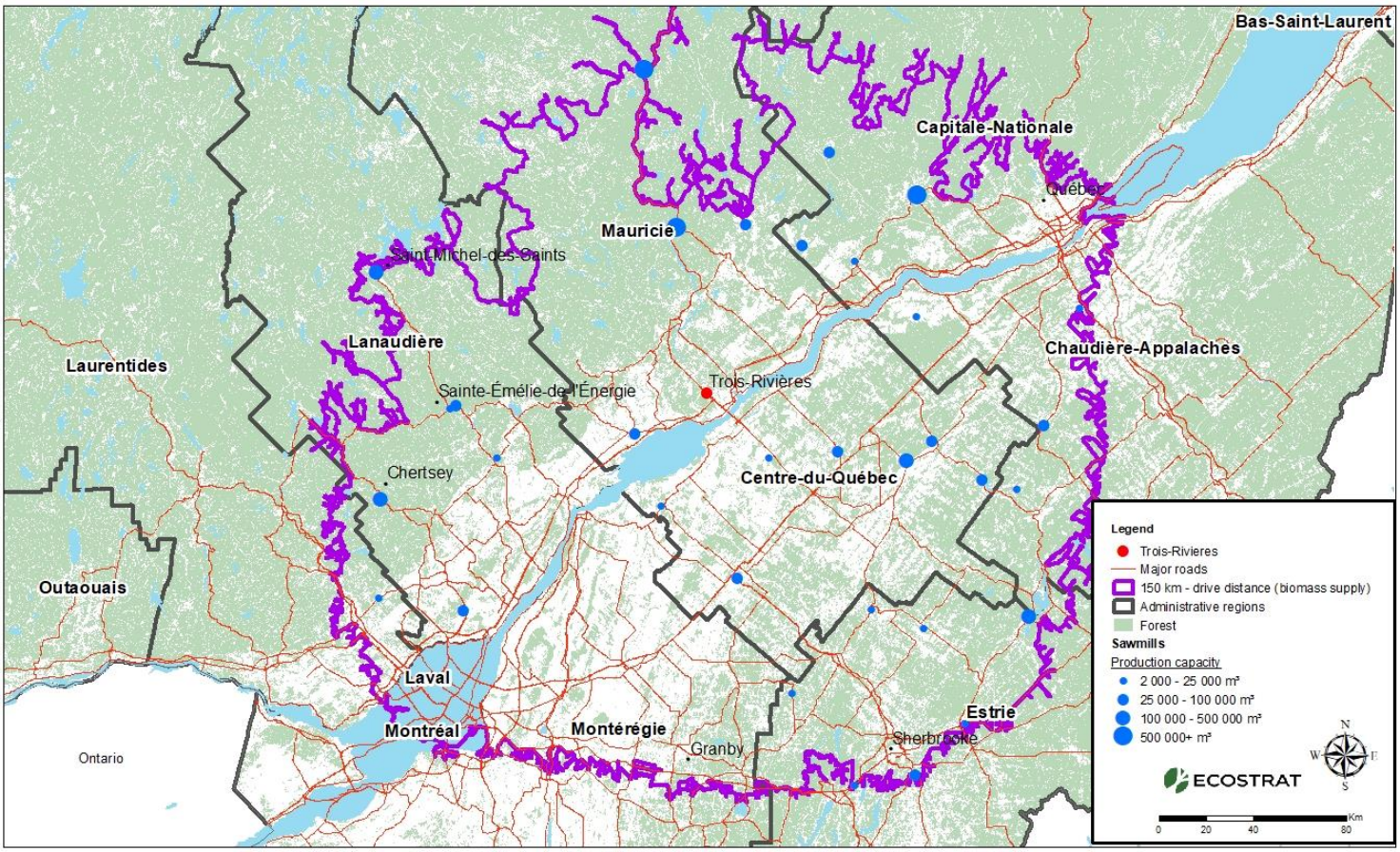
Subsequently, we estimated the total quantity of forest residues generated through harvest operations from this converted roundwood quantity.

Finally, considering factors such as accessibility, biomass quality, and demand, we applied various reduction factors to account for limitations. These reduction factors were applied to determine the technically available forest residues.

Our analysis indicates that approximately 16.5% of the total quantity of forest residues associated with the AAC of roundwood could potentially be available for recovery by the bioenergy sector. It is important to note that these estimations are subject to variations based on factors such as availability, market conditions, and technological advancements.

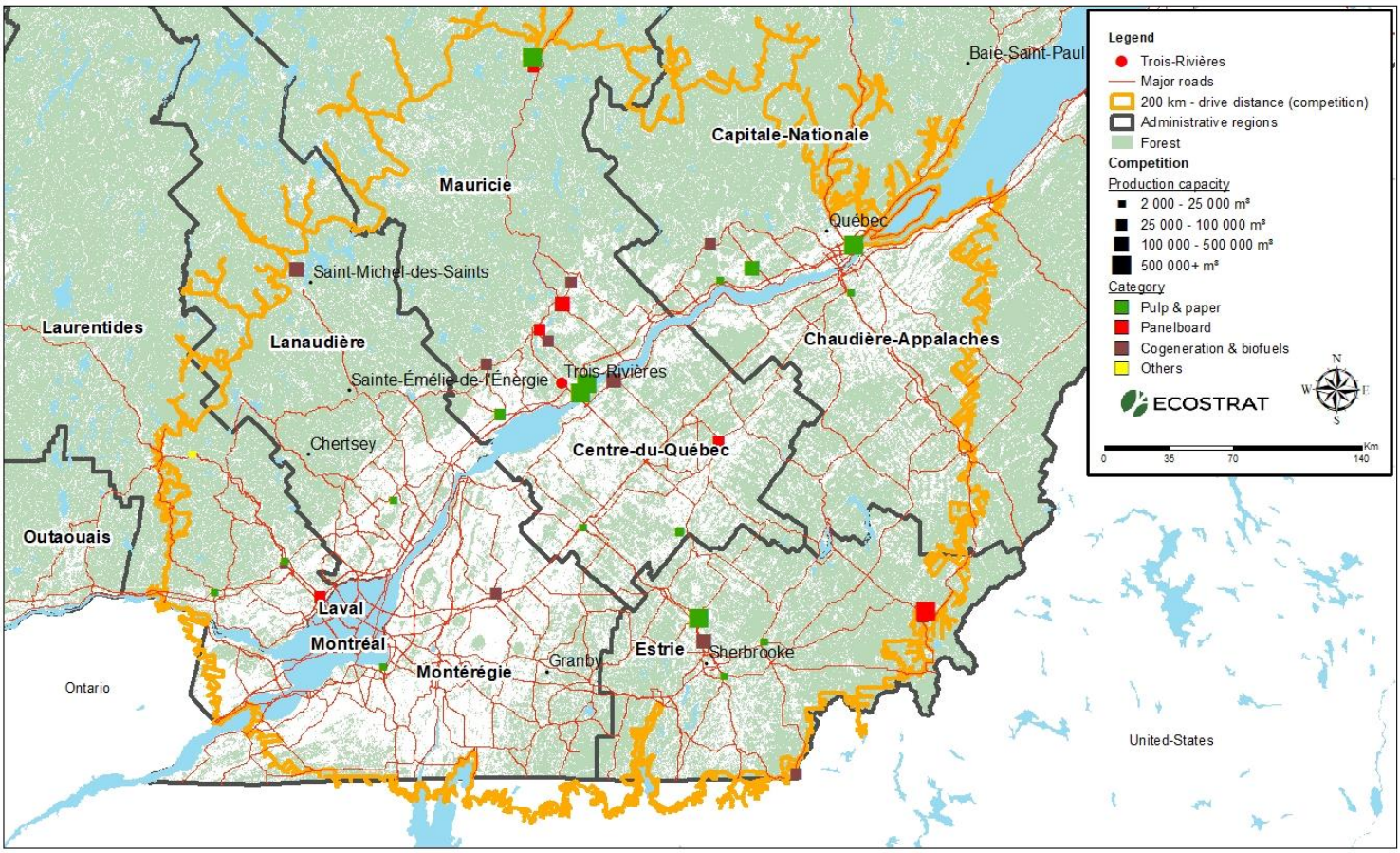
APPENDIX D: SAWMILLS

Map D-1. Sawmills within 150 km drive distance from Trois-Rivières



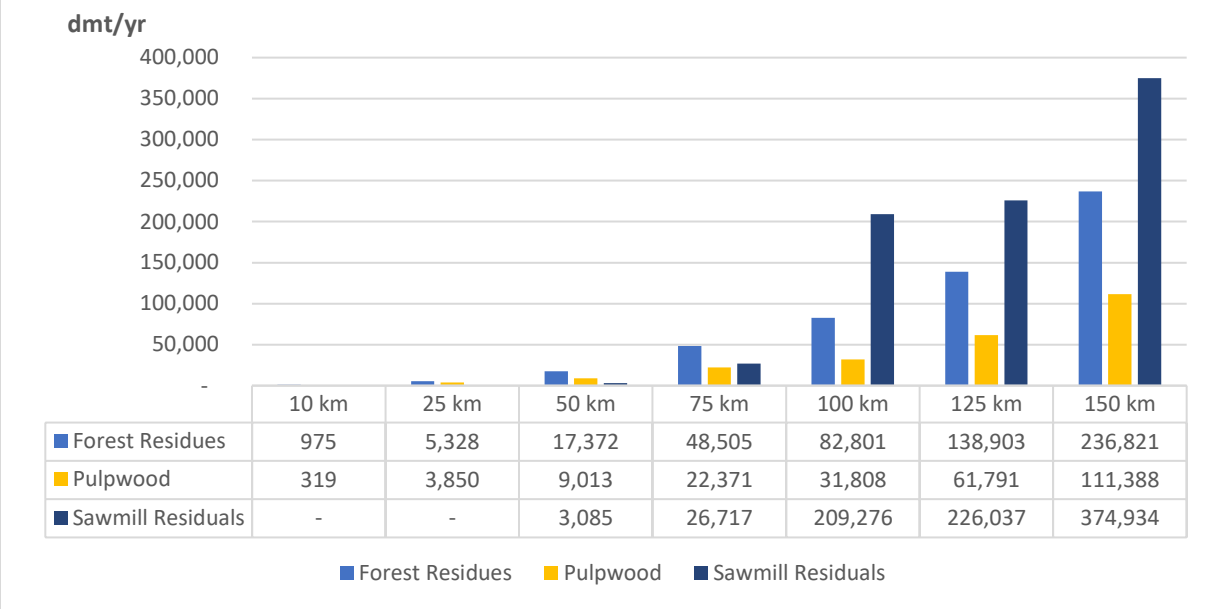
APPENDIX E: CURRENT COMPETITION

Map E-1. Current competitors for feedstock within 200 km drive distance from Trois-Rivières



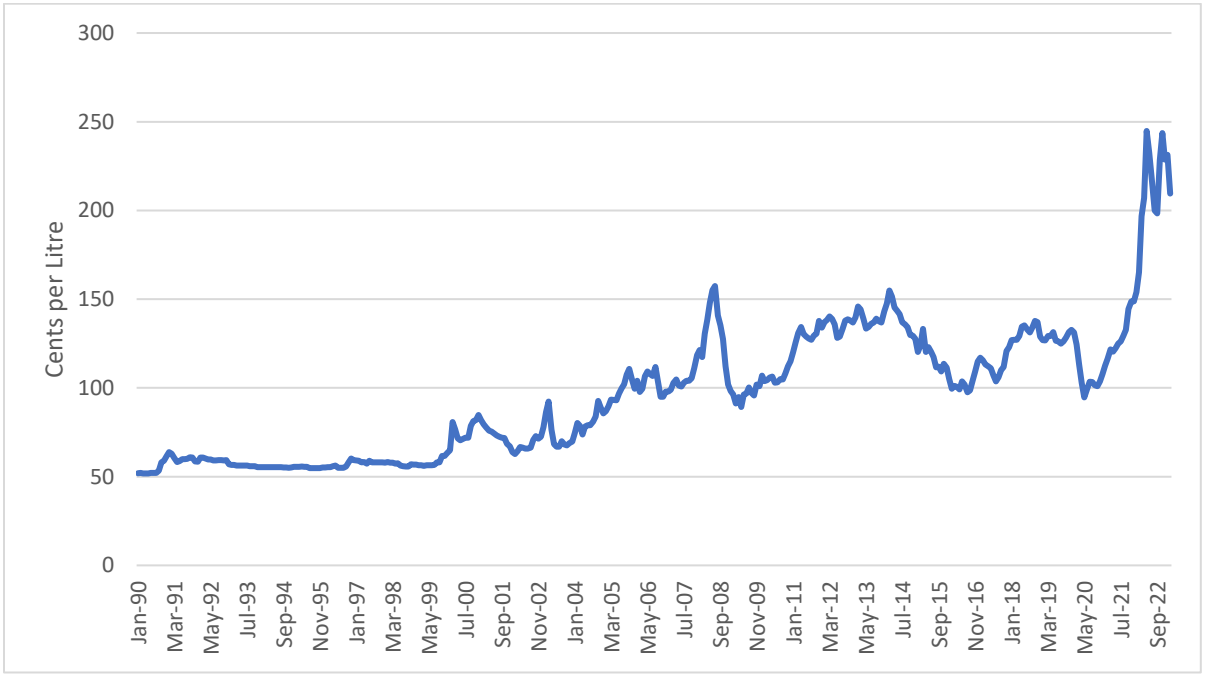
APPENDIX F: OTHER CHARTS AND FIGURES

Figure F-1: Biomass supply curve: potential availability at a distance



	10 km	25 km	50 km	75 km	100 km	125 km	150 km
Forest Residues	975	5,328	17,372	48,505	82,801	138,903	236,821
Pulpwood	319	3,850	9,013	22,371	31,808	61,791	111,388
Sawmill Residuals	-	-	3,085	26,717	209,276	226,037	374,934

Figure F-2: Historical diesel prices for Quebec, 1990–2023



APPENDIX G: DEFINITIONS

Feedstock availability

Availability refers to the state of being accessible, usable, or ready for use. It is a commonly used term to describe the degree to which a system, resource, or service can be accessed and operated within a specified timeframe. In simpler terms, availability measures how reliably and consistently something can be accessed and utilized when needed or expected. This is often quantified as a percentage, indicating the proportion of time that a system or service remains operational and accessible out of the total time considered. In the context of forest biomass, availability is dependent on various factors, including seasons, wood market conditions, workforce availability, natural disturbances, government policies, and investments. Due to the influence of these factors, our experience has shown that only a portion of the total biomass generated can be consistently and reliably accessible to potential buyers. To address this, we employ the Biomass Availability Multiple (BAM) as an estimation tool to determine the quantity of biomass that is typically available when needed within a specific timeframe. For this particular BZO Zone Rating, we apply a BAM ratio of 1.5x for Sawmill Residuals and 2x for Forest Residues. Pulpwood, on the other hand, does not require a BAM ratio as the estimates already incorporate the technical pulpwood availability, accounting for all the aforementioned factors.

Feedstock categories

Sawmill Residuals include wood chip, sawdust, shavings and bark.

Wood chip

Wood chip is a process residual made from low-grade or off-specification wood and off-cuts, essentially wood that remains after processing sawtimber into lumber. In Quebec, 42% of raw log ends up as wood chip. Aside from slightly lower moisture contents, wood chip produced from sawmilling operations is structurally identical to clean chip made from pulpwood. If woodchip comes from kiln-dried wood, it is considered "dry" (~10-20% moisture content), while if it comes from non-dried wood, it is referred to as "green" (~40-50% moisture content). Wood chip is frequently used by markets like pulp mills and wood pellet mills. In Quebec, in 2021, approximatively 41% of the biomass from all harvested logs ended up as wood chips.

Sawdust

Sawdust is a sawmill residual defined as being less than 2.5 mm in diameter. Approximately 8.75% of softwood and 14% of hardwood sawmill inputs by weight end up in sawdust form. Dry sawdust has ~10-20% moisture content, while "green" sawdust has ~40-50% moisture content.

Shavings

Shavings are process residuals defined as being between 2.5 and 15 mm in any dimension. Shavings are generated primarily from planer operations, with approximately 7.75% of softwood and 7% of hardwood sawmill inputs ending up in this form. Shavings are used by higher end markets, such as animal bedding and pellet manufacturing.

Bark

Bark, also referred to as "hog fuel," is a by-product of debarking operations and is typically used as boiler fuel. Bark tends to be uniform in size and shape. Approximately 5.2% of softwood and 10.8% of hardwood mill inputs end up as bark. The moisture content of bark is typically 55 – 65%.

Forest Residues

Forest Residues, alternatively "slash" or "hog fuel," is a by-product of in-woods forestry operations, including pulpwood production. This typically includes limbs, small low-grade logs, bark and crowns of harvested trees, as well as unwanted trees that have been cut or knocked down and left on site. Examples of this include dead and cull trees, as well as growing stock removed in forest silvicultural operations. Harvest residue is generally processed in woods to reduce the size and increase bulk density for transportation.

Pulpwood

Pulpwood is defined as roundwood with small diameter, usually up to 11-inches at breast height (dbh). Additionally, sub-quality roundwood (deformed, species with no markets) that cannot be processed by a sawmill is also considered as pulpwood. Pulpwood had been traditionally used to make paper, paperboard, oriented strand board (OSB), and medium density fiberboard (MDF). Currently, large quantities of pulpwood are also used to produce wood pellets. The moisture content of pulpwood is generally between 45% to 50% (as received)5 depending on the harvest season.

APPENDIX G: LEGAL DISCLAIMER

This BDO Zone Rating (the "Rating") is prepared for, and provided to, Trois-Rivières, QC community, and is intended to be read and used in its entirety and not in parts. Separation or alteration of any section or page from the main body of this Rating is expressly forbidden. In preparing this Rating, Ecostrat has used information obtained from third parties or otherwise publicly available. All such information has not been independently validated, verified, or confirmed by Ecostrat (except where otherwise specifically indicated) and Ecostrat makes no representation or warranty as to the accuracy or completeness of any information provided by third parties or otherwise publicly available. Therefore, it should be abundantly clear that under no circumstances should this BDO Zone Rating form the basis for an investment decision.

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