COMMITTED TO WEALTH CREATION

QUÉBEC TIMBER PRODUCTION STRATEGY

Votre gouvernement

Québec

Committed to **Wealth Creation**

- **Strengthens the competitiveness of the forest industry**
- **Promotes innovation, modernization and market development**
- **Contributes to climate change mitigation**
- **Contributes to sustainable forest management**

This document is available on the following website:
mffp.gouv.qc.ca
Original text in French

Cover photos credits

Forest: Gérald Landry, MFFP
Wood: Adobestock

Legal Deposit

Bibliothèque et Archives nationales du Québec, 2020
ISBN : 978-2-550-86556-8 (print)
ISBN : 978-2-550-86557-5 (PDF)

A Word from the Minister

The Québec Timber Production Strategy is the product of an extensive consultation process. As a result, it meets the industry's needs and still satisfies the sustainable development aspirations of Québecers. Its purpose is to develop Québec's forests responsibly, with a view to increasing the contribution made by the forest products industry to the economy of Québec and its regions, and continuing to address public needs and values. It also sets out the major role that the forest will play, now and in the future, in achieving Québec's objectives to tackle climate change. We hope to increase the wealth obtained from the forest while applying the Government's protection, conservation and social acceptability guidelines.

With the Strategy, the Gouvernement du Québec has taken an important step that will help propel Québec's forest industry into the future. It will cultivate the collective wealth we derive from wood by applying an approach aimed at increasing the productivity of the forests under management and improving the characteristics of the timber to encourage harvesting more timber that meets the needs of the forest industry. To do this, it will take action to optimize the harvesting of available timber and produce more timber with the characteristics sought by the industry through profitable investments for our society. The Strategy forms part of Québec's economic recovery plan, and gives the forest industry a key role in the recovery of both Québec and its regions.

The forestry sector is present in 902 municipalities, and is one of Québec's major economic pillars due to its economic impacts. In 2018, it generated a gross domestic product (GDP) of $6.5 billion, or 2% of Québec's total economic activity, and helped to maintain roughly 60,000 direct jobs. With sales of $10.5 billion outside Canada, the forest sector accounts for 11% of all Québec's exports.

With this new Strategy, the Government will be able to optimize its silvicultural investments by providing rigorous care to the forests in order to improve the predictability and stability of timber supplies and better meet the forest industry's needs. In doing this, we will enhance the sector's prosperity by reinforcing the competitive capacity of the forest products industry. In addition, Québec will make sure the necessary resources are available to support products innovation and diversification to meet market needs.

The Gouvernement du Québec has undertaken to provide the means needed to ensure the success of the Québec Timber Production Strategy. Access to quality timber will be one of its priorities. A decentralized approach will allow each region to contribute to common goals via its own regional strategy.

In short, our efforts to ensure sustainable development will allow millions of Québecers as well as future generations to take advantage of the many opportunities offered by the forest. As a result, our forests will continue to be a source of pride and prosperity for society as a whole.

Pierre Dufour
Minister of Forests, Wildlife and Parks

Photo: Hugo Tremblay, MFFP

Photo: François Guillemette, MFFP

Table of Content

Innovative, the Québec Timber Production Strategy will help to address **the future of timber production in Québec with confidence,** especially by creating wealth for the society and contributing to the tackle against climate change.

Photo : Cecobois

An Essential Strategy

Québec's forests are a source of pride and wealth, and have been used by its citizens in many different ways over the years. The Québec Timber Production Strategy will help to sustain their contribution to public well-being by encouraging the creation of wealth from the forests. The context is currently favourable to forest products: these are used increasingly as substitutes for high carbon-footprint products in the global tackle against climate change. Québec is well-positioned in a number of ways to take full advantage of this situation, in particular because of the wide range of products that can be created from its wood, the vast size of its forest and the tremendous capacity for technological innovation demonstrated by its forestry sector companies. Over the years, timber production has been intensified over roughly 15% of Québec's total productive area, and volumes of timber with characteristics sought by the industry will become available for harvesting from 2040-2045 onwards.

> ***"The context is currently favourable to forest products: these are used increasingly as substitutes for high carbon-footprint products in the global tackle against climate change."***

In the short term, however, Québec must address diminishing quantities and declining wood quality in its forests, a trend that has accentuated in recent decades. Tree size continues to decrease steadily in the softwood forest, while tree quality is declining in the hardwood forest. Less desirable species proliferate in many sectors. Stands are also becoming more difficult to harvest: they are now more scattered and are often located in areas that are difficult to reach or are used for multiple purposes. It is difficult to sell low-quality hardwood, and the structural decline in the world demand for newsprint has caused major fluctuations in the use of softwood lumber by-products, especially chips.

The Ministère des Forêts, de la Faune et des Parcs (hereinafter the Department) has prepared the Québec Timber Production Strategy to address current timber supply challenges and to improve the wealth creation potential of Québec's forests. The Strategy will also help to enhance the quality and increase the volume of timber produced from Québec's public and private forest. In addition, by contributing to reduce greenhouse gas emissions, it will allow the forestry sector to fulfill its important role in the tackle against climate change.

> ***"The Department has prepared the Québec Timber Production Strategy to address current timber supply challenges and to improve the wealth creation potential of Québec's forests."***

In the Québec Timber Production Strategy, wealth is created mainly by increasing the volumes of available timber and improving the characteristics of forest stands to ensure that they respond more adequately to the needs of markets and the industry. The Department has also taken into account the fact that all forest uses play a role in the social and economic development of Québec, and has ensured that they are considered when establishing timber production targets. As provided for in the Sustainable Forest Development Act and the Regulation respecting the sustainable development of forests in the domain of the State (chapter A-18, R-0.01), the timber production effort will be planned as part of a process that is coordinated both regionally and locally. This rigorous legislative and regulatory framework also guarantees that timber is produced as part of a sustainable forest management process.

Photo: Frédéric Martineau

Creating Wealth in Synergy

The Québec Timber Production Strategy is coordinated with existing Government strategies and measures in the forestry sector, and falls within the general framework of sustainable forest management.

The Strategy's basic aims are to optimize investments in the forest and to shift the focus of forest management to value. In real terms, this means ensuring that money invested in Québec's forests is used to produce more timber with characteristics that meet the needs of Québec's forest industry, in forests that can be exploited economically. This approach will increase the volumes of timber in Québec's public and private forests and will help to maximize the use of the forest's potential to create wealth for society as a whole, while helping to achieve the Government's objectives and targets to tackle climate change (mitigation and adaptation).

The impacts of the Québec Timber Production Strategy will be enhanced by current Government measures and ministerial strategies. First, the industrial strategy will reduce unpurchased timber volumes by encouraging diversification of forest products and markets. Future forest entrepreneurship initiatives will also help to improve the productivity and viability of forestry operations and provide competitively-priced supplies to the mills. Lastly, Government climate change mitigation and adaptation initiatives will increase the demand for low carbon-footprint forest products.

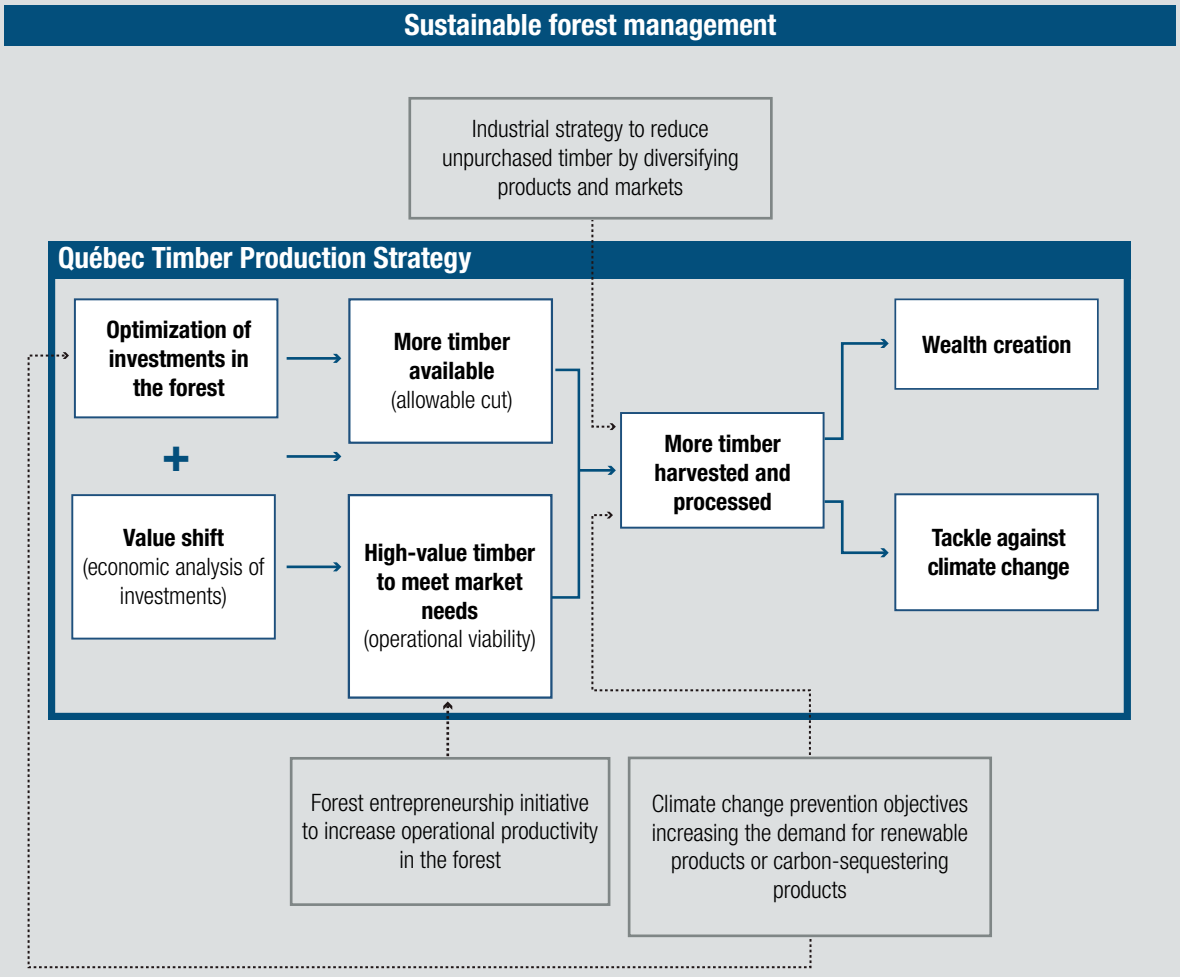


Figure 1: Links between the Québec Timber Production Strategy and related government measures

Photo: Gérald Landry, MFFP

Photo: MFFP

Photo: Réserve faunique de Rimouski, Sépaq

Photo: Marc Leblanc, MFFP

Contributing to Sustainable Forest Management

Thanks to the Sustainable Forest Development Act, Québec's forest regime is among the most advanced in the world. It harmonizes the economic, ecological and social dimensions of forest management, relying on ecosystem-based management and integrated land and resource management to promote forest vitality and encourage diversity of use. This innovative approach has earned Québec's forest regime an excellent international reputation.

The goal of the Québec Timber Production Strategy is to strengthen the economic dimension of sustainable forest management through measures aimed at increasing the collective wealth derived from Québec's forests.

The Strategy does this is by optimizing the human and technical resources of the Department and its partners. Investments will be channelled to the right places, at the right time and with the best available techniques. Once implemented, the Strategy will help to achieve a sustainable increase in the value of the forests and will improve the way in which they are used for the benefit of society as a whole. This, in turn, will consolidate employment while providing new opportunities in both the forest management and wood processing sectors.

"Once implemented, the Strategy will help to achieve a sustainable increase in the value of the forests and will improve the way in which they are used for the benefit of society as a whole."

Photo: Parc national du Lac-Témiscouata, Sépaq

Photo : Adobestock

A Greater Focus on Value

To create wealth from the forest, it is important to remember that, even without human intervention, the forest produces wood naturally through tree growth. Silvicultural work and investments should therefore focus on increasing value for the timber harvesting and wood processing industries. This involves ensuring that forest management produces timber with the characteristics needed by the forest industry to satisfy its markets.

To do this, the Strategy uses a forest management approach designed to improve the characteristics of the trees (their quality[1]) in order to satisfy the needs of markets and the industry, and to increase the quantity of the timber that is available, harvested, and processed. The value of the timber available for harvest derives from a combination of these two elements (quality and quantity). In short, the Strategy's focus on value is intended mainly to increase the value of the timber available for harvesting, as defined earlier, in order to create wealth for society.

> ***"The Strategy uses a forest management approach designed to improve the characteristics of the trees (their quality) in order to satisfy the needs of markets and the industry, and to increase the quantity of timber that is available, harvested, and processed. The value of the timber available for harvest derives from a combination of these two elements (quality and quantity)."***

By basing their management decisions on the goal of increasing the value of the timber available for harvesting, the Department's regional forest management offices (hereinafter the regional offices) will be able to make better silvicultural choices. By increasing the production of timber with the characteristics sought by the industry, it will be possible to increase its value and reduce the gap between timber available and timber harvested. Special attention will therefore be given to the elements that affect stands value, such as volume of timber per hectare, species composition and tree size and quality.

> ***"By basing their management decisions on the goal of increasing the value of the timber available for harvesting, the Department's regional forest management offices will be able to make better silvicultural choices."***

1 Tree quality is defined mainly by its mechanical qualities, the quality of its fibre and its appearance.

Photo: Réjean Poliquin, MFFP

Implementation of the Québec Strategy by the regions

The vision set out in the Québec Timber Production Strategy will be implemented through regional timber production strategies to address the challenges and issues specific to each region. The elaboration of these strategies will enable regional stakeholders, especially in the forest industry, to become actively involved so that investments in forests meet local needs for timber production.

The Department's regional offices will determine the regional timber production objectives while taking into account the current and potential condition of its industrial structure. These objectives will act to increase quantity and quality of the harvested timber and contribute to the achievement of national strategic targets. Regional timber production strategies will be developed with a structured approach and their implementation will be tied to the current forest planning process. Therefore, they will be integrated into the tactical integrated forest management plans, which are periodically updated. The strategies developed by regions will also be analyzed by the Chief Forester to ensure that they help achieving the targets.

The sum of the actions in each of the regional strategies will allow national strategic targets to be reached, and a feedback loop will be put in place to ensure that they are met. Also, during the implementation phase, the indicators identified to monitor the results will make it possible to measure the progress towards the achievement of the targets.

The Québec Timber Production Strategy, with its aim of increasing harvests, will be applied in combination with predictability guidelines that require three years of harvesting to be planned at once, in order to improve the competitive capability of the forest industry.

Photo : Frédéric Martineau

Vision

With a forest regime built on the principles of sustainable forest management, the Gouvernement du Québec is now taking action to increase the value of the province's public and private forests and create more wealth that will not only benefit all the regions but will also support the role played by the forest in the tackle against climate change.

The Québec Timber Production Strategy is an ambitious initiative designed to produce more timber with the desired characteristics, through profitable investments, while developing the forest's existing potential to create more wealth.

Provincial Strategic Targets

Short-term: Optimize operational conditions to increase timber harvest by at least 4 Mm^3 per year from available volumes, starting in 2025.
Medium-term: Increase the volume of timber harvested by 13.9 Mm^3 over and above the reference value, and generate an additional GDP of $3 billion for the forestry sector by 2050.
Long-term: Increase the volume of timber harvested by 23.9 Mm^3 over and above the reference value, and generate an additional GDP of $6 billion for the forestry sector by 2080.

Achieving the strategic targets will also help to increase the value of forest product exports and the number of jobs generated by the sector. To help achieve the provincial targets, each region will prepare its own timber production strategy by December 2021. The Minister will set up a monitoring and reporting mechanism to ensure that the provincial targets are in fact achieved, and the Chief Forester will examine the regional strategies to ensure that they are sufficient for provincial targets to be achieved.

The additional timber harvested to achieve the short-term target (2025) will come from the volume already available for harvesting. The additional volume harvested in 30 and 60 years' time will come from volumes already available and from additional timber production. Increases in harvested volumes and improvements to timber characteristics will be achieved with due respect for the values of Québec society.

Table 1 Provincial strategic targets in volumes of timber harvested (Mm^3) and gross domestic product ($ billions)

Timeframe	Provincial strategic targets		Economic indicators related to Strategy targets	
	Volumes of timber harvested in the public and private forests (Mm^3)	Forestry sector GDP ($ billions, 2018)	Forest product exports ($ billions, 2018)	Number of jobs (Thousands of jobs)
Reference[a]	29.0	6.3	9.3	59.1
2025	33.0	7.1	10.7	63.5
2050	42.9	9.3	14.1	71.6
2080	52.9	12.3	19.0	75.4

a. The reference period is 2013-2018 for the management units and 2015-2018 for the residual forest areas. The data include unharvested volumes determined by the Chief Forester. The reference period for the private forest is the year 2018. The harvested volume in the private forest excludes firewood production.

Québec has chosen to adopt sustainable forest management and uses an ecosystem-based management approach along with integrated, regionalized land and resource management. The Québec Timber Production Strategy will apply these principles to help strengthen Québec's position as a world leader in sustainable forest management.

Appendix 1 presents the volume aspect of the provincial targets, and Appendix 2 presents the economic targets and indicators.

Carbon sequestration in forest products

Forest products such as lumber used in construction can store carbon for long periods. In this respect, the targets of this Strategy predict that, by 2050, it will be possible to annually harvest about 13.9 Mm^3 of timber more than at present. A significant proportion of this additional volume of harvested timber will materialize through the marketing of lumber produced by sawmills in Québec.

Based on the average sawmill consumption in Québec, the target of 2050 corresponds approximately to the annual roundwood use of 28 sawmills processing softwood[2] and 8 sawmills of hardwood.[3] Assuming that the entire additional volume that will be harvested is transformed into lumber, it would be possible to build the equivalent of 855,174 housing units (apartments or condominiums).

The "Origine" ecocondos project in Québec City is an example of Québec's know-how in massive timber construction. This 12-storey building is built entirely of solid wood (cross-laminated panels and laminated wood). Assuming that the additional harvested timber volume of the 2050 horizon of the Québec Timber Production Strategy (13.9 Mm^3 of timber) were totally transformed into the forest products needed for the construction of such a building, this amount of timber could be used to build 2,800 housing units each year.

Photo: Stéphane Groleau

2 Data from the 2018 Department's Forest Register, calculated based on the average volume used by softwood sawmills processing 200,000 m^3 of timber or more.

3 Data from the 2018 Department's Forest Register, calculated based on the average volume consumed by hardwood sawmills processing 25,000 m^3 of timber or more.

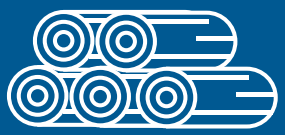
Five Major Axis

The Québec Timber Production Strategy focusses on five major axis fulfilled through eleven objectives (Figure 2), all aiming to create wealth by the effects they will have on improving the characteristics and the quantity of timber produced in Québec's private and public forests. The Department has identified the specific actions needed to achieve these objectives. It has also defined the indicators to be used to evaluate the achievement of these objectives (see the section titled Monitoring of Results).

Major axis 1

Production of economically desirable timber

- **Objective 1** Increase timber production with characteristics desired
- **Objective 2** Make profitable investments in the forest
- **Objective 3** Increase the robustness of management strategies so that they are able to withstand risk and uncertainty in the context of climate change
- **Objective 4** Provide the necessary care to forests in which silvicultural investments have been made in order to achieve the anticipated results



Major axis 2

Harvest of available timber

- **Objective 5** Increase the harvest of available timber
- **Objective 6** Make better use of the timber available in the short and medium term

Major axis 3

Private forest's contribution to collective wealth

- **Objective 7** Increase the harvest of available timber in private forests
- **Objective 8** Increase timber production in private forests

Major axis 4

Forest sector's contribution to climate change mitigation goals

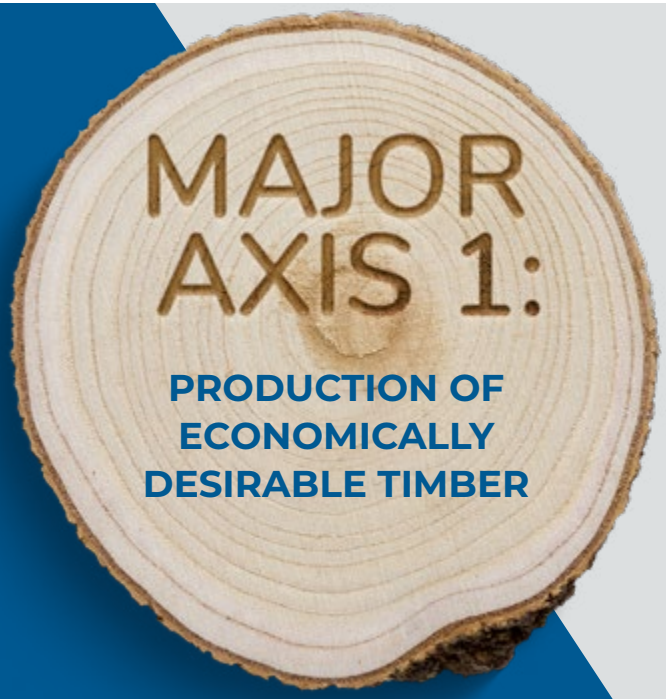
- **Objective 9** Help to increase carbon sequestration in the forest and in forest products

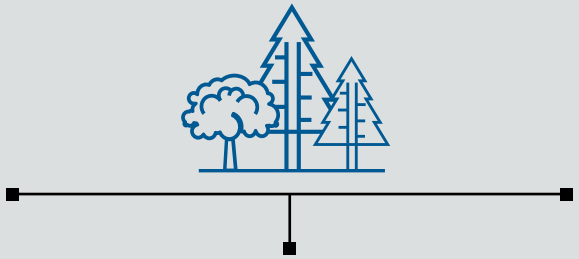
Major axis 5

Innovation and knowledge

- **Objective 10** Support innovation, research and development
- **Objective 11** Incorporate leading-edge knowledge into forestry practices

Figure 2: The five major axis of the Québec Timber Production Strategy





The Gouvernement du Québec invests in the management of the public and private forests in order to provide, among other things, a supply of timber with the characteristics desired by the industry and markets. For the timber produced to be economically attractive, the Government ensures that silvicultural investments are profitable and that regional management strategies are robust enough to withstand risk. It also ensures that the forests in which silvicultural investments are made receive the care needed for them to deliver the anticipated results.

Objectives	Specific Actions
Objective 1 **Increase timber production with characteristics desired**	1.1 Create regional timber production strategies to meet local timber production needs
	1.2 Encourage silvicultural treatments that will help produce high timber quality and generate economic benefits for society
Objective 2 **Make profitable investments in the forest**	2.1 Support State decisions to invest in sustainable forest management with economic analysis
Objective 3 **Increase the robustness of management strategies so that they are able to withstand risk and uncertainty in the context of climate change**	3.1 Include risk management guidelines for natural disturbances in management strategies
	3.2 Diversify timber production options to address different issues
	3.3 Gradually incorporate the impacts of climate change into forestry plans
Objective 4 **Provide the necessary care to forests in which silvicultural investments have been made in order to achieve the anticipated results**	4.1 Plan investments according to the operational feasibility of the silvicultural scenario
	4.2 Monitor and maintain areas under management to obtain the anticipated economic and timber yields

Objective 1 – Increase timber production with characteristics desired

The vision set out in the Québec Timber Production Strategy will be implemented through regional strategies. Each region must therefore prepare a timber production strategy that will help achieve the provincial targets by December 2021. Regional strategies will be based on regional objectives regarding projected timber production and will be developed from the current demand and estimates of future needs.

The regional offices will play a leading role in deciding on regional timber production objectives. Since they are familiar with their region's specific challenges, issues, and industrial structure, they are best placed to select the most advantageous combinations of timber production options and sylvicultural solutions to achieve the Québec Timber Production Strategy's objectives.

Timber production options are the main categories of action available to forest managers to meet national targets and regional timber production challenges.

Examples of timber production options currently possible:

- Focus on natural regeneration
- Manage the lack of natural regeneration
- Practice intensive silviculture
- Grow high quality timber in hardwood and mixed forests
- Use partial cuts in softwood forests
- Restore impoverished and degraded forests
- Increase the forest area in production

Protection of natural regeneration remains an inexpensive option to provide volumes of profitable timber over large areas. If the chosen option is not based on natural regeneration, the timber production objective must be clear and the economic viability of the other options considered must be demonstrated.

Depending on the chosen timber production options and the available financial resources, forest managers will implement the most appropriate silvicultural options to achieve the timber production objectives. Table 2 sets out some of the possible silvicultural solutions. Each of them impacts certain characteristics of the timber produced. These characteristics are important in increasing the value of timber available in the forest.

Table 2 Potential increase in timber value compared to naturally regenerated forest, based on different silvicultural solutions

Examples of silvicultural solutions	Timber characteristics			
	Volume per hectare	Species composition	Tree diameter	Timber quality
Natural regeneration	Reference scenario			
Elite and intensive plantation	++[a]	++	++	na
Basic plantation	+	++	+	na
Fill planting	+	+	+	na
Shelterwood cutting in hardwood and mixed forests	=	+	+	+
Selection cutting in hardwood forests	=	+	+	++
Commercial thinning	=	+	++	na
Partial cuts in softwood forests	=	+	+	na
Pre-commercial thinning	(+)[b]	+	(+)[b]	na

a The "+" sign indicates an increase over a naturally regenerated forest, "na" means not applicable, and "=" means that the option has little or no impact on the characteristic.

b This effect is currently being studied by the Direction de la recherche forestière [Forestry Research Division] of the Department.

The creation of more wealth from forest is based on the volume of timber available for harvest and on the characteristics of trees that form it. Implementation of the Québec Timber Production Strategy aims at a volume not only higher and of better quality, but also growing at a faster rate in the future.

The relevance of timber production options and silvicultural solutions will vary according to regional characteristics. The regional offices will have to be creative and innovative in exploring new avenues to improve the wealth created from timber harvested in Québec. They will have access to a number of tools to help guide their decisions, including "Le Guide sylvicole du Québec" [Québec's Silvicultural Guide] (Ministère des Ressources naturelles, 2013). They can also count on the expertise of the Bureau de mise en marché des bois [Timber Marketing Bureau] and the collaboration of the Chief Forester's Office.

The preparation of regional strategies will use the public participation mechanisms as planned in the Sustainable Forest Development Act. These mechanisms, based on integrated, regionalized, participatory management of forest resources, allow for the general public's interests, values and needs to be taken into account throughout the forest planning process. To foster local ownership for the content of the regional timber production strategies, the individuals and organizations concerned will be invited to play an active role in the preparation process. In addition, the Sustainable Forest Development Act requires the Department to carry out separate consultations with the Aboriginal communities.

The specific actions to be included in the regional strategies are listed in Table 3 (p. 34). Once established, the regional timber production strategies will be used to prepare forest management strategies that are updated every five years via the integrated tactical forest management plans prepared for each of the management units.

Specific action:

1.1 Create regional timber production strategies to meet local timber production needs

Intensive plantations significantly increase the volume of desired species per hectare over a short period of time. The principle underlying this approach is to concentrate plantations on productive, accessible sites in order to obtain high timber yields over a portion of the territory. Depending on the circumstances, intensive silviculture will play a significant role in achieving the timber production objectives set out in the regional strategies. Since this option requires major investments and constant care, it must be planned very carefully, taking into account the risks to which the plantations may be exposed.

The Sustainable Forest Development Act provides for the possibility of implementing more intensive sylvicultural practices to achieve timber production objectives. This type of sylvicultural practice involves the establishment of a framework that allows forest users to agree on the best sites for implementing these practices, based on productivity, access, risk, and harmonization with other uses criteria and compliance with environmental objectives. When decisions are preceded by discussions with forest users, it is easier to plan and carry out the sequence of work needed to achieve the desired results and thus to obtain the anticipated return on investments. The implantation of intensive silvicultural practices as well as the proportion of the territory they will occupy will be determined through a participatory identification process that will be put in place by the regional offices. In closing, it has to be stressed that the intensification of forest management on part of the territory is an important tool to achieve the national timber production targets.

Specific action:

1.2 Encourage silvicultural treatments that will help produce high timber quality and generate economic benefits for society

A framework for deployment of intensive silviculture

"Le Guide sylvicole du Québec" [Québec's Silvicultural Guide] helps to ensure that the silvicultural effort is spread evenly across the regions, that investments are made in the right places and that the work is monitored appropriately. The gradient of silvicultural intensity advocated in the guide is composed of four levels of intensity according to the means used, the objectives and the frequency of intervention required: extensive, basic, intensive and elite (Ministère des Ressources naturelles, 2013). In the Québec Timber Production Strategy, the notion of intensive silviculture is associated with the latter two levels, i.e. intensive and elite sylviculture.

Intensive silvicultural practices are used to meet timber production objectives in connection with volume and characteristics of timber from Québec forests. Their deployment is regulated by a certain number of ministerial guidelines designed to promote efficiency while ensuring compliance with the principles of sustainable management. These guidelines include some of the following:

- When preparing regional timber production strategies, input must be obtained from the individuals and organizations concerned before deciding on the quantity and general location of intensive silvicultural practices. These aspects must then be the subject of consultations with the public and Aboriginal communities as part of the annual planning process.
- Since 2001, no phytocides can be used in the forest, regardless of the level of silvicultural intensity.
- When planting, the vast majority of the plants are indigenous species (currently more than 98.5%).
- Some of the trees planted may be derived from or have undergone genetic improvement, but none of the seedlings have been genetically modified.
- The use of intensive silviculture must not compromise the achievement of ecosystem-based management objectives at landscape level. At stand level, however, the other objectives must not compromise the anticipated return on investment.

The annual yield on intensive forestry sites whose objective is the increase in volume per hectare, will be four times greater than on the rest of the territory. It will reach more than 6 m^3 per hectare per year. This expected yield reaches that of the Scandinavian forests, recognized as being the best performers in this respect in the boreal forest.

Photo: François Nault, MRC de la Jacques-Cartier

Objective 2 – Make profitable investments in the forest

For the 2013-2018 period, Government investments in silviculture were $225 million per year in the public forest and roughly $35 million per year for the implementation of private forest development support programs, in addition to several types of ad hoc assistance. Total Government investment in the forest during that period therefore exceeded of $1.4 billion. Public investments of this scope are justified if they are profitable and create wealth for society, the industry and the communities. The Department's role is to ensure this profitability. It is also responsible for optimally distributing investments in order to achieve the targets of the Québec Timber Production Strategy.

The regional offices have decision-support tools to carry out economic profitability analyzes allowing them to guide or inform the decision-making process with a view to wealth creation. The economic profitability of an investment is calculated according to the difference between revenues and costs for society. The calculation takes into account the income earned by workers in silvicultural, logging and wood processing companies, the corporate profits of these companies as well as the logging dues and royalties paid to the Government. Supply, wood processing and sylvicultural costs are also considered. The economic profitability analysis therefore compares the creation of wealth generated by a sylvicultural investment to that generated by the forest natural production. Economic indicators for silvicultural scenarios and management strategies can be found in the section titled Monitoring of Results.

Although the general intention of the Québec Timber Production Strategy is to focus on profitable silvicultural scenarios, there are some situations in which actions will depend on broader considerations than timber production alone. For example, it is sometimes preferable to avoid losing productive areas, restore productive ecosystems or protect other forest uses (e.g. wildlife production, recreational or tourist attractions). Although difficult to quantify in the current economic analysis, these types of measures will continue to be implemented in management plans, and will be included in future economic analyses.

Specific action:

2.1 Support State decisions to invest in sustainable forest management with economic analysis

Objective 3 – Increase the robustness of management strategies so that they are able to withstand risk and uncertainty in the context of climate change

Risk will be integrated in management analyses and choices to maximize the likelihood of creating wealth from silvicultural investments in the medium and longer term. A variety of risks will be taken into account in regional timber production strategies, including those relating to natural disturbances (fire, insects, diseases, windfall), the commercial context (markets, labour) and climate change. Depending on the nature of the risk, the Department will adopt preventive measures that will reduce the probability that they will occur, or mitigation measures to reduce their impacts. These measures may also lead the regional offices to change their management strategy.

Once the risks associated with natural disturbances have been identified and understood for a given region, investments can be adjusted to reflect the anticipated risks, mitigation and prevention measures can be introduced, and mechanisms can be put in place to produce effective salvage plans where necessary.

Specific action:

3.1 Include risk management guidelines for natural disturbances in management strategies

As some risks are more difficult to predict than others (future market needs, tangible impact of climate change on forest dynamics and yields, etc.) but nonetheless have to be considered when preparing regional timber production strategies, their potential effects can be reduced by applying the precautionary principle and diversifying investments. The regional offices will therefore seek to build a diversified portfolio of silvicultural and timber production options in order to take these risks into account in their regional timber production strategies.

Certain problems that may arise from effects can be anticipated by analyzing the vulnerability of Québec's forests to climate change. The results of these analyses will help guide certain management choices, such as the species to be planted. The Department will have to give greater consideration to the impacts of climate change on certain species when selecting the seeds used in plantations.

The biggest challenge faced by forest managers with respect to climate change is the uncertainty surrounding the forests' reaction to new climate conditions and consequences of global changes (e.g. the arrival of exotic species). Given the socio-economic importance of the forest sector, it is therefore essential for Québec to manage its forests in a way that will strengthen their resistance, resilience and capacity to adapt. This can be done by maintaining biodiversity and natural processes in forests under management to form a solid basis on which other actions can be built, such as managing the origins of the seeds to replant species better suited for future climate.

The Department is currently working on a climate change adaptation strategy whose aim is to include vulnerability analyses and stands resilience management in the forest planning process.

Specific actions:

3.2 Diversify timber production options to address different issues

3.3 Gradually incorporate the impacts of climate change into forestry plans

Photo: Nathalie Lavoie, MFFP

The availability of a forestry workforce: A known issue

The success of the implementation of the Québec Timber Production Strategy depends, among other things, on the ability of the Department and its wood-sector partners to perform the actions identified, both in the forest (forest management and forestry operations) and in the mills (wood processing). Given the current labour shortage, the availability of qualified employees who are able to carry out silvicultural work and transform timber into forestry products in the mills is a major risk factor that must be considered.

The Gouvernement du Québec is well aware of this issue. The Department is already involved in a number of structuring initiatives applicable to the forestry workforce by providing financial and technical support. For example, the "Comité sectoriel de main-d'œuvre en aménagement forestier" [Forest Management Workforce Committee] is working actively with Québec's professional training centres and various forest industry partners to meet the needs of forest sector workers. More generally, this committee also works hard to emphasize the importance of the forest management industry workforce in Québec.

The labour shortage poses a significant risk to the ability to implement regional timber production strategies. This risk must be analyzed and taken into consideration when selecting silvicultural scenarios. Given this issue, the Department intends to work closely with its partners to identify existing and anticipated problems. A clear, shared diagnosis will form a basis for solutions adjusted to the context of each individual region.

The combined efforts of the Department and its partners aim to help companies attract, retain and develop a qualified forestry workforce both in the mills and in the forest; this, in turn, will benefit the Québec population as a whole.

Photo: Steve Lemay, MFFP

Objective 4 – Provide the necessary care to forests in which silvicultural investments have been made in order to achieve the anticipated results

So far, past silvicultural efforts have produced mixed results. In his Advice on Plantation Success, the Chief Forester found that, on average, volume yields at maturity would have been 37% higher in public forests if plantations had been monitored and maintained more effectively (Bureau du Forestier en chef [Chief Forester's Office], 2015).

To deliver the expected results in forest management strategies, the monitoring of silvicultural scenarios will be carried out in such a way as to maximize the potential for reaching timber production targets. The level of intensity of sylvicultural scenarios will determine the scope and amount of monitoring needed. For example, intensive sylvicultural scenarios, which usually require more intermediate treatments and investments, will be monitored more frequently than the extensive and basic levels.

Specific actions:

4.1 Plan investments according to the operational feasibility of the silvicultural scenario

4.2 Monitor and maintain areas under management to obtain the anticipated economic and timber yields

Photo: Marc-André Brochu, MFFP

The traceability of the seed source makes it possible to ensure that silvicultural treatments are carried out at the appropriate time and produce the anticipated plantation yields. Among other things, traceability allows to monitor more accurately the growth of genetically improved plants. Since these plants grow more quickly, the timing of silvicultural interventions becomes less flexible and more critical. Traceability thus contributes to a better return on silvicultural investments.

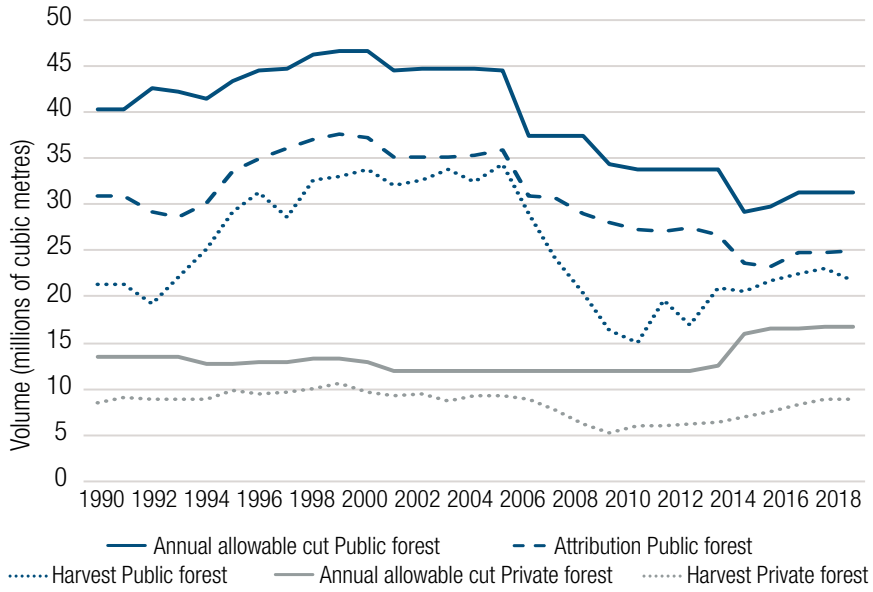
Most of the silvicultural investments made today will impact the quantity and quality of timber harvested in the medium and longer term, i.e. in 30 years or more. On the other hand, to increase the value of the short-term timber harvest, work must be done on timber that is already or is about to become mature. Targeted measures can increase the harvesting and processing of this timber and thus better develop the forest's current potential. The predictability and stability of short- and medium-term timber supplies can be improved by making better use of the timber that is currently available.

Objectives	Specific Actions
Objective 5 **Increase the harvest of available timber**	5.1 Support the development of the industry and its supply structure by taking timber production issues into account
	5.2 Introduce means, including programs, to facilitate the harvest of available timber
	5.3 Increase the harvest rate for timber affected by natural disturbances
Objective 6 **Make better use of the timber available in the short and medium term**	6.1 Optimize harvest planning to minimize impacts on supply costs
	6.2 Perform a detailed characterization of the quality and volume of timber currently available and required in the future

Objective 5 – Increase the harvest of available timber

In the past, allowable cuts have always been greater than volumes allocated, and volumes allocated have been greater than volumes harvested (Figure 3). In recent years, this gap has left a potential unharvested volume of nearly 20 Mm^3 of timber per year. Nearly half of this unharvested volume is situated in private forests. Roughly 43% is composed of softwood and 57% of hardwood. The gap is due among other things to a lack of purchasers for some types of timber and to a variety of factors that reduce the viability of forest operations. It is also due to the reluctance of some private forest owners to harvest timber, or to limitations imposed by municipal by-laws. Although it is highly unlikely that all the allowable cut will be harvested, the Department will aim to increase the value (quantity and quality) of harvested timber.

Figure 3: Changes in harvested volumes compared to allowable cuts in public and private forests since 1990[4]



4 The volume harvested in the private forest excludes firewood production. The volume harvested in the public forest excludes unharvested volumes (UHV) from previous periods identified by the Chief Forester.

Photo: MFFP

There are thousands of hectares of impoverished and degraded forests. Since the timber value of these forests is worth a lot less than it could otherwise be, they tend not to be harvested.

To develop a greater percentage of the timber potential, it is essential for the Government to orient its action according to the close connection between the characteristics of the timber produced and the needs of the industry. While forest management choices must adjust the timber production to meet as much of the demand as possible, industrial development must also focus on niches that can become part of a value chain better suited to the timber available in the forest. The industrial niches most likely to use the timber for which purchasers are not currently available can be targeted by characterizing the timber in more detail and obtaining more information on its availability over time.

For example, in many regions, intolerant hardwoods could be harvested to provide immediate access to what may be a significant volume of softwood trees located in mixed stands or hardwood-dominated forests. The timber "released" in this way would immediately increase the supplies available to softwood purchasers. It would also offer more options for silvicultural actions designed to use the potential timber available at productive sites situated close to communities and processing mills. In this scenario, there is a clear connection between better mixed stand management practices and an increased harvest of timber for which there are no purchasers, offering the potential to produce timber for both the short and longer term.

Actions taken to develop the forest products industry should contribute to increase harvesting of available timber. Industry partners therefore have a crucial role to play in improving the wood sector value chain in the regions.

In addition to measures to develop the forest products industry, a number of steps can be taken to develop available timber. In the public forest,[5] programs encourage industrial actors to develop portions of the territory currently unharvested.

Specific actions:

5.1 Support the development of the industry and its supply structure by taking timber production issues into account

5.2 Introduce means, including programs, to facilitate the harvest of available timber

Another aspect that must be considered to reduce the gap between available timber and harvested timber is the harvesting of timber damaged by natural disturbances such as fire, insects, disease and windfall. So far, efforts have been devoted to salvaging timber from areas affected by the spruce budworm epidemic and fires. An additional effort may help to improve the salvage rate following these types of major disturbances and others, where it is economically relevant to do so, and in respect of ecological issues. To improve its effectiveness in this regard, the Department uses increasingly precise detection tools to identify disturbed and vulnerable stands.

Specific action:

5.3 Increase the harvest rate for timber affected by natural disturbances

5 Major axis 3 of this Strategy is concerned specifically with private forests, due to their distinct nature.

Objective 6 – Make better use of the timber available in the short and medium term

Two ways to obtain more benefit from harvesting the timber that is currently or about to become available are to improve the value of the timber available in the short term and to act on the factors that influence supply costs.

Given the pace of growth of the forest, there are few options to improve the value of the timber currently available in the short- and medium-term horizons. The importance of ensuring a stable, predictable supply of quality timber volumes prompts to explore different avenues. The solution may sometimes lie in timber production options that are known to be effective, and at other times may be found by innovating to test new methods. The Strategy is designed to encourage an appropriate combination of these two approaches.

In the short and medium term, wealth creation from available timber largely depends on developing some forest stands that are currently less sought-after for processing, and on the possibility of acting on supply costs. The greater the value of harvested timber and the optimization of supply costs, the greater will be the profitability perspective of companies. Supply costs are influenced by a number of factors, some of which are related to stand distribution (transportation distance, aggregation rate, etc.) and others to site conditions (steep slopes, wetlands, topography). Other elements unrelated to forest planning can also have significant impacts on supply costs, including the difficulty of integrating the activities of guarantee holders who harvest supplies of different species from the same site, and the type and productivity of the machinery used. Operational innovation and sorting yards are potential solutions to these types of issues.

Thanks to the quality improvement of forest inventories, the introduction of new technologies and modelling, timber available now and in the next 30 years can be characterized more accurately. Special attention can therefore be paid to the forest's attributes and operating conditions, which are key elements in the value of harvested timber and in operational viability. For example, characteristics such as species composition, average volume per tree, and volume per hectare may be projected over time. Travelling distance to stands available for harvesting in the coming decades can also be estimated.

This information can be used to produce a more accurate diagnosis of the issues affecting the availability of desired forest attributes and operating conditions over the next 30 years. Based on this, it will be possible to stabilize the flow of timber with the characteristics desired by the industry and also provide greater predictability and the possibility of regulation for forestry operations. Planning of road networks and distribution of logging, both spatially and over time, must also be considered as part of this process.

Consequently, it will be possible to resolve the short- and medium-term timber supply issues while improving the long-term timber production by looking for structuring solutions. Among these solutions is the fine characterization of the timber currently available and to come.

Specific actions:

6.1 Optimize harvest planning to minimize impacts on supply costs

6.2 Perform a detailed characterization of the quality and volume of timber currently available and required in the future

The road network and land access

Access to the land is a key element in forest management. Therefore, road network planning and maintenance are important factors that the Department and its partners must consider concurrently with all the other factors contributing to the achievement of the objectives of the Québec Timber Production Strategy.

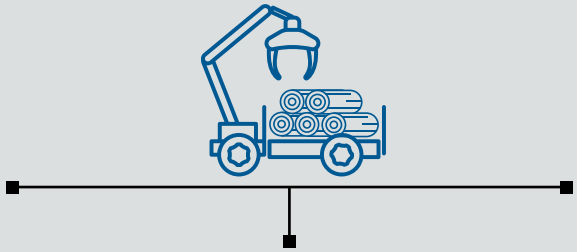
Road network planning requires strategic thinking in order to address the possibility of forestry operations over the entire timeframe of the silvicultural scenarios. The scenarios' operational and economic feasibility will depend on the ability to access stands at the appropriate time and to carry out all intermediate treatments. Road networks must also provide access to mature stands at the appropriate time, and must allow for transportation distances to be spread out, thereby stabilizing average supply costs.

These issues must be addressed from the standpoint that roads will inevitably deteriorate over time. Wise choices must therefore be made and road maintenance must be planned carefully, in collaboration with all users for whom road condition is a concern.

The road network provides access to public land for other uses (multi-resource use). The strategic reflection must therefore consider other issues, such as access by all forest users, Aboriginal occupation of the area, management of risks relating to natural disturbances and maintenance of isolated wild areas (e.g. for the woodland caribou).

For all these reasons, the Department must continue its strategic thinking so as to improve road network planning and maintenance, ensure the profitability of its investments in forest roads, and provide proper access to the province's forests.

Photo: Nordic structures



The 134,000 private forest owners in Québec are essential actors in the development of the province's forest industry. In their forests, and including firewood, they currently harvest less than half the annual allowable cut (Fédération des producteurs forestiers du Québec, 2019). And yet, these forests are among the most productive in Québec. In addition, they are served by a well-established road network and are close to processing mills and the labour pool.

It is possible to increase timber production in the private forests and hence create more wealth for forest owners and society in general. To do this, the Québec Timber Production Strategy proposes two objectives, namely to increase the harvest of available timber in private forests (short term) and increase timber production in private forests (medium and longer term).

Objectives	Specific Actions
Objective 7 **Increase the harvest of available timber in private forests**	7.1 Encourage forest owners to harvest more timber
Objective 8 **Increase timber production in private forests**	8.1 Ensure that investments in private forests are economically profitable
	8.2 Improve forest productivity by intensifying silviculture and increasing the size of areas to be used for forest production
	8.3 Provide better protection for the private forests, including via the spruce budworm spray program

The Gouvernement du Québec has been working with private forest owners for almost 70 years. The Québec private forest development regime stands out across Canada. It relies on a sharing of costs and profits between the State, the owner and the wood processing mills of Québec, as well as on a network of dynamic professionals that supports owners in the management of their forests and the marketing of their timber.

Objective 7 – Increase the harvest of available timber in private forests

Increasing the harvest of available timber in private forests is a key objective. Steps to increase the volume of timber harvested and transported to processing mills have already been initiated. In 2018, some 6.4 Mm^3 of timber were transported from the private forests (Fédération des producteurs forestiers du Québec, 2019). Efforts to increase the volume harvested and transferred to processing mills targeted in particular the financial opportunities, regulatory, administrative and legislative relief, and incentives for owners and contractors.

The collaboration of the many private-forest stakeholders will allow the implementation of the new "Plan d'action national de mobilisation des bois en forêt privée – 2020-2024" [National Action Plan for the Mobilization of Wood in Private Forests – 2020-2024]. This plan and the ensuing follow-up will be anchored with Major axis 3 of the Québec Timber Production Strategy.

In the 2020-2024 Plan, the Department maintains actions relating to municipal by-laws, taxation and promotion among forest owners and new contractors. For example, in order to provide a regulatory context that promotes the sustainable development of private forests, it will be important that the Department and private-forest actors involve municipalities to a greater degree, and provide information through training sessions on how to revise by-laws for the cutting of trees and protection of forest cover where they are not suited to the area in question. To help achieve this, a group of municipal and forest sector stakeholders came together to develop the "Guide d'aide à la rédaction d'un règlement municipal sur l'abattage d'arbres et la protection du couvert forestier" [Guide to the preparation of municipal by-laws on the cutting of trees and forest protection] (Côté et al., 2018).

The Department, in its supply scenario forecasts for the 2018-2023 period, estimated that 7.8 Mm^3 of timber (roughly 4.8 Mm^3 of softwood and 3.0 Mm^3 of hardwood) could be obtained annually from the private forest (Ministère des Forêts, de la Faune et des Parcs, 2017). This increase of 1.4 Mm^3 over the 2018 figure represents the private forest's contribution to the Québec Timber Production Strategy's goal of increasing the annual timber harvest by 4 Mm^3 by 2025.

The Private Forest Development Support Program is the Government's main fund for private forest investment. It allows the Department to guide the development of the province's private forests. The availability of additional volumes from the private forests would have a significant positive impact on mill supplies.

The Government relies on the contribution of an extensive network of forestry consultants to produce this additional volume. Moreover, it has introduced a number of levers that will encourage forest owners to harvest their timber. The Department is also continuing its reflections on Government aid and/or a taxation measure that will encourage the use of timber from private forests, with input from a task force composed of representatives from Québec's Ministère des Forêts, de la Faune et des Parcs, and the Ministère des Finances.

If timber from private forests is to be used, it will require synergy among the stakeholders working in both the public and private forests. The Department set up a liaison committee in 2011 that is responsible for addressing market access concerns and for developing proposed improvements that will allow the private forest to stand out.

At the same time, the Department would like to help private-forest stakeholders to develop a communication strategy aimed at adding new active and proud owners of private forests, with a view to increasing the sale of timber to Québec's processing mills. The communication strategy would also serve as a showcase for the work done in private forests and would help encourage owners to manage their forest.

Lastly, the Department estimates that an increase of 1.4 Mm^3 in the volume of timber shipped to processing mills would require roughly 70 additional mechanized logging contractors. The challenge is a significant one, and is addressed in the "Plan d'action national de mobilisation des bois en forêt privée – 2020-2024".

Specific action:

7.1 Encourage forest owners to harvest more timber

Objective 8 – Increase timber production in private forests

As is the case for the public forest, investments in private forests are justifiable only if they increase the production of wealth for society, communities and the industry. Economic analysis tools adjusted to the particular context of private forests are used to assess investment profitability. In a context where financial needs are significant, it is important to direct silvicultural investments to areas where they will address timber production and viability objectives, especially given the risks associated with the work to be carried out.

Timber production in private forests can be increased by expanding the areas used to produce timber, for example by afforestation of wild land. The new forests produced by this effort would also play a role in carbon sequestration.

Silvicultural investments in private forests need to be protected in order to obtain the anticipated benefits. To this end, two specific steps will be taken to help fight the current spruce budworm epidemic: 1) dead and weakened trees, as well as trees vulnerable to damage from the epidemic, will be harvested to help limit timber losses, and 2) a spruce budworm spray program will be applied to reduce damage.

Government incentives generate opportunities to improve forest productivity in private forests and to fight spruce budworm infestations. To benefit from these incentives, forest owners must obtain a forest producer certificate and register a forest area. Information obtained from monitoring of registered forest areas can be used to estimate the level of production in the private forests. The Department estimates that registered forest areas could increase from 2.8 Mha to 3.4 Mha by 2023.

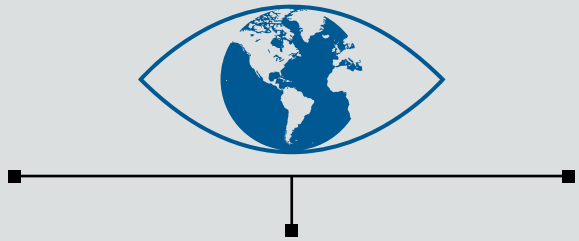
Specific actions:

8.1 Ensure that investments in private forests are economically profitable

8.2 Improve forest productivity by intensifying silviculture and increasing the size of areas to be used for forest production

8.3 Provide better protection for the private forests, including via the spruce budworm spray program

Photo: François Naud, MRC de la Jacques-Cartier



Because trees store carbon, both in the forest and in forest products, and because forest products can replace products with a high carbon footprint, the forest sector plays a key role in mitigating the impacts of climate change. Hence, it contributes substantially to the achievement of Québec's climate change objectives.

Objective	Specific Actions
Objective 9 **Help to increase carbon sequestration in the forest and in forest products**	9.1 Identify the forest sector's potential additional contribution to the achievement of Québec's greenhouse gas reduction objectives and targets
	9.2 Promote silvicultural scenarios that will help increase the contribution of forest management to the tackle against climate change

Objective 9 – Help to increase carbon sequestration in the forest and in forest products

The components of the forest ecosystem (living trees, deadwood, litter and soil) contain carbon in different forms and are involved in a natural cycle that sequesters and stores significant quantities of carbon in the forest. The forest's role as a carbon sink is a major factor in mitigating climate change.

Québec's forest sector stands out as a key player in a green economy. The Department hopes to increase the forest's role in mitigating climate change by processing timber into forest products that store carbon for fairly long periods (e.g. construction materials). This positive impact can be enhanced by using wood to replace products with a manufacturing process that generates high carbon dioxide (CO_2) emissions, and that therefore have a larger carbon footprint than wood (e.g. steel or concrete). The Government proposes measures to promote the development of a long-lasting forest products industry (lumber, engineered wood, boards, etc.) and new forest products. The fact that these niches provide opportunities to increase the value of timber available but for which there is currently less demand is also an advantage from the standpoint of timber production (see Major axis 2).

The Québec Timber Production Strategy fits into this overall vision of mitigating climate change. Among other things, its aim is to promote management strategies that will increase the amount of carbon stored in the forest and that will provide the best options for producing long-lasting biomaterials and products able to reduce fossil fuel consumption. One avenue currently being explored is the possibility of increasing Québec's forested area by planting trees in unforested or sparsely forested areas, with due consideration for other potential uses.

Carbon storage in the forest can also be improved by basing management choices on a better understanding of the forest ecosystem's ecological processes. In some circumstances, intensive plantation silviculture can increase the amount of sequestered carbon at stand level. In other cases, it may be preferable to apply partial cutting to maintain the carbon reservoir in the various ecosystem components (including soils) while still harvesting some of the available timber. On some sites, it may be more effective to leave an entire forest standing, to act as a carbon sink. The best approach to maximize the desired effect is to apply a combination of different measures adjusted to the situation at landscape level.

Recent, ongoing, and forthcoming research will provide relevant information for making management choices and finding the best possible combinations of options for the local conditions and timeframes under consideration. As part of this process, choices must take into account the forest's resilience to climate change and its ability to adapt. A forest that is not resilient or that is poorly adapted to climate change will not store carbon for long. The performance of regional timber production strategies will be analyzed with regard to their impact on mitigating the effects of climate change.

A $75 million Government investment to restore nearly 30,000 hectares of poorly regenerated or unproductive forests areas will capture the equivalent of 1.2 M tons of CO_2 eq by 2050.

Specific actions:

9.1 Identify the forest sector's potential additional contribution to the achievement of Québec's greenhouse gas reduction objectives and targets

9.2 Promote silvicultural scenarios that will help increase the contribution of forest management to the tackle against climate change

The forest sector's growth largely depends on its ability to innovate and generate new knowledge. These factors will help improve the industry's ability to compete and promote forest management aimed at ensuring both the forest's resilience and the sustainability of the benefits derived from forest resources development. Thanks to the synergy that has developed between actors in the innovation chain over the years, Québec has become a key figure in research and development throughout the forest sector. Better integration of knowledge into practices will concretely improve forestry practices.

Objectives	Specific Actions
Objective 10 **Support innovation, research and development**	10.1 Provide financial support for silviculture and sustainable management research institutions and centres, and ensure that they complement the Government's own research
Objective 11	11.1 Make available the products derived from knowledge acquisition
Incorporate leading-edge knowledge into forestry practices	11.2 Ensure that knowledge is incorporated into forestry practice

Objective 10 – Support innovation, research and development

The Department carries out a number of research projects directly related to innovation needs for timber production. Some of these projects focus on the development of knowledge for economic analyses, risk management, the wood sector value chain (supply/demand analysis) and the impacts of silviculture. This knowledge contributes to the development of tools that will be used to implement the Québec Timber Production Strategy.

For example, there are some gaps in current knowledge of the real impacts of silvicultural treatments applied to hardwood forests. By improving this knowledge and comparing it to economic models, it will be possible to calculate the quality value of timber produced in this type of forest.

The Department has also undertaken several research projects on climate change. Studies on the impact of climate change on forest ecosystems helped understand the forest's vulnerability. Findings on potential changes to natural disturbance regimes inform risk management decisions when planning forest activities.

Other research has been carried out in conjunction with academic experts, FPInnovations and the Ministère de l'Environnement et de la Lutte contre les changements climatiques, with the purpose of improving knowledge in the tackle against climate change. In addition, the Chief Forester's Office carries out research in order to include carbon and climate change adaptation measures in the models used to calculate allowable cuts while the "Bureau de mise en marché des bois" [Timber Marketing Bureau] has undertaken to integrate carbon into its tools for analyzing the economic profitability of silvicultural investments.

At the same time, Government support to universities, research centres and college transfer and technology centres helps speeding up innovation. The research projects it has funded focus directly on the research needs identified by the Department and are carried out in collaboration with its in-house researchers. Collaborating practitioners are brought onto the research teams to ensure that the findings address users' needs. Awareness of users' needs is a major factor in developing and improving relevant knowledge. In addition, the practitioners' involvement enhances both the research capacity and the impacts of the Department's investments. The Department's investments in external research are intended to ensure ongoing innovation in silviculture and sustainable forest management, as well as complementarity with Government research.

Specific actions:

10.1 Provide financial support for silviculture and sustainable management research institutions and centres, and ensure that they complement the Government's own research

Photo: MFFP

In 2017-2018, the Department invested $4.5 million in external research over two years. More than 30 new research projects were initiated.

Objective 11 – Incorporate leading-edge knowledge into forestry practices

It is important to continue to acquire knowledge and transfer it to users in order to encourage innovation in timber production. The availability of information is a constant concern for the Department, to ensure that its staff and partners have the knowledge they need to make informed decisions and improve their practices, especially in the area of silviculture. Effective management of current and future knowledge is also a major concern. The implementation of a knowledge management vision will precisely help ensure that leading-edge knowledge is acquired, incorporated and transferred to foresters.

For example, it is becoming easier to characterize timber thanks to the new technological tools that are constantly being developed. Among other things, leading-edge technologies can be used to locate available timber, identify its characteristics and define any operational limitations. They also provide new information that improves the predictability of forestry work and promotes effective forest management.

The Department is currently acquiring data on southern Québec, using LiDAR laser remote sensing technology which provides rapid leading-edge information on topography and forest stands.

These benefits can be enhanced by making the information available and encouraging its use in forest management processes. The Department seeks to make information more easily available by disseminating it to a wide audience and ensuring that knowledge-transfer activities target all users, whether they are internal to the Department or part of its extensive external client base.

The Department has a data dissemination policy where free data is the norm, and pricing the exception.

To simplify access to available information on the forest, the Department has created "Forêt ouverte" [Open Forest], an interactive Web-based map system through which ecoforest data can be viewed and downloaded free of charge (Données Québec, 2019). It includes the different ecoforest maps of Québec, satellite image datasets and aerial photographs. Layers showing the ecological classification and vegetation of northern Québec are also available, as are LiDAR by-products and details of temporary sample plots from recent inventories.

Specific action:

11.1 Make available the products derived from knowledge acquisition

11.2 Ensure that knowledge is incorporated into forestry practice

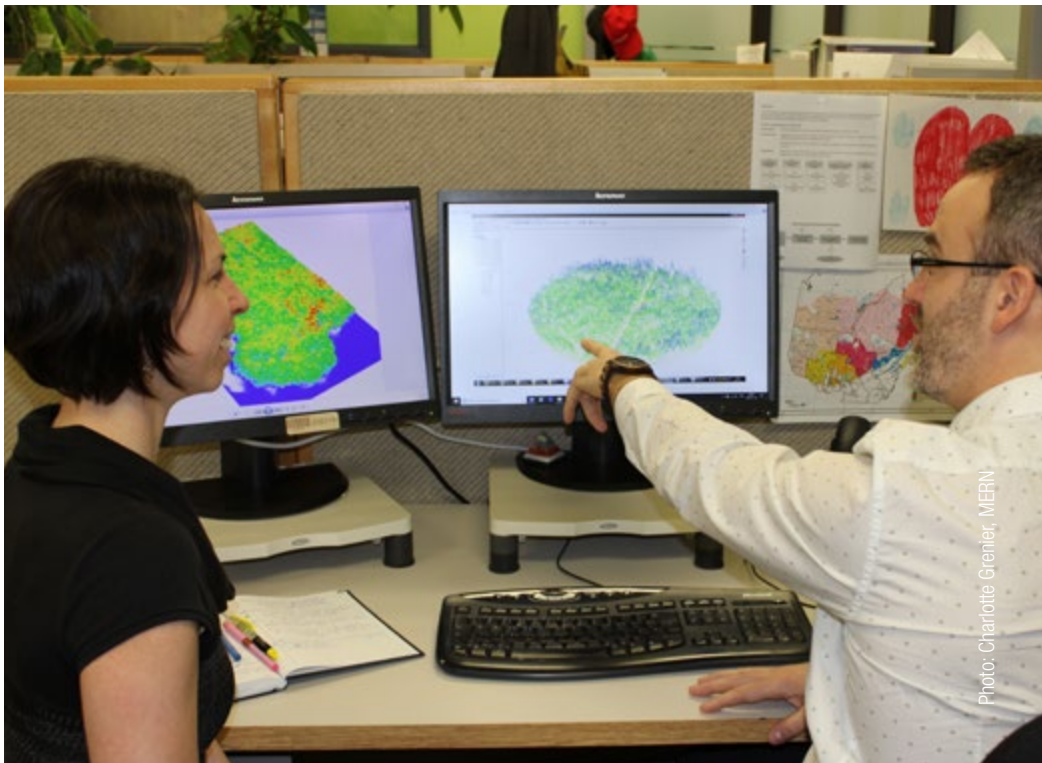


Photo: Charlotte Grenier, MERN

Monitoring of Results

The Department will rigorously monitor the implementation of the Québec Timber Production Strategy to ensure that it is able to achieve its strategic targets. Two types of indicators will be used: 1) status indicators showing progress towards the achievement of strategic targets and objectives, and 2) action indicators showing progress with specific actions. The combination of these two indicators will allow to assess the implementation and effectiveness of the Québec Timber Production Strategy and the regional strategies, to verify the performance of both and to make any adjustments that may be needed. Progress will be measured using points of reference established from the 2013-2018 period for the public forest and from the year 2018 for the private forest.

The improvement of the value of harvested timber (quality and quantity), which constitutes the medium- and the long-term targets, will reflect the level of success of all the actions taken. It will be measured every five years.

A number of specific actions will be included in the regional timber production strategies (Table 3) while others will be measured regularly, using indicators (Table 5). These indicators are:

- Economic profitability of silvicultural scenarios and management strategies
- Economic benefits
- The ratio of volumes harvested to allowable cuts in the public forest
- The ratio of volumes harvested to allowable cuts in the private forest
- The ratio of forest monitoring completed to forest monitoring planned
- The ratio of silvicultural work completed to silvicultural work planned
- The success of silvicultural treatments (size, volume, composition, quality) compared to anticipated success by silvicultural intensity gradient level
- Quantity of carbon sequestered and climate benefits (radiative forcing) obtained from silvicultural work

These indicators will be subject to public accountability, some of them in the Sustainable Forest Management Report produced every five years by the Department.

The actions relating to innovation and knowledge will be monitored at the provincial level (Table 4).

Photo: Marc-André Brochu, MFFP

The Sustainable Forest Development Act requires the Minister to table a review of sustainable forest management every five years. The Department therefore reviews all its processes and outcomes on a five-year basis. The next review will cover the 2013-2018 period and will be available in 2020.

Table 3 Specific actions to be included in regional strategies

1.1	Create regional timber production strategies to meet local timber production needs
1.2	Encourage silvicultural treatments that will help produce high timber quality and generate economic benefits for society
2.1	Support State decisions to invest in sustainable forest management with economic analysis
3.1	Include risk management guidelines for natural disturbances in management strategies
3.2	Diversify timber production options to address different issues
3.3	Gradually incorporate the impacts of climate change into forestry plans
4.1	Plan investments according to the operational feasibility of the silvicultural scenario
4.2	Monitor and maintain areas under management to obtain the anticipated economic and timber yields
6.1	Optimize harvest planning to minimize impacts on supply costs
6.2	Perform a detailed characterization of the quality and volume of timber currently available and required in the future
9.2	Promote silvicultural scenarios that will help increase the contribution of forest management to the tackle against climate change

Table 4 Actions associated with management of innovation and knowledge at provincial level

10.1	Provide financial support for silviculture and sustainable management research institutions and centres, and ensure that they complement the Government's own research
11.1	Make available the products derived from knowledge acquisition
11.2	Ensure that knowledge is incorporated into forestry practice

Photo: Marc-André Brochu, MFFP

Table 5 Indicators to be measured regularly and associated specific actions

Indicators	Specific actions associated with the indicators
Economic viability of silvicultural scenarios and management strategies Economic benefits	2.1 Support State decisions to invest in sustainable forest management with economic analysis 3.1 Include risk management guidelines for natural disturbances in management strategies
Ratio of forest monitoring performed to forest monitoring planned Ratio of silvicultural work performed to silvicultural work planned Success of silvicultural treatments (size, volume, composition, quality) compared to anticipated success by silvicultural intensity gradient level	4.2 Monitor and maintain areas under management to obtain the anticipated economic and timber yields
Ratio of volumes harvested to allowable cuts in the public forest	5.1 Support the development of the industry and its supply structure by taking timber production issues into account 5.2 Introduce means, including programs, to facilitate the harvest of available timber 5.3 Increase the harvest rate for timber affected by natural disturbances
Ratio of volumes harvested to allowable cuts in the private forest	7.1 Encourage forest owners to harvest more timber 8.1 Ensure that investments in private forests are economically profitable 8.2 Improve forest productivity by intensifying silviculture and increasing the size of areas to be used for forest production 8.3 Provide better protection for the private forests, including via the spruce budworm spray program
Quantity of carbon sequestered and climate benefits (radiative forcing)	9.1 Identify the forest sector's potential additional contribution to the achievement of Québec's greenhouse gas reduction objectives and targets

With the Québec National Timber Strategy, **the province is resolutely committed to create wealth from wood**. Québec is proud to present a **new vision of forestry** that will maintain its leadership in sustainable forest management.

Photo: Roch Théroux

APPENDIX 1: Clarification of Provincial Targets

Provincial targets for increased harvested timber volumes in 30 and 60 years' time (see the "Vision" section) were estimated from measures already in existence, for which anticipated outcomes are highly probable. Additional measures were also considered, including:

- Plantations already completed and growing, in both public and private forests
- Higher success rates in recent public forest softwood plantations
- Commercial thinning carried out in public and private forests
- Additional harvests in private forests
- Additional partial cuts in public softwood forests
- Improved hardwood quality
- Restoration of production in unforested areas

Other elements will be considered more specifically when the regional strategies are prepared. It is at that time that each region will decide on the appropriate combination of timber production options for its specific area, and their contribution to the achievement of provincial targets for harvested volume increases.

Table 6 presents a sample breakdown of the provincial targets set out in Table 1 of the "Vision" section. The data in Table 6 are more detailed and the values for the public and private forests are shown separately.

The first column of the table breaks down the data for the public forest, the private forest and the total. The second column presents details based on the provincial target timeframes.

The "Allowable cut" column shows the allowable cut for the reference period, i.e. 2018-2023 for the public forest and the year 2018 for the private forest. The "Allowable cut with optimized investments" column shows the allowable cuts anticipated for each timeframe when silvicultural investments are optimized. Silvicultural measures will increase timber production and help increase the allowable cuts. Given that it takes time to produce timber, very little additional volume will be available in 2025. On the other hand, in 2050, an additional 12.5 Mm^3 will be available for harvesting, over and above the reference period level. The regional timber production strategies will confirm the timber production options and the best ways of producing this additional volume.

The allowable cuts for the public forest are calculated by the Chief Forester every five years. Numerous elements are considered in the calculation process. Some may decrease the allowable cut (natural disturbances, new protected areas, etc.), while others may increase it (intensification of silviculture, work adapted to stand age structure, etc.).

The "Harvest percentage" column shows the approximate change in the percentage of the allowable cut that will be harvested.

The "Timber harvest target" column shows changes over time in the volume harvested annually, and is obtained by multiplying the harvest percentage by the allowable cut with optimized investments. During the reference period, the total annual harvest is 29 Mm^3 of timber (private and public forests). The figure will increase to 33 Mm^3 in 2025, 42.9 Mm^3 in 2050 and 52.9 Mm^3 in 2080.

The "Annual yield" column shows the probable change in the allowable cut per hectare per year. Annual yield is the ratio between the gross annual allowable cut and the area considered when calculating the allowable cuts, i.e. 27.8 M hectares in the public forest and 6.8 M hectares in the private forest.

Table 6 Breakdown of provincial targets for timber harvest (Table 1)

Source	Timeframe	Allowable cut (Mm^3)	Allowable cut with optimized investments (Mm^3)	Harvest percentage (%)	Timber harvest target (Mm^3)	Annual yield ($m^3/ha/yr$)
Public	**Reference[a]**	**32.8**	**32.8**	**68.9**	**22.6**	**1.2**
	2025[b]		35.4	71.2	25.2	1.3
	2050[c]		43.7	75.3	32.9	1.6
	2080[c]		51.2	79.9	40.9	1.8
Private	**Reference[d]**	**16.7**	**16.7**	**38.3**	**6.4**	**2.5**
	2025		16.7	46.7	7.8	2.5
	2050		18.3	54.6	10.0	2.7
	2080		18.5	64.9	12.0	2.7
Total	**Reference**	**49.5**	**49.5**	**58.6**	**29.0**	**1.4**
	2025		52.1	63.3	33.0	1.5
	2050		62.0	69.2	42.9	1.8
	2080		69.7	75.9	52.9	2.0

a The reference period is 2013-2018 for the management units and 2015-2018 for the residual forest areas. The data include unharvested volumes (UHV) from previous periods determined by the Chief Forester and harvested during the reference period.

b The public forest allowable cut of 35.4 Mm^3 is determined for the management units by the Chief Forester for the period 2018-2023 plus that for the residual forest areas in force on April 1, 2020.

c The public forest allowable cuts for 2050 and 2080 are inspired by the opinion published by the Chief Forester in December 2017, entitled "Predictability, Stability and Allowable Cut Increases".

d The reference period for the private forest is the year 2018. The harvested volume for the reference period excludes firewood production.

APPENDIX 2: Clarification of Economic Indicators

The measures set out in the Québec Timber Production Strategy, which are designed to help achieve the volume targets shown in Appendix 1, will also generate more wealth for Québec. This Appendix presents the gross domestic product (GDP) targets and economic indicators chosen to measure the wealth creation impacts generated by the intensification of harvesting and timber production activities.

GDP targets and two economic indicators (jobs and exports) were chosen. They are calculated for the forestry sector as a whole, including:

- Forestry support activities
- Forestry and forest operations
- Primary wood and paper processing
- Secondary wood and paper processing

GDP is the monetary value of all goods for the entire forestry sector. It represents wealth produced from the forest resource.

Annual equivalent employment refers to forestry sector jobs including jobs in silviculture and other forestry support jobs generated by harvesting and processing of wood and by forest management investments.

The column "Québec's forest product exports" shows the value of forest products from Québec that are sold outside Canada.

These indicators are calculated for the Strategy's three timeframes (2025, 2050 and 2080) and for the reference period.

The economic spinoff assessment is based on the inter-sector model of Québec prepared by the Institut de la statistique du Québec. The model is used to analyze the economic impacts of harvest intensification at a given time. In the case of the Québec Timber Production Strategy, growth timeframes are long, and a projection is therefore made for the economic variables based on the Strategy's different management scenarios over 30 and 60 years.

It is important to remember that the simulation uses assumptions for volume increases and changes to timber characteristics. These assumptions are as follows:

- The GDP share of Québec's forest product exports is maintained over time; in other words, there is no change in the trade structure. This assumption appears to be the most realistic, because while exports may increase if production is increased, domestic consumption may also increase when specific measures are implemented, in particular those relating to the use of timber for construction, thereby reducing exports.
- The production and consumption market is stable, i.e. product types and the demand structure for those products will not change.
- Labour productivity increases over time. This increased productivity is usually expressed as a reduction in the use of the labour factor to produce the same quantity. However, Statistics Canada's index of labour productivity[6] does not capture improvements to employment conditions or job quality. Consequently, it may show a smaller increase in employment than GDP over time, but does not assess job quality.

The economic targets and indicators do not take into consideration the impacts of unforeseen events (recession, trade conflicts, etc.) or other actions such as Government measures and initiatives to encourage the development of Québec's forest products industry at the local, national and international levels. The economic indicators are presented in constant 2018 dollars.

Table 7 presents a breakdown of economic indicators and targets for timber harvest and wealth, for Québec as a whole (total of the public and private forests), based on changes to the allowable cut. The data are more detailed and show variations for the target timeframes.

6 Source: Statistics Canada, Multifactor productivity and related variables in the aggregate business sector and major sub-sectors, by industry, Table 36-10-0211-01.

Table 7 Economic impacts of provincial timber harvest targets

Provenance	Horizon	Allowable cut without investment optimization (Mm^3)	Allowable cut with investment optimization (Mm^3)	Harvest percentage (%)	Timber harvest target (Mm^3)	GDP target ($ billions)	Economic indicators for Strategy targets	
							Forest products exports ($ billions)	Number of jobs (Thousands of jobs)
Forests of Québec	**Reference**	**49.5**	**49.5**	**58.6**	**29.0**	**6.3**	**9.3**	**59.1**
	2025		52.1	63.3	33.0	7.1	10.7	63.5
	2050		62.0	69.2	42.9	9.3	14.1	71.6
	2080		69.7	75.9	52.9	12.3	19.0	75.4

The GDP increase of $9.3 billion in 2050 and $12.3 billion in 2080 is generated by an increase in timber harvesting and processing as a result of the Québec Timber Production Strategy measures. The increase has two components, namely an increase in the volume of timber harvested and processed in each target year, and an increase in added value as a result of these volumes being processed after 2050.

The GDP reference value[7] is the average GDP value between 2013 and 2018. The reference GDP is related to the timber harvest target (Mm^3). Specific regional features have been considered, such as the proximity to markets and the climate conducive to tree growth in Southern Québec's forests, which create a better context for operations. The impact of forestry support activities for GDP is assumed to be stable over time, and no assumption has been made regarding increased investment, other than inflation.

The export reference value[8] is the average value of exports between 2013 and 2018. Export values may be $14.1 billion in 2050 and $19 billion in 2080. To isolate the impacts of the Québec Timber Production Strategy, the model assumes a linear relationship between GDP growth and growth of Québec's forest product exports. There is therefore no change in trade structure, as noted earlier. The reference value is the average annual value of exports between 2013 and 2018.

The last column shows changes in employment for harvesting, processing (primary and secondary) and forestry support. The employment reference value[9] is the average between 2013 and 2018. The number of jobs follows the increase in harvested volumes and reflects the fact that all volumes do not have the same impact on employment. An assumption regarding productivity gains is made, i.e. the ratio of jobs/processed m^3 will decrease over time. The number of jobs in the sector should increase to 72,000 in 2050 and 75,000 in 2080.

Forestry support jobs remain proportionally stable because they are linked to investments and the productivity gain potential over time is relatively low for this type of activity.

With due regard for its limits, the projection shows that the Québec Timber Production Strategy will generate economic gains for three indicators of prosperity in Québec, within a context of sustainable management and enhancement of the forest resource.

7 Source: Statistics Canada, Gross domestic product (GDP) at basic prices, by industry, provinces and territories, Table 36-10-0402-01.

8 Source : Institut de la statistique du Québec, based on the type of goods classification.

9 Source: Statistics Canada. Table 14-10-0202-01 Employment by industry, annual data.

Bibliography

BEAUREGARD, R. (2015), *Chantier sur la production de bois, Le volet économique de la Stratégie d'aménagement durable des forêts.* Final report, February 2015, 65 p.

BUREAU DU FORESTIER EN CHEF (2015). *Succès des plantations. Avis du Forestier en chef, FEC-AVIS-04-2015.* Roberval, Gouvernement du Québec, 22 p.

BUREAU DU FORESTIER EN CHEF (2017). *Prévisibilité, stabilité et augmentation des possibilités forestières. Avis du Forestier en chef*. Roberval, Gouvernement du Québec, 46 p.

BUREAU DU FORESTIER EN CHEF (2018). *Détermination 2018-2023. Synthèse provinciale.* Update – March 2018. [Online]. [https://forestierenchef.gouv.qc.ca/wp-content/uploads/2018/03/rxx_synthese_provinciale_mars_2018.pdf].

COMMISSION D'ÉTUDE SUR LA GESTION DE LA FORÊT PUBLIQUE QUÉBÉCOISE (2004). *Report*, 307 p.

CÔTÉ, M. A. et al. (2018). *Guide d'aide à la rédaction d'un règlement municipal sur l'abattage d'arbres et la protection du couvert forestier.* Fédération québécoise des municipalités. [Online]. [http://fqm.ca/publications].

DELISLE, J.-F. (2019). *Ressources et industries forestières du Québec – Portrait statistique, édition 2018*. Québec, Gouvernement du Québec, ministère des Forêts, de la Faune et des Parcs, Direction de la modernisation de l'industrie des produits forestiers, 232 p.

DONNÉES QUÉBEC (2019). *donneesquebec.ca*. [Online]. [https://www.donneesquebec.ca/fr/].

FÉDÉRATION DES PRODUCTEURS FORESTIERS DU QUÉBEC (2013). *La récolte de bois de chauffage en forêt privée*, Forêt de chez nous PLUS, August 1, 2013, vol. 18, no. 8, 2 p.

FÉDÉRATION DES PRODUCTEURS FORESTIERS DU QUÉBEC (2018). *La forêt privée chiffrée, édition 2018*. Longueuil, Fédération des producteurs forestiers du Québec, 32 p.

FÉDÉRATION DES PRODUCTEURS FORESTIERS DU QUÉBEC (2019). *Bilan de la mise en marché des bois de la forêt privée en 2018*, Forêt de chez nous PLUS, April 1, 2019, vol. 24, no. 4, 2 p.

MINISTÈRE DE L'ENVIRONNEMENT ET DE LA LUTTE CONTRE LES CHANGEMENTS CLIMATIQUES (2012). *2013-2020 Climate Change Action Plan*. Québec, Gouvernement du Québec, 55 p.

MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (2015). *Objectifs de protection et de mise en valeur des ressources du milieu forestier*. [Online], Québec, Gouvernement du Québec. [https://mffp.gouv.qc.ca/forets/amenagement/documents/liste-OPMV.pdf].

MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (2015). *Sustainable Forest Management Strategy*. Québec, Gouvernement du Québec, 38 p.

MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (2017). *Plan d'action national sur la mobilisation des bois en forêt privée – 2016-2019*. Québec, Gouvernement du Québec, Direction de l'aménagement et de l'environnement forestiers, 17 p.

MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (2018). *Stratégie de développement de l'industrie québécoise des produits forestiers 2018-2023*. Québec, Gouvernement du Québec, 67 p.

MINISTÈRE DES RESSOURCES NATURELLES (2018). *Une Stratégie – Aménagement pour mieux protéger les forêts*. Québec, Gouvernement du Québec, 213 p.

MINISTÈRE DES RESSOURCES NATURELLES (2013). *Le guide sylvicole du Québec, Tome 2*. Québec, Les Publications du Québec, 744 p.

MINISTÈRE DU TRAVAIL, DE L'EMPLOI ET DE LA SOLIDARITÉ SOCIALE (2018). *National Workforce Strategy 2018-2023*. Québec, Gouvernement du Québec, 95 p.

QUÉBEC (2013). *Forest Act*, CQLR, chapter F-4.1, updated on March 31, 2013. Québec, Éditeur officiel du Québec.

QUÉBEC. (2017). *Regulation respecting the sustainable development of forests in the domain of the State*. [Online]. Gazette officielle du Québec, May 2, 2017, 149th year, no. 21, p. 1805-1866. [http://www2.publicationsduquebec.gouv.qc.ca/dynamicSearch/telecharge.php?type=1&file=66586.pdf].

QUÉBEC (2019). *Sustainable Forest Development Act*, CQLR, chapter A-18.1, updated on November 1, 2019. [Online]. Les Publications du Québec, LégisQuébec. [http://legisquebec.gouv.qc.ca/fr/ShowDoc/cs/A-18.1].

Forêts, Faune
et Parcs
Québec