



Québec Wood Production Strategy

A Commitment to Wealth Creation

Consultation Document – Version of June 5th, 2018

ENSEMBLE  
on fait avancer le Québec

Québec 

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A Word from the Minister

Québec's forests are remarkable for their vastness and diversity of wood species. These features allow the forestry industry to play a major role in the economy of Québec and its regions. In 2016, the forestry industry employed nearly 60,000 workers from every part of the province and exported \$10.4 billion in wood products.

This draft Québec Wood Production Strategy proposes that the Ministère focus and intensify its efforts to ensure that Québec's forests generate greater benefits for everyone. Through targeted investments and the creation of favourable conditions, we believe that private and public forests will be able to produce a continuous supply of wood with the desired characteristics for processing.

We are confident that the consultation we are launching today will promote the adoption of a new approach to wood production that places greater emphasis on the value of wood available for harvest rather than solely considering its volume. It will help ensure that harvested wood meets industry needs and is financially viable.

The comments you provide will enrich our reflection. Ultimately, the implementation of the Québec Wood Production Strategy will depend on the mobilization of all forestry management stakeholders and particularly on the strategies developed in each region. The ingenuity of every stakeholder will be essential to achieving the goal of sustainable forest management.

Thank you for helping Québec reaffirm its commitment to strengthen the development and competitiveness of its forestry industry.

I wish you a most constructive consultation!

A stylized, handwritten signature in black ink, appearing to read 'Luc B.' with a large, sweeping flourish at the end.

Luc Blanchette
Minister of Forests, Wildlife and Parks

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The Current Status of Wood Production

In recent years, the Ministère des Forêts, de la Faune et des Parcs (MFFP) has worked hard to implement a new forest regime based on the principles of sustainable forest management. As part of this process, the province has adopted its first Sustainable Forest Management Strategy (SFMS),¹ which provides economic, ecological and social guidelines for the Government's forest management actions. The current forest regime was built on a consensus among numerous actors from the forest community, and has earned an excellent reputation worldwide for Québec.² The Québec Wood Production Strategy falls within this general context. With its strong commitment to wealth creation, it focuses on the economic aspect of the SFMS.

As far back as the 1990s, Québec was already making some important forest management choices, in particular when it adopted its Forest Protection Strategy, an initiative taken in response to growing concerns about sustainable, multiple use of the forests. It also confirmed the Government's intention to take advantage of abundant and inexpensive natural regeneration in logged areas. The many measures subsequently introduced to maintain biodiversity and multiple forest uses, ranging from the inclusion of sustainable management indicators and criteria in the *Forest Act* (chapter F-4.1) to the adoption of the ecosystem-based approach to forest management, have combined to diversify the forest and make it more resilient. Thanks to this solid base, it is now possible to approach the issue of wood production with confidence, in order to face future uncertainties concerning markets and climate change.

In a context marked by market conditions that are increasingly favourable to wood products and by an increase in the use of wood products for construction, the Québec Wood Production Strategy seeks to take advantage of the province's many assets, including the characteristics of its wood, its immense territory and the strong innovative capacity of its forest sector companies. To do this, the province must meet the challenges posed by the current status of wood as a resource. In recent decades, the supply of wood has diminished, in terms of both quantity and quality. Between 2000 and 2018, allowable cuts shrank by 22%. Tree size continues to decline steadily in the softwood forest, and tree quality is diminishing in the hardwood forest. Less desirable species proliferate in many sectors. Trees are also becoming difficult to harvest: they are more scattered and generally grow in areas that are difficult to reach or are used for multiple purposes. Fluctuations in the use of forest products in Québec suggest that it is becoming increasingly difficult to sell low-quality hardwood and softwood lumber by-products such as chips.

In view of these widely-shared facts, the MFFP has prepared the Québec Wood Production Strategy with the aim of creating wealth for society. In doing so, it has taken a structured approach combining existing ways of improving wood production with new methods that have yet to be deployed.

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

2. CHALIFOUX, É. (2018). *Customer Market Acceptance Research*, Montreal, Léger, 146 p.

From Volume to Value

In the past, the main approach to wood production focused on increasing the total volume available for harvesting. However, although increasing the volume of wood is likely to generate additional economic benefits, it is not the only way of creating wealth. For example, management strategies may generate more wood, but only part of that wood may have the qualities required by the markets. To produce more wood that is suitable for processing, the Québec Wood Production Strategy takes an approach focused on the value of the harvested timber supply, rather than on volume alone.

This does not mean that concerns regarding the volume of wood produced will be ignored. On the contrary, volume is an essential variable, since it is the multiplying factor for the wood's characteristics. Producing more wood with the desired characteristics, at a competitive price, based on profitable investments, is the fundamental aim of a wood production strategy focused on value.

The timber supply strategies prepared by the forestry companies already include the notion of value. Among other things, this explains why significant quantities of wood are not harvested. Some forestry attributes have always been safe (see the box below, on the timber supply), providing ample justification for actions to increase their availability over time. Considering volume alone may cause certain attributes to be ignored. Forest managers can therefore make better choices by basing their decisions on both variables of the timber supply (quantity and characteristics of the wood), with due consideration for cost. In an approach such as this, silvicultural investments will be used more effectively, and the economic benefits for society will also be greater.

The Timber Supply

The timber supply comprises two variables: the “quantity of wood available for harvesting” (the allowable cut) and the “characteristics of the wood”. It depends on a number of forestry attributes including:

- Total harvestable volume
- Volume per hectare
- Species composition
- Tree diameter
- Wood quality, established mainly from its mechanical properties and appearance

The timber supply is assessed once every five years.

Value of the Harvested Timber supply

The value of the harvested timber supply is calculated using the equation shown in Figure 2. It results from a combination of:

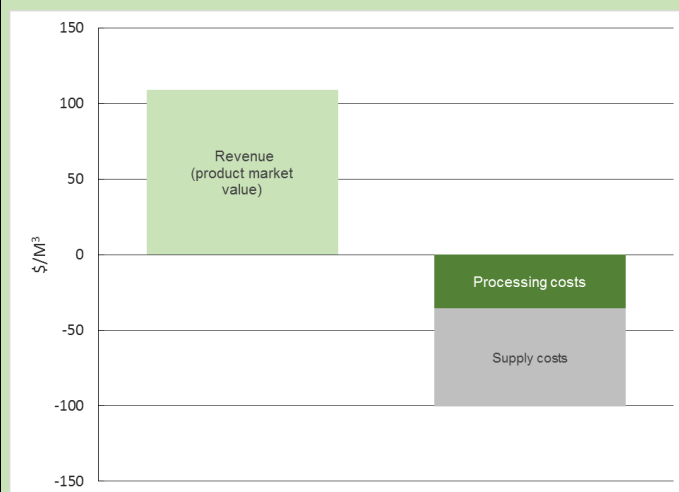
- The available timber supply: the annual allowable cut and its characteristics.
- The value of potential products:³ the market value of the products minus processing and transportation costs. This is also referred to as the net processing revenue.
- The available wood utilization ratio: wood harvested as a percentage of the allowable cut.

The best lever for increasing the economic benefits of the forest for Québec society (State, companies and workers) is to increase the value of the timber supply with the characteristics desired by the industry, and at the same time to control or reduce supply costs. This will help to create collective wealth and achieve employment stability in the forest sector in both the medium and longer term.

Potential product value

In a stand, individual trees can be processed to make different products, depending on their attributes. Each tree or stand therefore constitutes a basket of potentially developable products.

For wood production purposes, potential product value is obtained by subtracting processing costs from the market value of the products.



Potential product value determines whether or not it will be profitable for a company to harvest a given stand. If the answer is “yes”, the amount of its expenses will be divided between its supply costs and its transfers to the State. The remainder will constitute its net profit. The company therefore benefits if the potential product value is higher. There is also an advantage for the State, because the economic activity from harvesting generates more economic benefits.

Figure 1 shows that the market value of the products minus the processing costs gives the margin available for supply costs. It is this margin that constitutes the potential product value.

Figure 1 – Diagram showing a company's revenues and expenses

3. Sources of information to calculate the product value include publications such as Pribec, Wood Resources International and the 2013-2014 survey of lumber operating costs and revenues for Québec's forest industry.

Calculating the harvested timber supply value

To create wealth, the MFFP considers the economic viability of investments as a prerequisite for increasing the value of the harvested timber supply. As for supply costs, they must be controlled or reduced, because they influence the utilization rate. Lastly, processing profits impact both product value and utilization rate. It is on these points in particular that the Québec Wood Production Strategy connects with the 2018-2023 Development Strategy for Québec's Forest Products Industry.

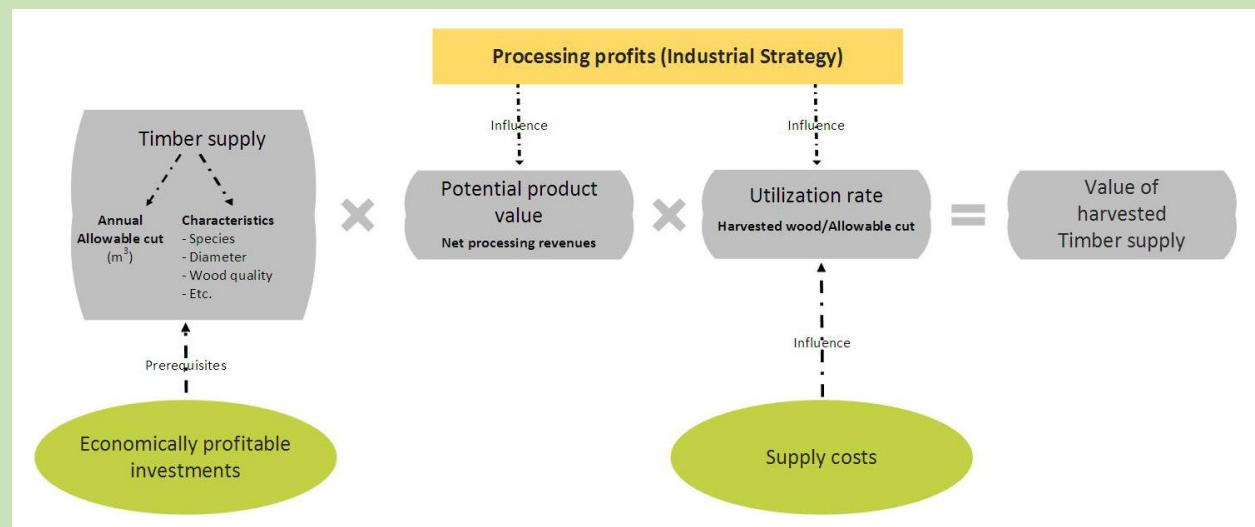


Figure 2 – Calculating the harvested timber supply value

Sample calculation: Harvested timber supply value

Table 1 shows a simplified example of how harvested softwood value is calculated. The underlying assumptions are that allowable cut and utilization rate do not change, investments are profitable and supply costs are controlled or reduced. The calculation uses the following data:

The product value of one cubic metre of softwood in 2018 is roughly \$64/m³, based on an average harvested tree diameter of 16 cm. If the diameter was 20 cm, the product value would be roughly \$72/m³. The additional value would be due to a higher lumber percentage and hence a lower percentage of by-products (chips, sawdust), which are worth less.

Table 1 – Sample calculation: Value of harvested softwood supply

Variables	Current situation for softwoods	Potential situation for softwoods
Allowable cut (net volume)	20.5 Mm ³	20.5 Mm ³
Product value	\$64/m ³	\$72/m ³
Utilization rate	80%	80%
Value of harvested softwood supply	20.5 Mm ³ x \$64/m³ x 80% = \$1.05 billion	20.5 Mm ³ x \$72/m³ x 80% = \$1.18 billion

As the example shows, if the product value were to increase from \$64/m³ to \$72/m³, then the harvested timber supply value would be \$130 million more than is currently the case. The additional value would therefore increase not only the company's profits, but also, all other things being equal, the gross domestic product (GDP).

Building on Past Achievements

The Québec Wood Production Strategy implements a set of commitments made under the orientation “Increase the value created from wood to generate greater collective wealth” in the Sustainable Forest Management Strategy. Its aim is to strengthen the economic component of the Sustainable Forest Management Strategy, in harmony with undertakings made in the social and environmental components.

A forest used for multiple purposes

As Figure 3 shows, the Québec Wood Production Strategy is consistent with the Development Strategy for Québec's Forest Products Industry in that it focuses on the production of timber for the wood industry. However, other forest uses are also considered, along with their economic, ecological or cultural importance. The population of Québec enjoy these activities, and some, such as hunting, fishing, vacationing and ecotourism, play a significant role in local economies.

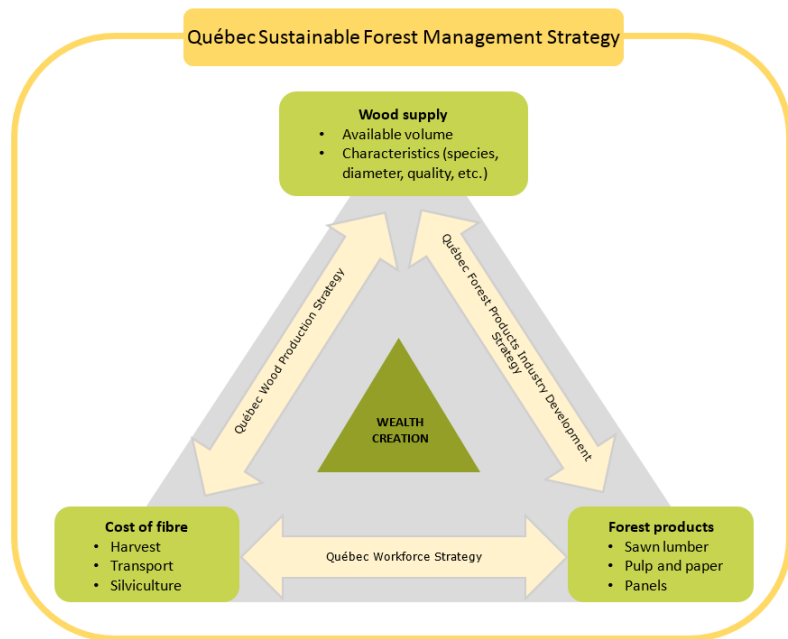


Figure 3 – Wealth creation from Québec's forests

Wood production depends on the presence of viable, functional ecosystems. For production to be sustainable, ecological processes must therefore be considered when managing the forests. The MFFP uses ecosystem-based management to ensure that the anticipated economic services provided by the forest will be sustainable.

Forest managers must therefore adjust their wood production efforts in order to reconcile the expectations of different users, as provided for in the Sustainable Forest Development Act (SFDA, chapter A-18.1) and the Sustainable Forest Management Strategy. The Québec Wood Production Strategy will focus on mutually beneficial wood production opportunities. When wood production options overlap other uses, the Strategy will provide for harmonization measures. In some cases, zoning will be used to define the territorial boundaries of clearly established areas in which intensive wood production will take priority.

Community involvement

Québec's forest regime includes a number of mechanisms to involve communities and ensure that the stakeholder's interests, values and needs are taken into account throughout the forest planning process. These mechanisms, which are based on integrated, regionalized, participatory management of forest resources, will be used to implement deploy the Québec Wood Production Strategy.

As provided for in the Sustainable Forest Development Act, the MFFP will conduct separate consultations with the Aboriginal communities. The Québec Wood Production Strategy will be implemented with due regard for the existing ancestral or treaty rights of Aboriginal peoples and the obligations that arise from them. It will also aim to foster economic spinoffs for the communities.

The forest as a means of countering climate change

More than ever before, the forest and forest products are sought-after for their role in mitigating climate change impacts. The forest captures and sequesters large quantities of carbon, and forest products can be used instead of materials whose production generates large volumes of greenhouse gases. The silvicultural scenarios proposed in the strategy that will guarantee the sustainable delivery of forest products, emerged from a process of reflection on climate change. The Strategy will play a significant role in achieving the ambitious adaptation and mitigation objectives for climate change, set by the Québec Government.

Wealth creation

Québec's forest regime is based on a plural vision of the province's forests, which are regarded simultaneously as renewable resources, scenery, sites of interest, cultural value, natural sites used for recreational, tourism, vacation and outdoor activities, and diverse wildlife and plant habitats.⁴ The forest's diversity is an essential component of Québec's social and economic development. Accordingly, the Québec Wood Production Strategy will focus on its sustainability, so that present and future generations can continue to benefit from and enjoy it.

The MFFP has considered the multiple uses of the province's forests and the economic contribution of each use, and has focused the Québec Wood Production Strategy on wood as a resource. The notion of wealth creation that forms an inherent part of the Strategy therefore has a specific meaning, that of increasing, over time, both the value of wood available for harvesting and the economic viability of the silvicultural investments needed to do so. The aspect of time is crucial: to create wealth, it is a question of making management choices that will be profitable in the medium and longer term, with due respect for multiple forest uses, rather than simply increasing the short-term profits from wood production.

4. Inspired by the report of the COMMISSION D'ÉTUDE SUR LA GESTION DE LA FORÊT PUBLIQUE QUÉBÉCOISE (2004). *Rapport*, Québec, Gouvernement du Québec, 307 p.

Workforce issues

The Québec Government is aware of the issues raised by the labour shortage. It has therefore presented its first-ever National Workforce Strategy, which sets out the steps it intends to take to strengthen the vital role played by workers in Québec's economy. Forest sector companies will benefit from a series of measures adapted to their specific professional context.

The forest industry must have access to an adequate supply of qualified, competent, motivated workers to ensure the survival of efficient forest management companies. However, it is often difficult to attract and retain forestry workers, due among other things to the lack of predictability of the work, difficult working conditions, the seasonal aspect of jobs and the fact that training is not always adjusted to the needs of the employment market.

The labour shortage poses a significant risk to the successful application of regional wood production strategies. This risk will be examined regionally, to ensure that it receives proper consideration when selecting silvicultural scenarios.

In addition, the *Comité sectoriel de main-d'œuvre en aménagement forestier* (forest management sector workforce committee, or CSMOAF) is working actively with Québec's vocational training centres and various forest industry partners to meet the needs of forest sector workers. It oversees continuous training and professional qualification of the forestry workforce and supports good human resource management practices. More generally, the CSMOAF also works hard to assert the value of the forest management industry workforce in Québec.

This combined effort will help companies to attract, retain and develop a qualified forestry workforce, in the mills and in the field, and this, in turn, will benefit the Québec population as a whole.

Vision

With a forest regime built on the principles of sustainable forest management, the Québec Government is now taking action to increase the value of wood harvested in the public and private forests, to help create wealth that will benefit all the regions.

Provincial strategic targets

- Short-term:** Harvest an additional 4 million cubic metres (Mm³) of wood per year within five years.
- Medium-term:** Increase the value of the harvested timber supply by at least 30% within 20 years, by focusing on both the quality and the quantity of wood available for harvesting.
- Achieve 25 % of areas of increased timber production (AITP) entered in the register provided for in the Sustainable Forest Development Act.
- Long-term:** Increase the value of the harvested timber supply by at least 40% within 45 years, by focusing on both the quality and the quantity of wood available for harvesting.

In 2013-2018, the forest sector employed approximately 60,000 people. The average annual allowable cut (public and private forests) was 47.4 Mm³ and the volume harvested was 26.6 Mm³, for a utilization rate of 56 %. Based on a value of \$66 /m³ for the period, weighted by product, the value of the harvested timber supply was \$1.75 billion.

The number of jobs shown in Table 2 reflects current mill productivity. One of the aims of the 2018-2023 Development Strategy for Québec's Forest Products Industry is to increase productivity. This would mitigate the estimated employment increase.

Table 2 – Provincial strategic targets

Time-frame	Provincial targets			Positive consequences			Inputs
	Increase the value of the timber supply			Number of jobs created			Increase in allowable cut
	%	M\$	m ³	Forest ^a	Mill ^b	Total	
5 years	10	200	4 M harvested	2 000	8 000	10 000	n/a
20 years	30	400	8 M harvested	4 000	16 000	20 000	8 M m ³
45 years	40	750	14 M harvested	8 000	32 000	40 000	16 M m ³

a. Forestry and logging

b. Production of wood and paper products

Chief Forester's Advice

The Minister of Forests, Wildlife and Parks asked the Chief Forester to identify measures that will help improve supply predictability for the industry and better address the economic aspect of sustainable management. The premise underlying this request was the fact that supply stability over time would help create a commercial context conducive to investment. The Chief Forester's main recommendations were as follows:⁵

Recommendation 1: Undertake to achieve established wood production targets in order to maintain and increase allowable cuts. The Chief Forester suggested that the forest yield should be increased by raising total allowable cuts by at least 25% between now and 2038, and by 50% by 2063, compared to the yields calculated for the period 2018-2023.

Recommendation 2: Use the forest and wood products as tools to mitigate climate change impacts. The Québec Government must be able to rely on the forest's potential contribution to the achievement of greenhouse gas reduction targets. Achieving wood production targets would provide increased carbon capture and storage capacity in the forest and in wood products.

Recommendation 3: Enhance the forest's capacity to adapt to uncertainty, so that it remains healthy and becomes more diverse. Effective salvaging of wood damaged by natural disturbances is one method that can be implemented as part of a risk management plan.



5. Taken from the report prepared (in French only) by the Office of the Chief Forester (2017). *Prévisibilité, stabilité et augmentation des possibilités forestières. Avis du Forestier en chef*. Roberval, Gouvernement du Québec, p. 5-6.

Five Focus Areas

The strategic targets for increasing the value of the harvested timber supply, used over time to structure the Québec Wood Production Strategy, focus on five separate but related areas (Figure 4), each with its own heading. To increase the value of the harvested timber supply in the short, medium and longer term, it will be necessary to improve the timber supply (focus area 1), and the wood harvest (focus area 2), some of which is in the private forest (focus area 3), by making production choices within the context of climate change (focus area 4) and relying on innovation and knowledge (focus area 5). For each area heading, the MFFP has set a number of objectives and identified the specific actions needed to achieve them. It has also identified indicators that will be used to evaluate the success of the Strategy (see the section entitled Monitoring of Results).

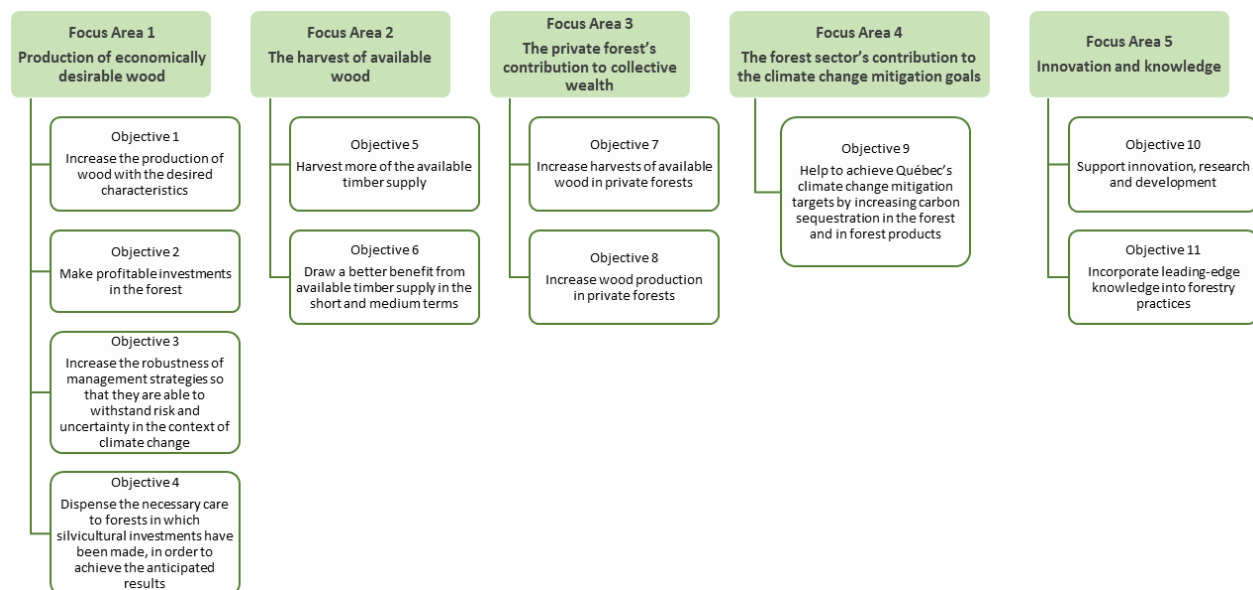


Figure 4 – The five focus areas of the Provincial Wood Production Strategy

A Provincial Strategy Driven by the Regions

Because every region has its own issues and challenges, the Provincial Strategy's vision will be implemented through regional wood production strategies. Forest managers, thanks to their knowledge of their region's specific features, will therefore play a leading role, and it will be their responsibility to identify the means they will use to deploy the Provincial Strategy in a way that will address the specific situation of their management unit. Forest managers, working with various MFFP stakeholders and their partners, will also be required to set their own wood production goals, aligning them with existing industrial structures and with their assessment of the current and future supply and demand for forest products.

Provincial strategic targets will therefore be achieved through the specific actions contained in the regional strategies. They are listed in Table 4, page 36. The indicators identified during the monitoring process will be used to monitor progress towards achieving the targets.

Regional forest managers will have access to the *Guide d'élaboration d'une stratégie régionale de production de bois*⁶ to assist them with their work. The guide supplements the *2018-2023 Manuel de planification forestière*⁷, which can be adjusted to regional contexts and needs.

Once the regional wood production strategies have been established, they will be used to prepare forest management strategies that will be updated every five years in each management unit. The elements that will be included in the regional strategies have already been incorporated into the integrated tactical forest management plans that came into force on April 1, 2018.

Every region of Québec will prepare its own adapted, profitable, robust wood production strategy for 2021.

6. MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (2017). *Guide d'élaboration d'une stratégie régionale de production de bois – version préliminaire*, Québec, Gouvernement du Québec, Direction de l'aménagement et de l'environnement forestiers, 63 p.

7. MINISTÈRE DES FORÊTS, DE LA FAUNE ET DES PARCS (2016). *Manuel de planification forestière 2018-2023*, version 8.1, Québec, Gouvernement du Québec, Direction de l'aménagement et de l'environnement forestiers, 270 p.

Focus Area 1: Production of economically desirable wood

The Québec Government invests in the management of the public and private forests. These investments are used to implement a variety of wood production options with a view to achieving certain objectives, namely a supply of wood with the characteristics desired by the industry and markets that is therefore economically attractive. The economic viability of silvicultural investments is also an important factor. To ensure viability and obtain the anticipated yields, investments must be planned on the basis of operationally feasible silvicultural scenarios, and the ensuing actions must be performed at the right time. Lastly, better consideration of risk will ensure that the Strategy is more robust in the long term, meaning that silvicultural investments can be broken down to obtain the anticipated economic benefits.

Objective 1 Increase the production of wood with the desired characteristics	1.1	Set regional objectives for the desired timber supply
	1.2	Prepare a regional wood production strategy containing an appropriate set of wood production options
Objective 2 Make profitable investments in the forest	2.2	Base all forest management decisions on cost-benefit analyses of silvicultural scenarios and management strategies
	2.2	Divide silvicultural investments on the basis of the results of the cost-benefit analyses
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	Develop and implement integrated management orientations for the risks associated with natural disturbances
	3.2	Diversify regional strategies by designing a varied portfolio of wood production options that will meet multiple objectives
	3.3	Gradually incorporate, into forest plans, the elements of a strategy that will allow the forests to adjust to climate change
Objective 4 Dispense 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 all the silvicultural scenarios
	4.2	Monitor and maintain areas under management to obtain the anticipated results
	4.3	Complete the creation of areas of increased timber production (AITP)

Objective 1 – Increase the production of wood with the desired characteristics

The aim of the Québec Wood Production strategy is to increase the wealth creation potential of Québec's forests. Although making more wood available for harvesting is a key factor in this, it cannot be the only factor, since the value of the available wood will vary. In the past, some of the wood available for harvesting was not harvested because it did not have the characteristics desired by the industry, or because the supply costs were too high.

Increasing the production of wood with the desired characteristics will not only increase the value of the harvested timber supply, but will also reduce the gap between wood available for harvesting and wood harvested.

Although there is some uncertainty regarding future industrial needs and markets, it is nevertheless possible to identify the main attributes of the forest that determine the value of the harvested timber supply (see the “timber supply” box). These attributes remain fairly stable over time, and therefore provide a solid basis on which to build and improve the desired timber supply.

The current market demand for wood and an estimate of future potential demand will be used to establish regional wood production objectives which, in turn, will serve as a starting point for the choice of the means to be included in regional wood production strategies, in order to achieve the provincial objectives.

The wood production objectives set out in the regional strategies will be achieved to a large extent by deploying a range of wood production options through specific actions in the forest.

The wood production options take the form of silvicultural investment choices with which forest managers are familiar. Table 3, while by no means exhaustive, lists some potential wood production options.

Specific action:

1.1 Set regional objectives for the desired timber supply

Table 3 – Potential increase in the value of the timber supply compared to the naturally regenerated forest, based on the main wood production options

Wood production options in an ecosystem-based approach to management	Attributes of the forest			
	Volume per hectare	Species composition	Tree diameter	Wood quality
Natural regeneration	Reference scenario			
Intensive plantation silviculture	+ + ^a	+ +	+ +	
Planting	+	+ +	+	
Cultivation of high-value wood in hardwood and mixed forests		+	+	+ +
Commercial thinning		+	+	
Partial cuts in the softwood forest		+	+	+
Precommercial thinning (PCT)	(+) ^b	+		
Full afforestation	+	+		
Afforestation	+ + +	+ +		

a. A + sign indicates an increase over a naturally regenerated forest.

b. This effect is currently being studied by the MFFP's Direction de la recherche forestière.

All the wood production options will be examined to identify their potential contribution to the achievement of regional results and provincial targets, and this will allow forest managers to decide what needs to be done. There is no single silvicultural recipe that will address every challenge and every circumstance. Managers and partners must therefore seek to deploy the best possible combination of options to suit the specific context of their region.

One of the potential options is intensive planting silviculture. This is a recognized way of significantly increasing the volume of desired species per hectare. A variety of means, such as the use of enhanced plants, the choice of spacing between plants, control of competing vegetation and tending or thinning treatments, can help produce per-hectare yields that are significantly higher than those obtained from forests not under management. Because this option requires considerable investments and constant care, forest managers must plan it in detail and consider the risks to which the plantations may be exposed. It is an option that is feared by some users, although they may be reassured by the fact that forest managers have the means to ensure that the plantations will merge into a landscape that can be used for multiple purposes, and that the principles of ecosystem-based management are upheld (report on intensive plantation silviculture in the context of ecosystem-based management).⁸

Planting is also used in circumstances where silvicultural intensity is less and more variable (e.g. to compensate for the lack of post-logging regeneration or obtain full afforestation or afforestation of burned areas, etc.). To mitigate climate change, planting can also be used to create forests in areas that are currently not forested. This option is an important one and will

8. BARRETTE M. AND M. LEBLANC (Eds.) (2013). *La sylviculture intensive de plantations dans un contexte d'aménagement écosystémique – Rapport du groupe d'experts*, Québec, Groupe d'experts sur la sylviculture intensive de plantations, 112 p.

continue to be used over large areas, even if the anticipated yields are less than those obtained from intensive plantation silviculture, because the initial investments and level of care are less onerous and social acceptability is higher.

Although reforestation in Québec is usually carried out with softwood plants, commercial hardwood species also offer some potential and must therefore be considered.

Commercial thinning, usually associated with intensive plantation silviculture, can help to improve the timber supply by increasing the size of trees at maturity. Currently, roughly 3% of clear-cut areas have undergone commercial thinning.

These plants could be used as a sub-storey in hardwood stands whose value and productivity have diminished or declined, to increase their value.

Precommercial thinning (PCT) is also a tending treatment often associated with intensive plantation silviculture. The impacts of this treatment on stand volume, composition and age at maturity are currently being studied by the MFFP's Direction de la recherche forestière. Depending on the results of these studies and the associated cost-benefit analyses, the place of this treatment will be decided based on its ability to meet different wood production objectives. At the present time, roughly 33% of clearcut areas have undergone precommercial thinning.

Cultivation of high-value wood in hardwood and mixed forests is one of the options that offers the greatest potential for wealth creation in southern Québec regions. In the case of hardwoods such as yellow birch and sugar maple, the increase in wood quality has a much greater impact on the value of the timber supply than the increase in volume. Only 35% of the allowable cut for species other than fir, spruce, jack pine and larch (FSPL) is harvested.⁹ Cost-benefit analyses are required when estimating the potential additional investment in hardwood forests in southern Québec.

In the case of yellow birch, for example, product value varies from \$50/m³ for wood intended for pulp to \$200/m³ for peeling quality wood – in other words, four times the value.

Partial cutting can also be used in softwood forests to achieve certain wood production objectives. First, it can be used in circumstances where clearcutting would be inappropriate, for example to meet usage harmonization needs. Second, partial cutting can help meet specific objectives, such as the production of larger trees, regeneration in desired species, control of competing vegetation or additional flexibility with harvesting times.

Protection of natural regeneration continues to be an inexpensive option to provide volumes of profitable wood over large areas. Québec is a leader in Canada in terms of its ability to use carefully executed harvesting methods, and the gains of the last 30 years in this respect must be preserved. Québec is proud to state that roughly 80% of all its harvested forests regenerate naturally. Therefore, despite all the production options proposed above, natural regeneration is still the silvicultural choice that will be used in most of Québec's forests.

The list of wood production options in this document is by no means exhaustive, and other options may also be relevant in some circumstances. Forest managers will have opportunities to be creative and innovative by exploring new ways of improving the value of the timber supply harvested in Québec.

9. Office of the Chief Forester (2017). *Prévisibilité, stabilité et augmentation des possibilités forestières. Avis du Forestier en chef*. Roberval : Gouvernement du Québec, 46 p.

Specific action:

1.2 Prepare a regional wood production strategy containing an appropriate set of wood production options

Objective 2 – Make profitable investments in the forest

The Québec Wood Production Strategy is designed to increase the value of the harvestable timber supply through profitable public investments. Simply investing to make wood grow more quickly or in greater volumes does not, in and of itself, guarantee wealth creation. For wealth to be created, the yield must be more than the cost of producing the wood. In addition, the forest generates a certain amount of value through natural growth, without human intervention. To be justifiable, public investments in the public and private forests must result in increased wealth for the State, the industry and the communities.

Forest managers now have economic analysis tools to help guide their decisions. Their analyses, performed on all silvicultural scenarios and management strategies, are intended to ensure that silvicultural investments are used in the best possible way, to increase the value of the harvestable timber supply. For the period 2013-2018, the Government invested \$225 million per year in silvicultural treatments in the public forest, roughly \$35 million per year to implement private forest management programs, and \$41.1 million on other types of assistance. This latter amount was made available in 2018, for the period 2018-2023. In addition, the Government allocated approximately \$12 million per year to the private forest property tax refund program, bringing its total investment in the forest to more than \$1.4 billion for the period in question.

The economic viability of an investment is calculated according to the difference between revenues and costs for society as a whole. The calculation takes into account the income earned by workers in silvicultural, logging and processing companies, and also includes the profits of these three types of companies as well as the logging dues and royalties paid to the State. Supply costs and silvicultural costs are also considered. The cost-benefit analysis therefore compares profits to investments and to what the forest would have produced without human intervention. Economic rate-of-return indicators are available for silvicultural scenarios and management strategies.

The MFFP's role is to ensure that silvicultural investments are profitable and that they increase the value of the harvestable timber supply. The investments must also be spread effectively, to achieve the strategic targets set out in the Provincial Wood Production Strategy.

Although the general intention is to select profitable silvicultural scenarios only, there are some situations in which actions will depend on broader considerations than wood production alone. For example, forest managers may wish to avoid losing productive areas, restore productive ecosystems or protect other forest uses (e.g. wildlife production, recreation or tourist attractions). These objectives are difficult to quantify in current cost-ratio equations. These types of actions will continue to be implemented in management plans, and forest managers will do their best to include them in future economic analyses.

Specific actions:

2.1 Base all forest management decisions on cost-benefit analyses of silvicultural scenarios and management strategies

2.2 Divide silvicultural investments on the basis of the results of the cost-benefit analyses

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 must be considered in management analyses and choices, to maximize the likelihood of obtaining a return on silvicultural investments in the medium and longer term. Depending on the type of risk, mitigation measures may be adopted or investment choices may be modified.

In the regional strategies, forest managers must consider a variety of risks, including those relating to natural disturbances (fire, insects, diseases), the commercial context (markets, labour) and climate change.

Some of these risks, such as those associated with natural disturbances, are relatively predictable. Despite the uncertainty caused by climate change, it is also possible to project its probable occurrence and impacts. Ministerial policies currently under preparation will offer guidelines to help forest managers with this aspect. Once the risks associated with natural disturbances have been identified for a given region, investments can be adjusted to reflect the anticipated risks, mitigation measures can be introduced and mechanisms can put in place to produce salvage plans when necessary.

Specific action:

3.1 Develop and implement integrated risk management orientations associated with natural disturbances

Some risks are more difficult to predict than others: for example future market needs or the impact of climate change on forest dynamics and yields. Risk prediction difficulties must be considered when preparing regional wood production strategies. One way to minimize the risk associated with future uncertainty is to diversify investments. Forest managers should therefore seek to build a diverse portfolio of silvicultural investments and wood production options.

Another way to anticipate certain stresses is to analyze the vulnerability of Québec's forests to climate change. It may then be possible to adjust certain management choices based on the analysis findings. For example, the MFFP should give greater consideration to the impact 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 to address the uncertainty of how the forest will react to new climate conditions and stress from global changes (e.g. exotic species). It is therefore essential to manage the forests in a way that will strengthen their resistance, resilience and adaptability. 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. An example would be to enrich forest stands with species that will increase their ability to adapt to the anticipated stressors, in order to reduce the risk of climate related forest degradation. Management for resilience is also a factor in intensive plantation silviculture, among other things when selecting the species to be planted.

The MFFP is currently working on a strategy that will help the forests to adapt to climate change. One of its aims is to include vulnerability analyses and resilience management in the forest planning process.

Specific actions:

3.2 Diversify regional strategies by designing a varied portfolio of wood production options that will meet multiple objectives

3.3 Gradually incorporate, into forest plans, the elements of a forest climate change adaptation strategy

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

Wood production targets will be achieved and investments will be profitable only if silvicultural efforts generate the anticipated yields. Past efforts have produced mixed results, sometimes below expectations. In 2013, the Chief Forester found that, on average, plantations generated volume yields equivalent to just 63% of the anticipated level.¹⁰

To deliver the anticipated results, forest managers must first take into account the operational feasibility of implementing all the scenarios provided for in their management strategies. To do this, they must use data on the distribution of work both spatially and over time, and on the organization's ability to perform that work.

It is very important to monitor silvicultural scenarios during application, to ensure that maintenance work is performed at the right time. Where necessary, both the scenarios and the management strategy must be adjusted in light of yields.

Specific actions:

4.1 Plan investments according to the operational feasibility of all the silvicultural scenarios

4.2 Monitor and maintain areas under management to obtain the necessary results

Some wood production options, such as intensive plantation silviculture, require significant investments. Economic viability and achievement of wood production goals depend to a large extent on the potential to apply the appropriate treatments at the right time. However, the requirements of some silvicultural scenarios may not be compatible with the needs of other forest users, and it is often best to decide on plantation sites in advance.

Areas of increased timber production (AITPs) are one way of fulfilling this need. They allow the partners in a given region to agree on well-defined areas that will be used in the long term for intensive forest management purposes. Creation of these areas is provided for in the Sustainable Forest Development Act and is an objective of the Sustainable Forest Management Strategy (Objective 4: Dedicate certain portions of land to timber production). Silvicultural investments already made in a given area must also be considered when selecting AITPs.

The Québec Wood Production Strategy will complete the process of creating areas of increased timber production by clarifying and explaining their objectives. A further aim is to identify the best combination of wood production options, based among other things on community concerns. In some cases, wood production goals will take precedence, while in others, silviculture may target several management goals at once.

10. OFFICE OF THE CHIEF FORESTER (2015). *Succès des plantations. Avis du Forestier en chef, FEC-AVIS-04-2015*. Roberval, Gouvernement du Québec, 22 p.

Specific action:

4.3 Complete the creation of areas of increased timber production (AITPs)

Focus Area 2: The harvest of available wood

Most of the silvicultural investments made today will impact the value of the timber supply harvested in the longer term, i.e. in 50 or 60 years' time. On the other hand, wood that is already or almost mature will generate wealth in the short and medium term. Two ways of enhancing Québec's timber potential in the short and medium terms are to harvest and process more of the wood that is available now, and put it to the best possible use.

Objective 5

Harvest more of the available timber supply

- 5.1 Adapt an economic model for forests subject to operational constraints
- 5.2 Introduce means and programs to facilitate the harvesting of available wood
- 5.3 Increase the harvest rate for wood affected by natural disturbances

Objective 6

Draw a better benefit from available timber supply in the short and medium terms

- 6.1 Characterize the existing and future timber supply in order to resolve wood production issues
- 6.2 Control or reduce supply costs in the short, medium and longer term

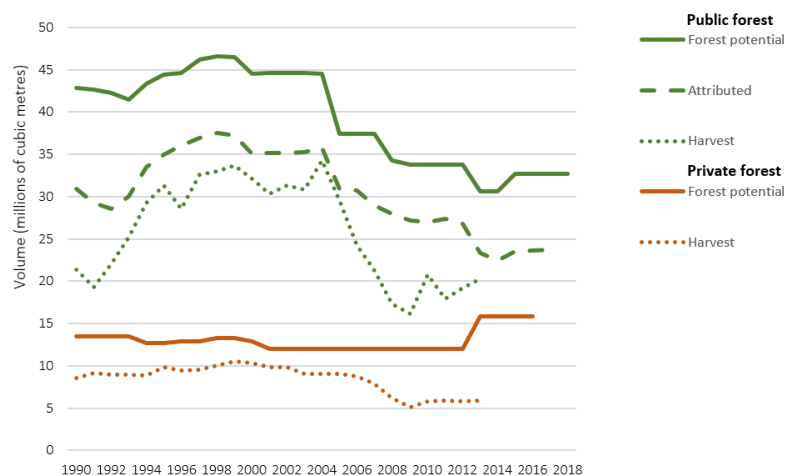
Objective 5 – Harvest more of the available timber supply

In the past, allowable cuts have always been greater than volumes allocated, and volumes allocated have been greater than volumes harvested (Figure 5). In the last five years, roughly 60% of the allowable cut was harvested in the public and private forests, leaving a potential unharvested volume of nearly 18 Mm³ of wood per year. This is due among other things to a lack of purchasers for some types of wood and to a variety of factors that reduce the viability of forestry operations. It may also be due to limitations imposed by municipal by-laws, or to the fact that some private forest owners are hesitant to harvest wood.

Several types of initiatives are required to create wealth from wood, and the challenge is to structure Government actions in order to obtain the best possible results. The connection between timber supply and industry demand must therefore be a core concern in wood production decisions. While forest managers must adjust the timber supply to meet as much of the demand as possible, companies must also focus their development on niches that can become part of a value chain suited to the timber supply. If this can be done, it will be possible to develop a larger percentage of the timber potential. The industrial niches most likely to use the wood for which purchasers are not currently available can be targeted by characterizing the wood in more detail and obtaining more information on its availability over time.

Not only do industrial development and supply strategies for different niches provide new business opportunities, they also act as levers for wood production. For example, in many regions, intolerant hardwoods can be harvested to provide immediate access to what may be a

significant volume of softwood enclaved in mixed stands or hardwood forests. This would offer more options for better silvicultural choices in certain types of forests, and would redirect timber production from certain stands towards forests of greater potential value.



Source: Ministère des Forêts, de la Faune et des Parcs (2018)

Figure 5 – Changes in harvested volumes as a percentage of allowable cuts, in public and private forests, since 1990

Actions taken as part of the Development Strategy for Québec's Forest Products Industry should aim to increase harvesting of available wood. Industry partners therefore have a crucial role to play in improving the value chain in the regions.

A number of steps can also be taken to develop available wood. In the public forest,¹¹ economic programs and models can be adapted to target specific elements of the unharvested timber supply, thereby encouraging industrial actors to develop it.

This Strategy therefore aims to increase the annual harvest by 4 Mm³ in the next five years, from wood currently available for harvesting in the public and private forests.

Specific actions:

5.1 Adapt an economic model for forests subject to operational constraints

5.2 Introduce means and programs to facilitate the harvesting of available wood

Another aspect that must be considered is the harvesting of wood damaged by natural disturbances. So far, considerable effort has been devoted to salvaging wood from areas affected by the spruce budworm epidemic. The MFFP has tools to identify the stands most likely to suffer serious damage, in order to minimize losses. Additional efforts may improve the salvage rate for wood damaged by other types of natural disturbances, especially forest fires.

Specific action:

5.3 Increase the harvest rate for wood damaged by natural disturbances

11. Focus Area 3 of this Strategy is concerned specifically with private forests, due to their distinct nature.

Objective 6 – Draw a better benefit from available timber supply in the short and medium term

Two ways to draw a better benefit from available timber supply are, first, to improve the timber supply in the short term, and second, to act on the factors that influence supply costs.

Given the pace of growth in the forest, the short and medium term horizons are brief and forest managers have limited means at their disposal to improve the timber supply. However, it is vital for them to explore every possible avenue in depth, to ensure that the mills have access to supplies. For example, wood production options such as commercial thinning or partial cut variations may help generate a flow of better-sized trees. The flow of wood with desirable characteristics can also be stabilized through careful selection of harvest areas. Innovative methods may also be used to identify other options.

In the short and medium term, wealth creation from available wood depends to a large extent on the possibility of reducing supply costs, since the companies' profits will increase as the value of harvested wood increases and supply costs decrease.

Stand distribution factors, such as transportation distance and stand aggregation, have a significant impact on supply costs. Site condition factors, including the presence of steep slopes, wet ground and hilly relief, also affect costs. If harvesting work in stands with operational constraints (or of less value) is spread over time, sectors of less interest will be left aside, meaning that profitability prospects will gradually be reduced.

As the quality of forest inventories improves and new technologies are introduced, the timber supply for the next 20 years can be characterized more accurately. Special attention should therefore be paid to the forest's attributes and operating conditions, which are key elements in the value of the harvested timber supply and in operational viability. Characteristics such as the volume of spruce, the average volume per tree and the aggregation rate can be projected over time. Travelling distance to stands that will become 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 attributes and operating conditions over the next 20 years. The MFFP can then plan forestry operations, maintaining a constant flow of wood that is of interest to the industry while gradually improving profitability prospects for the State.

These goals can be achieved in a number of ways, some of which are key, including the planning of road networks and distribution of logging both spatially and over time. In some locations, integration of forestry operations or the use of grading yards in the forest may also be considered.

One way of channelling innovation efforts more effectively is to analyze wood production issues in the short and medium term by characterizing the existing and future timber supply. The analysis should be integrated, in order to identify structural solutions for different management issues.

Specific actions:

6.1 Characterize the existing and future timber supply in order to resolve wood production issues

6.2 Control or reduce supply costs in the short, medium and longer term

The road network and land access

Access is a key element for wood production, one that determines whether or not forestry operations will be possible. Road network planning and maintenance are therefore extremely important to forest managers, who must address numerous considerations at the same time.

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

These questions must first be addressed from the standpoint that roads will inevitably deteriorate over time. Choices must therefore be made, and road maintenance must be planned carefully.

The road network also provides access to public land for other uses. 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 (woodland caribou).

For all these reasons, the MFFP must reflect generally on these issues if it is to improve strategic road network planning and benefit fully from the significant investments they require.

Focus Area 3: The private forest's contribution to collective wealth

The 134,000 private forest owners in Québec are essential actors in the development of the province's forest industry. They currently harvest less than half the allowable cuts on their land (Figure 5, page 22). The Québec Government has introduced a variety of measures to encourage the use of wood from the private forests and increase their contribution to industry supplies. For example, it has introduced a 2016-2019 provincial action plan on the use of wood from the private forests, the purpose of which is to improve the commercial context for forest producers so that more wood will be harvested and processed in Québec's mills. The action plan focuses on three areas, namely financial opportunities, regulatory, administrative and legal simplification, and incentives for woodlot owners and contractors to harvest wood (Figure 6).

It is also possible to increase wood production in the private forests. Mostly located in southern Québec, these forests are among the most productive in the province, and are also located close to the processing mills and labour pool. Their wealth creation potential must therefore continue to be developed.

Objective 7	7.1	Encourage forest owners to harvest wood - 2016-2019 plan
	7.2	Encourage forest owners to harvest wood - 2019-2023 plan
Increase harvests of available wood in private forests		
Objective 8	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, among other things via the spruce budworm spray program
Increase wood production in private forests		

Objective 7 – Increase harvests of available wood in private forests

Encouraging the use of wood is a cornerstone of the 2015-2019 Strategic Plan for Sustainable Management of Private Forests. One of the Plan's aims is to increase the volume of wood shipped to the mills from 4.6 Mm³ in 2014 to 6.4 Mm³ by the end of 2018. In 2017, 6.2 Mm³ of wood from Québec's private forests was shipped to the processing mills.

Economic opportunities	Administrative, regulatory and legal	Motivations of owners of harvest contractors
ISSUE 1.1 INVESTMENT IN PRIVATE FORESTS • Increase effectiveness of the PAMVFP and the RTF to help mobilize wood production	ISSUE 2.1 ADMINISTRATIVE ACTIONS FOR PERMITTING • Simplify MDELC requirements • Simplify municipal accountability requirements	ISSUE 3.1 PROMOTION AND AWARENESS • Influence harvest decisions
ISSUE 1.2 NET REVENUES OF PRODUCERS • Increase productivity • Maintain or improve effectiveness of tax measures	ISSUE 2.2 ADMINISTRATIVE ACTIONS FOR MANAGEMENT OF ASSISTANCE MEASURES • Simplify and streamline PAMVFP management, particularly for additional professional discretion • Motivations of owners of harvest contractors	HARVEST AND TRANSPORTATION WORKFORCE AND MACHINERY • Maintain jobs and encourage the next generation • Promote the availability of high-performance equipment
ISSUE 1.3 MARKETS • Increase market share for wood from private forests • Support marketing of wood by forest producers		

Figure 6 – Summary of the 2016-2019 provincial action plan for the use of wood from private forests

The Private Forest Management Support Program is the State's main investment program for the private forests. It allows the MFFP to guide the management of Québec's private forests. The availability of additional volumes from the private forests would have a significant positive impact on mill supplies. For example, increasing the harvest by 2 Mm³ would increase the value of the harvested timber supply by roughly \$140 million.¹² The Government relies on the contribution of an extensive network of forestry consultants to produce this additional volume. It has also introduced a number of levers that will encourage forest owners to harvest their wood.

The provincial action plan on the use of wood was developed with the collaboration of numerous private forest stakeholders. The plan's effectiveness depends to a large extent on the ability of these stakeholders to work together. Private forest partners and the MFFP have already carried out a number of actions from the plan.

In 2016-2017 and 2017-2018, the Québec Government allocated an additional \$6 million per year to the regional agencies for private forest development, based on a number of wood use criteria. The measure served as an additional lever for commercial work in the private forests. For the period 2018-2021, the Government will pay assistance of \$41.1 million, among other things to promote the use of wood and maintain the flow of wood from the private forests.

12. Based on a product value of \$70/m³. The assumption underlying this value is based on an estimated percentage of species, diameters and tree quality for the additional 2 Mm³ harvest.

Although the use of wood from the private forests has increased during the period covered by the 2016-2019 provincial action plan for the use of wood from the private forests, the MFFP wants the private forest partners to remain active. They will therefore be asked to complete the 2016-2019 plan, and eventually to decide on new wood use initiatives that will be set out in a new plan. The MFFP also wishes to maintain actions relating to municipal by-laws, taxation and promotion among forest owners. For example, a group of municipal and forest sector stakeholders came together to draft a Guide to the preparation of municipal by-laws on the cutting of trees and protection of forest cover.¹³ In the next few years it will be important to involve the municipal community to a greater degree and provide information, through training sessions, on how to revise by-laws on the cutting of trees and protection of forest cover, where they are not suited to the area in question. As for taxation, the 2016-2017 Budget contained three measures to improve the tax environment of forest producers, aimed at:



- Increasing the tax exemption threshold for forestry operations from \$10,000 to \$65,000;
- Spreading forest producers' income over time;
- Improving the real estate tax refund for forest producers by introducing an annual indexing mechanism.

The private forest partners have also developed campaigns to promote the different types of support offered by the Québec Government, including a campaign on family foresters, presenting the real estate tax refund program.

Québec is a leader in Canada in the area of forest taxation. The Government acknowledges that a forest producer's business structure is different from that of companies in other economic sectors, among other things due to the significant time gap between expenditure and revenue. Even so, the MFFP intends to explore new levers that may help to recruit new, currently unrecognized woodlot owners who may potentially be interested in harvesting wood.

Specific actions:

7.1 Encourage forest owners to harvest wood - 2016-2019 Plan

7.2 Encourage forest owners to harvest wood –2019-2023 Plan

13. CÔTÉ, M.A, F. GARNEAU, F. NAUD AND M.-A. RHÉAUME (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>].

Objective 8 – Increase wood production in private forests

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

Wood production in the private forest can be enhanced by expanding the areas used to produce wood, for example by afforestation of wild land. Not only would this increase wood production, but the new forest areas would also play a role in carbon sequestration.

It is equally important to protect silvicultural investments in both the private and public forests in order to obtain the anticipated benefits. For example, two specific steps can be taken to help fight the current spruce budworm epidemic: harvesting of dead and weakened trees and trees likely to be damaged by the epidemic, to help limit timber losses; and the application of a spruce budworm spray program to reduce damage.

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, among other things via the spruce budworm spray program

Focus Area 4: The forest sector's contribution to the climate change mitigation goals

As trees store carbon in both forest and forest products, forestry can help mitigating climate change impacts and help Québec to achieve its greenhouse gas reduction targets. The objective of increasing carbon sequestration in wood is considered in the Québec Wood Production Strategy alongside wood production objectives. If forest managers are to address the urgent challenge of climate change, they must consider both of these objectives at the same time, since the means used are often similar. An integrated vision of these two aspects of wood production is needed. For this reason climate change has been included in the Québec Wood Production Strategy as a focus area.

Objective 9

Help to achieve Québec's climate change mitigation targets by increasing carbon sequestration in the forest and in forest products

- | | |
|-----|---|
| 9.1 | Assess the forest sector's potential additional contribution to the achievement of Québec's greenhouse gas reduction target |
| 9.2 | Promote scenarios that will help increase the contribution of forest management to mitigate climate change impacts while also increasing the value of the harvested timber supply |
| 9.3 | Consider different options to strengthen the forest sector's contribution to the achievement of climate change mitigation targets |

Objective 9 – Help to achieve Québec's climate change mitigation targets by increasing carbon sequestration in the forest and in forest products

So far, the Government's forest sector efforts in mitigating climate change impacts have focused mainly on measures to promote the use of wood as a source of energy and as a construction material. While maintaining and reinforcing these types of interventions, it would also possible to go one step further through interventions in the forest to maximize the contribution of both the forest and forest products. This type of integrated approach can be used to adjust wood production so as to increase the amount of carbon sequestered in the forest and in forest products.

Carbon sequestration in the forest can be increased through management choices based on a better understanding of the ecological processes linking tree growth and soil dynamics to the carbon cycle. A variety of silvicultural actions can then be considered to increase the overall amount of carbon sequestered in the forest.

For example, restoring sparsely forested sites and apply more intensive silviculture would both help to increase the amount of carbon sequestered in the forest. In some cases, it may also be beneficial to encourage partial cutting, in order to maintain a carbon sink while removing some of the available wood. Here again, several different actions adjusted to a variety of circumstances is the best way to maximize the anticipated effects.

Wood production can also be directed towards long-lasting forest products and products that can be used in place of materials with a bigger carbon footprint. For example, thinning treatments will help to produce larger diameter trees.

Creating a link with the Development Strategy for Québec's Forest Products Industry will help promote the use of all long-lasting wood products (lumber, boards, etc.), which can store carbon over longer periods. From an energy standpoint, the use of their by-products in biomass and biofuel production offers an alternative to petroleum products.

The Québec Government has a number of tools to assess the impacts of management strategies on the forest's carbon balance. It will be taking steps in the coming years to make these tools more accurate and effective.

Given the importance of the climate change mitigation, the governments of Québec and Canada have introduced programs to encourage the forest sector to take part in greenhouse gas reduction efforts. However, additional measures, programs and funding may be needed to reinforce the forest sector's contribution to these objectives. A variety of potential options for this are examined in the Strategy.

Specific actions:

9.1 Assess the forest sector's potential contribution to the achievement of Québec's greenhouse gas reduction target

9.2 Promote scenarios that will help increase the contribution of forest management to mitigate climate change impacts while also increasing the value of the harvested timber supply

9.3 Consider different options to strengthen the forest sector's contribution to the achievement of climate change mitigation targets

Focus Area 5: Innovation and knowledge

The forest sector's growth depends to a large extent on its ability to innovate and generate new knowledge that will improve the industry's ability to compete. Over the years, synergy has developed between the actors in the innovation chain, and Québec has become a key player in research and development throughout the forest sector.

Objective 10

Support innovation, research and development

10.1 Support outside research into silviculture and sustainable management, and ensure that it complements in-house research

10.2 Improve the tools and knowledge required for economic analyses

10.3 Continue to carry out research into climate change adaptation and prevention

Objective 11

Incorporate leading-edge knowledge into forestry practices

11.1 Make available the products from knowledge acquisition and research

11.2 Provide ongoing training for forest managers on the inclusion of knowledge in work processes and on the use of economic tools

Objective 10 – Support innovation, research and development

The MFFP is involved in a number of research projects directly relating to innovation needs for wood production. Some of these projects focus on the development of tools and knowledge for economic analyses and risk management.

In addition, Government support for universities and teaching and research centres has also helped to speed up innovation. The research projects it has funded focus directly on the research needs identified by the MFFP and are carried out in collaboration with its in-house researchers. Collaborating practitioners are brought into the research teams in order to ensure that the findings address the clients' needs. The MFFP's investments in outside research are intended to ensure ongoing innovation in silviculture and sustainable forest management, as well as complementarity with Government research.

In 2017-2018, the MFFP invested in outside research through contracts totalling \$4.5 million over two years. More than 30 new research projects were begun.

Specific actions:

10.1 Support outside research into silviculture and sustainable management, and ensure that it complements in-house research

10.2 Improve the tools and knowledge required for economic analyses

The MFFP has also undertaken several research projects on climate change. Research carried out under Action 27.5 of the Climate Change Action Plan has focused, among other things, on the impact of climate change on forest ecosystems, and has helped understand the forest's

vulnerability. The findings have been used to plan forestry activities, based on the risks or opportunities inherent in the level of vulnerability.

Research has also been carried out in conjunction with academic experts, FPIInnovations and the Ministère du Développement durable, de l'Environnement et de la Lutte contre les changements climatiques (MDDELCC) with a view to improving the forest sector's contribution to climate change mitigation targets.

Work on these two focus areas will proceed alongside the preparation of a strategy to adapt the forest to climate change, which will include sections on aspects relating to climate change adaptation and prevention.

Specific action:

10.3 Continue to carry out research into climate change adaptation and prevention

Objective 11 – Incorporate leading-edge knowledge into forestry practices

It is extremely important to continue to acquire knowledge and transfer it to users, in order to encourage innovation in sustainable forest management focused on wealth creation. The availability and accuracy of information is a constant concern for the MFFP, to ensure that its staff and outside partners have the knowledge they need to make decisions and improve practices.

The MFFP is currently acquiring data on Southern Québec, using LiDAR laser remote sensing technology, which provides rapid leading-edge information on topography and forest stands. This process is an example of successful new technology integration.

An important step in the development and improvement of knowledge is to identify users' needs, so that the knowledge itself will be relevant. As for methodological and technological watch activities, they can help to optimize work processes by encouraging the use of new methods.

It is becoming easier to characterize the timber supply thanks to the new tools that are constantly being created. Characterization improves the effectiveness of forestry activities. Among other things, leading-edge technologies can be used to locate available wood, identify its characteristics and define the operating conditions at the site of the wood. The technologies provide new information that increases the predictability of silvicultural work so that the forests can be managed more effectively, based on provincial targets.

The MFFP will organize a major knowledge transfer activity in the spring of 2019: The 2019 Forestry Exchange – Knowledge for Value Creation. The event will provide an opportunity for dialogue between the sector's various actors and will demonstrate the economic, environmental and social gains to be obtained by incorporating leading-edge knowledge into forest management practices.

These benefits can be enhanced by making this information available and encouraging forest managers to include it in their work processes.

The MFFP therefore wishes 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 MFFP or part of its extensive external client base.

The MFFP unveiled its dissemination policy in December 2017. In the new policy, most information is available free of charge and fees are the exception.

Specific actions:

11.1 Make available the products from knowledge acquisition and research

11.2 Provide ongoing training for forest managers on the inclusion of knowledge in work processes and on the use of economic tools

Monitoring of results

The MFFP will rigorously monitor the implementation of the Québec Wood Production Strategy to ensure that it is able to achieve its strategic targets. Two types of indicators will be used for this purpose: (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 types of indicators will allow the MFFP to verify the performance of both the Provincial Strategy and the regional strategies. The mean result for each indicator in the period 2013-2018 will be used to set a point of reference from which to measure progress.

The value of the harvested timber supply, which constitutes the long-term target, will reflect the level of success of all the actions taken. It will be measured every five years with the tactical plan, and then 20 years and 45 years after implementation of the Québec Wood Production Strategy.

In addition, a number of specific actions will be included in the regional wood production strategies (Table 4, page 35), while others will be measured regularly, using indicators (Table 5, page 36). These indicators are:

- Economic viability of management strategies
- Economic viability of silvicultural scenarios
- Economic benefits
- Allowable cuts and volumes harvested in the public forest
- Allowable cuts and volumes harvested in the private forest
- Supply costs
- Budget breakdown
- Sequestered carbon
- Success of planting

These indicators will be used to assess whether or not the specific actions will be able to achieve the strategic targets and objectives set, and to make any adjustments that may be needed. Actions relating to innovation and knowledge will be monitored at provincial level (Table 6, page 37).

The MFFP will shortly be adopting an action plan setting out the responsibilities of monitoring measures.

Table 4 – Specific actions to be included in regional strategies

Specific actions to be included in regional strategies	
1.1	Set regional objectives for the desired timber supply
1.2	Prepare a regional wood production strategy containing an appropriate set of wood production options
3.1	Develop and implement integrated management orientations for the risks associated with natural disturbances
3.2	Diversify regional strategies by designing a varied portfolio of wood production options that will meet multiple objectives
3.3	Gradually incorporate, into forest plans, the elements of a strategy that will allow the forests to adjust to climate change
4.1	Plan investments according to the operational feasibility of all the silvicultural scenarios
4.3	Complete the creation of areas of increased timber production (AITP)
6.1	Characterize the available and future timber supply in order to resolve wood production issues
9.2	Promote scenarios that will help increase the contribution of forest management to mitigate climate change impacts while also increasing the value of the harvested timber supply

Table 5 – Indicators to be measured regularly and the associated specific actions

Indicators	Specific actions associated with the indicators
Economic viability of management strategies and silvicultural scenarios and economic benefits	2.1 Base all forest management decisions on cost-benefit analyses of silvicultural scenarios and management strategies
Allowable cuts and volumes harvested in the public forest	5.1 Adapt an economic model for forests subject to operational constraints 5.2 Introduce means and programs to facilitate the harvesting of available wood 5.3 Increase the harvest rate of wood damaged by natural disturbances
Allowable cuts and volumes harvested in the private forest	7.1 Encourage forest producers to harvest wood - 2016-2019 Plan 7.2 Encourage forest producers to harvest wood - 2019-2023 Plan 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, among other things via the spruce budworm spray program
Supply costs	6.2 Control or reduce supply costs in the short, medium and longer term
Budget breakdown	2.2 Divide silvicultural investments according to the results of the cost-benefit analyses
Sequestered carbon	9.1 Assess the forest sector's potential additional contribution to the achievement of Québec's greenhouse gas reduction target 9.3 Consider different options to strengthen the forest sector's contribution to the achievement of climate change mitigation targets
Planting success	4.2 Monitor and maintain areas under management to obtain the anticipated results

Table 6 – Other specific actions to be monitored

Other specific actions to be monitored	
10.1	Support outside research into silviculture and sustainable management, and ensure that it complements in-house research
10.2	Improve the tools and knowledge required for economic analyses
10.3	Continue to carry out research into climate change adaptation and prevention
11.1	Make available the products from knowledge acquisition and research
11.2	Provide ongoing training for forest managers on the inclusion of knowledge in work processes and on the use of economic tools

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