The Economic impact of Wahkohtowin's proposed Mycorrhizal Improved Forest Management Project

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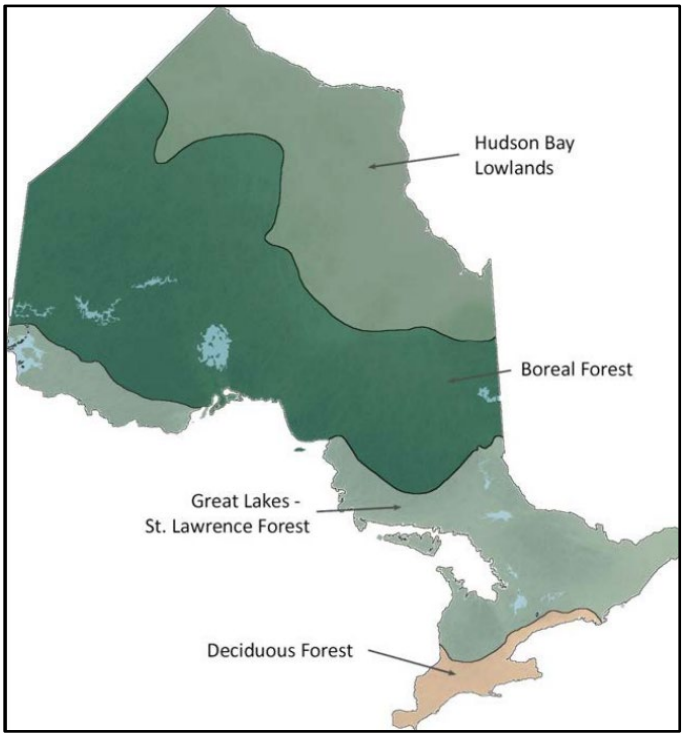
Glossary

Term	Definition
CO_2	Carbon dioxide
Carbon Offset	A measurable reduction in greenhouse gas emissions (or increase in carbon sequestration) used to compensate for emissions produced elsewhere. Forest-based offsets are commonly used in voluntary and regulatory carbon markets (Natural Resources Canada, 2025).
Carbon Price	The cost assigned to emitting one tonne of CO_2 equivalent, either through a carbon tax or emissions trading system.
Carbon Sequestration	The process by which carbon dioxide (CO_2) is removed from the atmosphere and stored in plants, soils, geologic formations, or the ocean. In forestry, this occurs as trees absorb CO_2 during photosynthesis and store it as biomass.
Direct Economic Impacts	Impacts resulting from change in output of a subject industry.
Full-Time Equivalent (FTE) Jobs	A ratio indicating the level of employment associated with a business or government where an FTE of 1.0 represents one person working full time hours for a given period of time and an FTE of 0.5 represents one person working for half of that time period.
Gross Domestic Product (GDP)	The value of all currently produced final goods and services created in a given period of time.
Gross Output	The total value of sales related to a good or service, including the value of intermediary goods or services used in production.
Input-Output (IO) Models	A quantitative economic model that represents the interdependencies between different sectors of a national economy or different regional economies.
Indirect Economic Impacts	The impacts generated through supply-chain transactions, as directly affected industries purchase goods and services from their suppliers.
Induced Economic Impacts	The impacts generated when employees spend the wages and salaries earned from both direct and indirect activities, creating additional demand in the broader economy.
Inflation	The decline of purchasing power of a given currency over time.
Labour Income	The amount employed people earn by working. It includes wages and benefits.
Model Shock	The modelled change in gross output in one or more industries or commodities included in the input-output model.
Multipliers	Factors of proportionality that related the change of one variable with the change in another. For example, $1.0 million in gross output may result in $0.6 million dollars in GDP. The gross output to GDP multiplier is therefore 0.6.
Nominal Dollars	The actual amount of dollars at a given time with no consideration for inflation.
Real Dollars	The constantly valued dollars, adjusted for inflation and based on purchasing power at a given point in time.
Value Added	The variance between the value of a final product and the inputs required to create it.

Introduction

Ontario is home to one of the largest forest areas in Canada, with over 71 million hectares—nearly 17% of the country's total. About 28 million hectares are classified as Crown-managed productive forests, where sustainable logging is allowed under long-term provincial plans. The boreal forest dominates Northern Ontario (**Figure 1**), supporting biodiversity, clean water, and carbon storage, while also playing a key role in the economy (Government of Ontario, 2016). In 2022, the forestry sector added $5.5 billion to Ontario's GDP and supported close to 149,000 jobs (Canada Action, 2023) (Government of Ontario , 2024).

Figure 1: Forest Regions of Ontario



Source: (Government of Ontario, 2017)

Two tree species, jack pine and black spruce, make up much of this harvest. They are essential for building materials, paper products, and increasingly, for their carbon storage potential (Government of Ontario, 2025). But conventional reforestation is slow, limiting how quickly new trees can provide economic or climate benefits.

Description of the Wahkohtowin Program

Qualitative Program Description

The Wahkohtowin-Mikro-Tek forest seedling inoculation technology was developed and tested by a small business in Timmins, Ontario, beginning in 2001. The naturally occurring mycorrhizal fungi benefit trees in the forest by attaching to the root systems and, though hyphae grown out into the soil, bring nutrients and water to the tree in exchange for carbohydrates that the fungi need. Test plots were established across Canada between 2001 and 2003 to evaluate the efficacy of the application technique developed in the Mikro-Tek lab in Timmins.

Wahkohtowin Development GP Inc., a for-profit company owned by three Northern Ontario First Nations, joined Mikro-Tek in 2020 to apply for federal funding to test the technology across the boreal forest. The consortium, in partnership with major forest managers in Ontario, secured funding to inoculate and plant 53 million trees as a commercialization exercise. These plantings have occurred mainly in Northern Ontario, with the initiative now expanding; the first trees intended for Northern BC were inoculated this year for planting in 2026. The inoculated trees lead to higher stand volume and improved biodiversity outcomes, which are monetized as carbon and biodiversity credits. These outcomes reflect the delta, the improvement over conventional planting methods, which benefits participating forest companies through both ecological and financial returns.

The program is in its third year and the response from First Nation partners, forest companies, nursery producers, and the finance sector has been overwhelmingly positive. This is demonstrated through interviews, personal communications, and testimonials, as well as high participation and engagement rates. Forest managers and companies have shown strong interest in the outcomes, particularly improved seedling survival and site occupancy rates, and increased stand volume. The consortium has received inquiries about the carbon offset products from multiple industrial sectors across Canada including mining, energy and telecommunications companies. Mikro-Tek has secured forward contracts on carbon offset volume with technology companies in the US, worth millions of dollars and payable upon delivery.

The project and technology support improved forest management from a First Nations perspective. It provides a viable alternative to using the herbicide glyphosate, linked to many environmental and health impacts, to manage ‘competition’ brush on young plantations. Mycorrhizal inoculation promotes stronger seedling establishment and early growth, enabling companies to reduce herbicide use while treating larger areas. This results in cost savings and helps preserve critical habitat for moose, bears, waterfowl, and other species that rely on young cutblocks for shelter and forage.

Quantitative Program Description

From an economic perspective, the Wahkohtowin Mycorrhizal Inoculation Project is grounded in the forest sector, with activities aligned with Ontario's regulated Crown-managed forestry operations.

The program supports value generation through increased forest productivity, timber yield, and the creation of verified carbon offsets. Initial program parameters include:

- Annual Program Spending: Estimated at $7 million per year at full scale, covering operational costs, workforce wages, materials, and monitoring activities. This figure represents the expected steady-state budget once the program has ramped up over the initial implementation period.

- Scalability Considerations: In response to an estimated $10 million in top-line revenue, questions have been raised about the program's potential to scale to $100 million annually. This highlights the strategic importance and broader economic potential of the initiative in Northern Ontario. The economic opportunity includes seasonal and monitoring jobs, many of which may be filled by community members, including First Nations. There is also potential for equity participation in the project's financial benefits. In addition, the program contributes to increased timber yield and carbon sequestration per hectare, reinforcing its role in sustainable forest management.

This analysis is intended to illustrate scale, but economic effects may not grow in a perfectly linear fashion with spending. As program size increases, factors such as operational efficiency, regional capacity, and multiplier saturation may influence actual outcomes.

Program Impact

The Wahkohtowin Natural Climate Management Project is designed to deliver measurable, long-term impacts across three key dimensions: forest productivity, carbon sequestration, and ecosystem resilience. These environmental benefits translate directly into economic value for Ontario's forestry sector and contribute to national climate and biodiversity goals.

Tree Growth and Forest Output

The application of mycorrhizal inoculation during planting significantly improves both tree survival and growth outcomes for Ontario's dominant boreal species, jack pine and black spruce. Based on project data:

- Jack pine stands are projected to see an average 29% increase in stand volume compared to non-inoculated (baseline) sites.
- Black spruce stands are projected to see an average 13% increase in stand volume per hectare.

Importantly, the increase in stand volume in inoculated plots is more pronounced in poorer sites, which has implications for climate adaptation, particularly in areas where drought is or may become a concern.

Field trials show that inoculated jack pine and black spruce stands consistently achieve higher survival rates compared to conventional plantings. On average, jack pine plots showed a 17% increase in stem density, while black spruce plots showed an 11% increase, indicating improved early survivability (Shabaga, Jason et. al, 2025). These gains in survival, combined with faster growth supported by mycorrhizal inoculation, contribute to overall stand volume increases of 29% for pine and 13% for spruce on a per-hectare basis. Together, these outcomes enhance the productivity and long-term value of reforested sites, particularly in areas with challenging growing conditions.

In addition to boosting stand volume, inoculated trees exhibit significantly higher early survival rates. Multiple field assessments report improvements in the areas surveyed, although planting density and site conditions vary.

- A 28% increase in jack pine survivability was observed, with counts rising from 1,483 stems per hectare (non-inoculated) to 1,910 stems per hectare (inoculated).
- A 21% increase in black spruce survivability was recorded, from 1,345 to 1,636 stems per hectare (WaDaGrow Forestry, 11-year Site Occupancy Index).
- Complementary long-term density measurements show 17% higher survivability in jack pine and 13% in black spruce after 20–25 years (Shabaga, Jason et al., 2025).
- Earlier CFIA field trials also recorded 3-year survival rates ranging from 8% to 15%, supporting improved establishment during critical early growth stages.

These combined gains in survival and growth lead to a greater number of healthy, merchantable trees per hectare—particularly in the most ecologically vulnerable areas—and significantly enhance the long-term productivity and value of reforested sites across Ontario's boreal forest.

Economic Impacts

The economic impacts of the Wahkohtowin program have been modelled using Statistics Canada Input-Output multipliers, capturing the full effects across direct, supply chain (indirect), and household spending (induced) channels. These impacts are measured in terms of employment (jobs), labour income and GDP contributions. Please note that these results reflect long-term impacts over a standard 65-year forest rotation and assume consistent program operations at scale; they should be interpreted in the context of economies of scale and gradual yield realization.

Core Economic Impact of the Program

This section summarizes the estimated annual economic impacts of the Wahkohtowin Natural Climate Management Project, using Statistics Canada's 2021 within-province input-output multipliers for the Ontario Forestry and Logging sector (NAICS 113).

The estimated annual economic impacts are presented in **Table 1**, which presents modeled impacts based on $10 million in annual program spending. To illustrate the range of potential economic outcomes as the program scales, $7 million and $100 million scenarios were also modeled and are discussed in the narrative below. A full breakdown is available in Appendix C – **Table 6**.

Table 1: Estimated Annual Economic Impacts of the Wahkohtowin Program in Ontario

Annual Program Spending (Million)	GDP Contribution (Million)	Jobs (FTEs)	Labour Income (Million)
$10	$8.27	52	$3.82

Source: (Statistics Canada, 2024), (Avaanz Ltd. , 2025).

In the core scenario of $10 million in annual spending:

- The program is expected to contribute $8.27 million in GDP.
- It would support approximately 52 full-time equivalent jobs across Ontario.
- It would generate an estimated $3.82 million in labour income through wages and salaries.

To illustrate the program's scalability, additional scenarios were modeled:

- At $7 million/year, the program would generate approximately $5.79 million in GDP, support 36 jobs, and contribute $2.67 million in labour income.
- At a scaled-up scenario of $100 million/year, the impacts grow proportionally: $82.7 million in GDP, 517 jobs, and $38.2 million in labour income.

These larger figures demonstrate the potential economic contribution if the program were expanded across a wider geographic footprint or implemented at higher funding levels.

To put these figures in context, the $82.7 million GDP contribution under a $100M program would represent roughly 1.9% of Ontario's total forestry sector GDP, which stood at $4.3 billion in 2020 (Canada Action, 2023). Given the program's focus on Northern Ontario, the relative economic importance to local, forest-based communities would be significantly higher.

Economic Impact of Increased Lumber Yield

The enhanced forest productivity enabled by the program will generate additional marketable timber, contributing substantial economic value through Ontario's forestry products supply chain. To estimate this value, a 50,000-hectare annual treatment area was modeled, consistent with the project's operational scope. The treated area was allocated by species—33.3% jack pine and 66.7% black spruce—reflecting the representative boreal composition. Baseline volumes per hectare were converted to thousand board feet (MBF) using a standard factor of 0.424 MBF per cubic metre (Forest NB, 2016). Species-specific productivity gains of approximately 29% for jack pine and 13% for black spruce were then applied to the baseline yields, producing the incremental harvest volume attributable to inoculation. These results are expressed as annualized impacts for comparability with program spending; however, the underlying biological effects accumulate gradually and are only fully realized over the ~65-year forest rotation.

The resulting increase amounted to:

- Estimated Annual Additional Lumber Production: 3,887 MBF (thousand board feet).
- Average Market Price: $620 per MBF (Government of Canada, 2025b)
- Annual Gross Value of Additional Lumber: $2.41 million

Using sector-specific multipliers, the projected economic impacts of the increased lumber yield include:

- Employment Generated: 12 full-time equivalent jobs per year
- Labour Income: $920,518 per year
- GDP Contribution: $1.99 million per year

These impacts represent the ongoing annual uplift attributable to enhanced forest productivity. While the biological gains materialize gradually as inoculated stands mature across the ~65-year harvest cycle typical of jack pine and black spruce in Ontario, the model expresses the result as an annualized flow at the provincial harvest scale (Government of Ontario, 2021).

These figures capture the direct, indirect (supply chain), and induced (household re-spending) effects of increased activity throughout the forest sector value chain. For full table refer to **Appendix C - Table 6**.

Based on an estimated 15,000 board feet of lumber required per home, the increased yield, when fully realized, could support the construction of approximately 259 single-family homes across Ontario (National Association of Home Builders, 2025) (see **Appendix D** for methodology).

Economic Impact of Carbon Sequestration

The Wahkohtowin Project's carbon sequestration offers significant climate value and the potential for financial returns through the creation of verified carbon offsets. These offsets provide a way to quantify and monetize environmental contributions, allowing forest-based climate solutions to participate in emerging carbon markets.

To ensure consistency with the project's biological and operational scope, sequestration impacts were modelled based on 50,000 hectares of treated forest area per year, distributed across the two dominant boreal species. Jack pine accounts for 33.33% of the treated area and has a net annual sequestration benefit of 0.95 tonnes of CO_2 equivalent (tCO_2e) per hectare, while black spruce represents 66.67% of the treated area with a net annual sequestration benefit of 0.72 tCO_2e/ha/year. Multiplying the treated area by the species-specific sequestration benefit yields an annual net additional sequestration from inoculation of 39,833 tCO_2e (**Table 2**).

Table 2: Annual Sequestration by Species

Species	Area Treated (ha)	Net Benefit (tCO_2e/ha/year)	Total Annual Carbon (tCO_2e)
Jack Pine	16,667	0.95	15,833
Black Spruce	33,333	0.72	24,000
Total	**50,000**	—	**39,833**

Source: (Avaanz Ltd. , 2025).

Under leading forest carbon crediting methodologies such as VERRA and other voluntary and compliance registries, deductions are applied to account for harvest-related removals and non-permanence risks:

- Planted Forest Discount (50%) – Applied to removal-based projects with a future harvest component, limiting the creditable portion of carbon sequestration in line with registry rules.
- Buffer Pool Discount (15%) – Applied as part of the non-permanence risk assessment during project design and certification. This portion of credits is placed into a pooled buffer reserve account held by the registry as insurance against carbon reversal events (e.g., wildfire, pest infestation).

Applying these adjustments results in the eligible credit volume shown in **Table 3**.

Table 3: Carbon Credit Volume after Adjustments

Adjustment Step	Carbon (tCO_2e)
Total Carbon	39,833
Less Planted Forest Discount	−19,917

Adjustment Step	Carbon (tCO_2e)
Less Buffer Pool Contribution	−5,975
Carbon Available for Credits	**13,942**

Source: (Avaanz Ltd. , 2025).

At different market price scenarios, the eligible 13,942 tCO_2e/year would generate the following estimated gross annual revenue, before accounting for verification, transaction, and administration costs (**Table 4).**

Table 4: Potential Annual Carbon Credit Value

Carbon Price ($/tCO₂e)	Annual Value ($)
$50	$697,083
$75	$1,045,625
$90	$1,254,750

Source: (Avaanz Ltd. , 2025).

The economic impacts of the carbon credit revenues were estimated using Statistics Canada's within-province input-output multipliers for NAICS 541620 – Management, Scientific and Technical Consulting Services (full methodology in **Appendix B**).

As shown in **Table 5,** the annual credit value at $75/$tCO_2e$ was multiplied by the industry-specific GDP, labour income, and employment multipliers to capture direct, indirect (supply chain), and induced (household spending) effects.

Table 5: Economic Impacts at $75/$tCO_2e$

Impact Category	Direct	Indirect	Induced	Total
GDP ($)	646,196	238,403	289,638	1,174,237
Jobs (FTE)	5	2	2	10
Labour Income ($)	493,535	154,753	$117,110	765,398

Source: (Avaanz Ltd. , 2025).

At $75/$tCO_2e$, the carbon credit component of the Wahkohtowin Project is estimated to support 10 full-time equivalent jobs, generate $765,398 in annual labour income, and contribute $1.17 million to Ontario's GDP each year.

The program's annual net sequestration of 39,833 tCO_2e is equivalent to removing about 8,659 passenger vehicles from the road each year (EPA, 2023).

Summary

The Wahkohtowin Natural Climate Management Project is poised to deliver significant and lasting benefits to Ontario and Canada, spanning economic development, climate resilience, and Indigenous-led land stewardship. Through a combination of increased forest productivity, carbon sequestration, and sustainable forest management, the project makes a compelling case for investment and long-term support.

At an annual program spending level of $7 million, the project is expected to generate $5.8 million in GDP, $2.7 million in labour income, and support 36 full-time equivalent (FTE) jobs. These figures reflect not only the direct effects of program operations, but also the broader ripple effects through the provincial economy via supply chains and household spending.

The enhanced forest productivity enabled by inoculation is projected to produce 3,887 MBF (thousand board feet) of additional lumber per year. This was calculated by applying species-specific increased yield assumptions—29% for jack pine and 13% for black spruce—to a 50,000-hectare treated project area. Valued at an average market price of $620 per MBF, the gross value of this additional lumber is approximately $2.41 million annually. The corresponding annualized economic impacts are estimated at $1.99 million in GDP, $920,518 in labour income, and support for 12 FTE jobs per year.

The climate benefit from inoculation, while more modest in scale, is both measurable and marketable. After applying registry-aligned deductions (50% Planted Forest Discount, 15% Buffer Pool Discount), the project is modeled to generate 13,942 tCO_2e of net additional sequestration credits per year. At a market-aligned price of $75 per tCO_2e, this annual credit volume has a gross value of $1.045 million before verification, transaction, and administrative costs. The corresponding economic impacts are $1.17 million in GDP, $765,398 in labour income, and support for 10 FTE jobs per year. This sequestration benefit is equivalent to removing approximately 8,659 passenger vehicles from the road each year, reinforcing the project's contribution to Canada's climate and clean growth objectives.

These results are expressed as annualized impacts for comparability with program spending; however, the underlying biological effects accumulate gradually and are only fully realized over the ~65-year forest rotation.

While both increased lumber yield and carbon sequestration provide measurable economic and environmental value, their employment effects differ significantly. The production of additional lumber requires sustained, labour-intensive operations across the forestry value chain—including harvesting, transport, milling, and processing—each supporting ongoing employment and supply chain activity. In contrast, carbon sequestration occurs passively as trees grow and requires minimal direct labour beyond periodic monitoring, modeling, and verification for credit issuance. As a result, the timber yield component is associated with higher ongoing employment over the 65-year rotation, while the carbon-related activities, though valuable, support fewer jobs. These outcomes are consistent with sector-specific economic multipliers and reflect the broader role of

forestry as a goods-producing industry versus the more technical, service-based nature of environmental consulting.

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Appendix A – Industry Classification

According to Statistics Canada, **NAICS 113 – Forestry and Logging** – comprises establishments primarily engaged in:

- Growing and harvesting timber on a long production cycle (of ten years or more). Long production cycles use different production processes than short production cycles, which require more horticultural interventions prior to harvest, resulting in processes more similar to those found in the Crop production subsector. Consequently, Christmas tree production and other production involving production cycles of less than ten years, are classified to the Crop production subsector.

- Industries in this subsector specialize in different stages of the production cycle. Reforestation requires production of seedlings in specialized nurseries. Timber production requires natural forests or suitable areas of land that are available for a long duration. The maturation time for timber depends upon the species of tree, the climatic conditions of the region, and the intended purpose of the timber. The harvesting of timber, except when done on an extremely small scale, requires specialized machinery unique to the industry. The gathering of forest products, such as gums, barks, balsam needles and Spanish moss, are also included in this subsector.

- The subsectors include:

  - **1131 - Timber tract operations**: This industry group comprises establishments primarily engaged in the operation of timber tracts, for the purpose of selling standing timber.
  - **1132 - Forest nurseries and gathering of forest products**: This industry group comprises establishments with two different production processes, those primarily engaged in growing trees for the purpose of reforestation, and those primarily engaged in gathering forest products.
  - **1133 - Logging**: This industry group comprises establishments primarily engaged in cutting timber, producing rough, round, hewn, or riven primary wood, and producing wood chips in the forest. Establishments primarily engaged in cutting and transporting timber are also included in this industry.
    (Government of Canada, 2018)

This classification aligns with the Input-Output industry category **"Forestry and Logging" (BS113000**), which was applied in the economic impact model to represent the core program activities associated with timber yield improvements and forestry operations.

(Statistics Canada, 2024)

According to Statistics Canada, **NAICS 541620 – Environmental Consulting Services** comprises establishments primarily engaged in:

- Providing advice and assistance to businesses and other organizations on environmental issues, such as the control of environmental contamination from pollutants, toxic substances, and hazardous materials.
- Conducting environmental assessments, audits, and site remediation planning.
- Supporting regulatory compliance and certification for environmental performance.
- Assisting with the measurement and management of greenhouse gas (GHG) emissions, including carbon footprinting, offset development, and participation in voluntary or regulatory carbon markets.

Environmental consulting services are often involved in:

- Monitoring, reporting, and verification (MRV) for carbon offsets;
- Development of carbon sequestration projects;
- Stakeholder and Indigenous engagement on land stewardship;
- Technical advisory related to land, air, and water impacts.

This classification is most appropriate for the carbon sequestration and offset development components of the Wahkohtowin Natural Climate Management Project.

(Government of Canada, 2018)

This classification aligns with the Input-Output industry category "**Management, Scientific and Technical Consulting Services" (BS541600)**, which was applied in the economic impact model to reflect the nature of carbon offset project development, monitoring, and related environmental services.

(Statistics Canada, 2024)

Appendix B – Methodology

1.1.1 Economic Impact Modelling Approach

The economic impacts of the Wahkohtowin Natural Climate Management Project were estimated using Statistics Canada Input-Output multipliers. The modelling captures the following economic effects:

- Direct Impacts: Employment, income, and GDP directly created through program activities (e.g., tree planting, monitoring, carbon tracking).
- Indirect Impacts: Economic activity generated in upstream supply chains through purchases of goods and services (e.g., forestry equipment, training services).
- Induced Impacts: Employment and income effects from the re-spending of wages by individuals employed directly and indirectly.

The model quantifies impacts in three key metrics:

- Jobs (Full-Time Equivalent, FTE positions)
- Labour Income (Wages and salaries earned)
- Gross Domestic Product (GDP) (Value-added to the economy)

1.1.1.1 Input-Output Modelling

Input-output models (IO models) are designed to conceptualize an economy by displaying the interconnected industries within that economy. IO models are a tool to calculate economic impacts associated with a change in gross output or "shock" within those industries.

An input-output analysis forecasts the economic impacts within the industries that are expected to experience a change in spending using IO models. Since industries are interconnected, input-output analysis account for the cascade of economic activity between related industries. This results in the ability to forecast economic impacts across an economic ecosystem, arising from an initial "shock".

In this analysis the economic impacts associated with the spending were calculated using the 2021 Statistics Canada provincial and territorial, industry input-output multipliers at the detail level (Statistics Canada 2021). The input-output multipliers provide estimates of economic impact per dollar of output delivered to final demand (final consumption expenditures, capital formation, or exports). The output is defined by industry sector according to the Input-Output Industry Classification. The economic impact is estimated for output, Gross Domestic Product (GDP) and its components (Statistics Canada, 2024).

This analysis was conducted using the "within province" multipliers for the Province of Ontario.

The economic impacts are calculated at 3 levels:

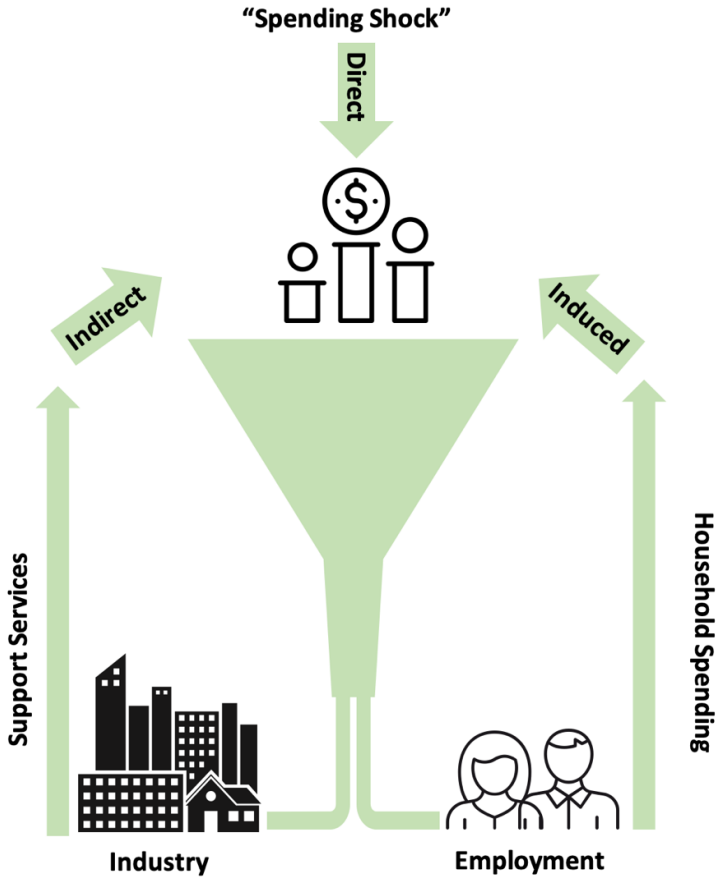
- **Direct impacts** – the initial changes in economic variables resulting from the initial spending "shock" (**Figure 2**).
- **Indirect impacts** – the iterative subsequent changes in economic variables associated with industry spending to support the direct spending associated with the initial shock. This includes all the chain reaction of output up the production stream since each of the products purchased will require, in turn, the production of various inputs (**Figure 2**).
- **Induced impacts** – the iterative subsequent changes in economic variables associated with changes in household spending related to the direct and indirect impacts on labour income (**Figure 2**).

The sum of these 3 levels of impact is the total economic impact.

Three economic variables are forecast:

- **Gross Domestic Product (GDP)** – the value of the final output of finished goods and services. GDP does not include the value of intermediate production.
- **Labour Income** – the value of wages and benefits earned by employed people working. Labour income is a constituent part of GDP.
- **Employment** – the years of full time equivalent (FTE) jobs worked in either the government or business.

Figure 2: Interrelationships of Input-Output Analysis



1.1.2 Limitations and Assumptions

- Input-Output multipliers assume constant returns to scale and average industry conditions.
- Lumber prices and carbon offset prices were based on available market data at the time of modelling; future variations are possible.
- Final project spending figures and carbon sequestration volumes will refine the precision of the estimates when available.

Appendix C – Input- Output Modelling Results

Economic impacts were estimated using Statistics Canada's 2021 within-province input-output multipliers. For project spending and lumber-related activities, the NAICS 113 – Forestry and Logging category was applied, with impacts calculated for annual program spending scenarios of $7 million, $10 million, and $100 million. For carbon credit generation and related scientific/technical services, the NAICS 541620 – Management, Scientific and Technical Consulting Services category was used[1]. In both cases, impacts are reported as direct, indirect, and induced effects, capturing total output, GDP contribution, labour income, and employment (full-time equivalent jobs) supported within Ontario's economy. **Table 6** presents the complete summary of all scenarios analyzed.

Table 6: Annual Economic Impact of the Wahkohtowin Program

		Direct	Indirect	Induced	Total
Project W - (7M)	GDP	$3,003,000	$1,862,000	$924,000	$5,789,000
	Jobs	15	15	6	36
	Labour Income	$1,288,000	$1,008,000	$378,000	$2,674,000
Project W - (10M)	GDP	$4,290,000	$2,660,000	$1,320,000	$8,270,000
	Jobs	21	21	9	52
	Labour Income	$1,840,000	$1,440,000	$540,000	$3,820,000
Project W (100M)	GDP	$42,900,000	$26,600,000	$13,200,000	$82,700,000
	Jobs	214	212	91	517
	Labour Income	$18,400,000	$14,400,000	$5,400,000	$38,200,000
Increased Lumber	GDP	$1,033,776	$640,989	$318,085	$1,992,849
	Jobs	5	5	2	12
	Labour Income	$443,391	$347,002	$130,126	$920,518
Carbon Sequestration ($75)	GDP	$646,196	$238,403	$289,638	$1,174,237
	Jobs	5	2	2	10
	Labour Income	$493,535	$154,753	$117,110	$765,398

Source: (Statistics Canada, 2024), (Avaanz Ltd. , 2025).

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[1] The sector BS541600 – Management, Scientific and Technical Consulting Services is a detail-level industry that falls under the broader BS540 – Professional, Scientific and Technical Services category in the Statistics Canada Input–Output multipliers. Using BS541600 ensures alignment with the detailed multipliers available for Ontario (2021), while BS540 would represent the broader industry grouping *(Statistics Canada, 2019)*.

Appendix D – Calculations

Annual Gross Value of Additional Lumber

The annual gross value of additional lumber was calculated by multiplying the estimated annual additional lumber production by the average market price per thousand board feet (MBF).

1. Annual additional lumber production was derived from the model:
    - A 50,000-hectare treatment area was assumed, split into jack pine (33.3%) and black spruce (66.7%).
    - Baseline volumes per hectare were converted into MBF using the standard factor of 0.424 MBF per cubic metre (Forest NB, 2016).
    - Species-specific productivity gains from inoculation were applied: 29% for jack pine and 13% for black spruce.
    - These assumptions yield an incremental harvest volume of 3,887 MBF per year.
2. Market valuation:
    - The average market price of softwood lumber was taken as $620 per MBF (Government of Canada, 2025a).
    - Gross Value = 3,887 MBF × $620/MBF = $2.41 million per year.

This figure represents the gross value of incremental lumber attributable to inoculation before accounting for downstream processing costs, transaction fees, or price volatility.

Lumber Yield Equivalency Calculation – Residential Housing Units

The estimated number of homes that could be constructed with the additional lumber produced by the Wahkohtowin Project is based on standard framing material requirements for single-family detached homes in Ontario.

- Assumed average softwood lumber usage per home: 15,000 board feet (BF), or 15 MBF
- This reflects standard framing for homes between 1,500–2,000 sq ft, consistent with industry norms and Ontario housing sizes.
- Using this assumption, the number of homes supported is calculated as total yield divided by 15.

(National Association of Home Builders, 2025).

Carbon Sequestration Modelling Steps

To estimate the carbon sequestration impact, the analysis begins with a project area of 50,000 hectares treated per year, divided between jack pine (33.3%, or 16,667 hectares) and black spruce (66.7%, or 33,333 hectares). Species-specific sequestration rates were then applied: jack pine was assumed to sequester 0.95 tCO_2e per hectare per year, yielding 15,833 tCO_2e, while black spruce was assumed to sequester 0.72 tCO_2e per hectare per year, yielding 24,000 tCO_2e. Combined, this results in a gross annual sequestration of 39,833 tCO_2e. In line with leading carbon crediting methodologies (e.g., VERRA), deductions were applied to reflect harvest-related removals

and non-permanence risks. A 50% Planted Forest Discount reduced the total by 19,917 tCO_2e, and a further 15% Buffer Pool contribution reduced it by 5,975 tCO_2e, leaving 13,942 tCO_2e of eligible credits per year. At market-aligned price scenarios of $50, $75, and $90 per tonne, this eligible credit volume translates to estimated gross annual revenues of $697,083, $1,045,625, and $1,254,750, respectively, before transaction and administrative costs.

Passenger Vehicles

The estimated number of passenger vehicles offset by the Wahkohtowin Project's annual carbon sequestration is based on data from the U.S. Environmental Protection Agency (EPA).

According to the EPA's Greenhouse Gas Equivalencies Calculator (2023):

- One passenger vehicle emits approximately 4.6 metric tonnes of CO_2 per year, based on the following assumptions:
    - Average annual distance traveled: 11,500 miles
    - Average fuel economy: 22.0 miles per gallon
    - Emissions factor: 8.89 kg CO_2 per gallon of gasoline combusted

(EPA, 2023)