
"Peace in the Woods: A History of Canada's Forests & Forest Sector, 2000-2050"

Scenario B
(one of four scenarios)

prepared by the

Forest Futures Project
Peter Duinker, Project Manager
Sustainable Forest Management Network
University of Alberta
Edmonton, AB

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Comments are welcome!

Please send them to Peter Duinker (peter.duinker@dal.ca)

http://www.sfmnetwork.ca/html/forest_futures_e.html

Summary: Can Canada and Canadians be proud of their forests and the forest sector at this halfway point of the 21st century? Have we moved smartly along the road to sustainability? Are we better off, forest-wise, than we were in 2000? There is much to be optimistic for and proud about. The forest sector has been able to make good on many of the issues of the day in the 1990s and 2000s. Forest ecosystem diversity has improved, and the species-at-risk situation has turned the corner. Climate change - fingers crossed - has so far been tolerable, and even helpful in some respects. The weak global timber and forest-products markets have repositioned Canada as a low-volume, value-added player, as much on the domestic stage as on the world's. The energy situation has brought little emphasis to bioenergy, despite the initial enthusiasms. Local and community-based input and control on forests have blossomed. Whatever conflicts have been occurring in and over the woods have been fairly peacefully resolved. Aboriginal communities are, by their own admission, much better off both politically and economically.

2000-2050 Trends at a Glance - Drivers

Climate Change	<ul style="list-style-type: none"> - measurable warming, but within range of adaptability - more windstorms in Atlantic Canada - reduced snowpacks across most of Canada
Geopolitics	<ul style="list-style-type: none"> - relative peaceful global relations - economic balance of power resides in Asia - E7 has risen above G7 in 50 yr!
Global Energy	<ul style="list-style-type: none"> - less than double increase in real price of fossil fuels - huge increases in nuclear and renewable energy, but not biomass
Air Pollution	<ul style="list-style-type: none"> - strong reductions due to lower consumption of fossil fuels and better regulations - fewer ozone episodes (but more severe due to warming)
Invasive Species	<ul style="list-style-type: none"> - more invasive alien species in the forests, especially invasive plant species - however, most are merely local/regional nuisances
Global For Prod Demand	<ul style="list-style-type: none"> - modest growth in consumption; wood not seen as best for making products - prices are flat, even for roundwood - lots of value-added production, weak production of commodities - plantations around the world have had expected high growth rates
Technology	<ul style="list-style-type: none"> - high levels of investment by both governments and private sector - strong innovation development and implementation in all tech sectors - major advances in nanotechnology, materials technology
Industry Profitability	<ul style="list-style-type: none"> - after rough times in 2000-2020, prosperity only for innovators - weak wood supply, modest demand for forest products
Demographics	<ul style="list-style-type: none"> - Canada grew from 30.9 to 45.9 million people; growth due to immigration - abated urbanization trend; people moving back to near-city rural areas - Aboriginal populations continue strong growth in numbers
Societal Values	<ul style="list-style-type: none"> - abated consumerism; communitarian behaviours; high volunteerism - people have their material needs easily met, and now turn to services - people concerned about all forests, especially hinterland boreal forests
Governance	<ul style="list-style-type: none"> - strong trend toward increased influence of local communities - comparatively strong forest regulations by provincial governments - huge divestment of Crown land to communities, both Aboriginal and not
Aboriginal Empowerment	<ul style="list-style-type: none"> - political empowerment strong and consistent across Canada - with all their new lands, many Aboriginal groups are doing well economically
Conflict over Resources	<ul style="list-style-type: none"> - active users of forest lands, esp. multiple-use lands, are seldom at conflict - most conflict resolutions are swift and amicable - this supports a strong sense of community in many rural areas

2000-2050 Trends at a Glance - Responses

Biodiversity	<ul style="list-style-type: none"> - 35% of all forests formally protected (22% in timber-productive forests) - widespread implementation of triad (and later quad) land-use zoning - more old forest on the landscape; better balance of conifers and non-conifers - forest species-at-risk situation improved; woodland caribou turned the corner!
Ecosystem Condition and Productivity	<ul style="list-style-type: none"> - considerably improved ecological integrity - modestly increased levels of disturbances - natural forest regeneration favoured, even when marginally successful
Water and Soil	<ul style="list-style-type: none"> - improved water quality due to strong regulations and huge public investments - no major soils issues except in wet parts of Canada with steep slopes
Carbon Cycles	<ul style="list-style-type: none"> - hinterland forests are small sources of atmospheric carbon
Amenity Values	<ul style="list-style-type: none"> - per-capita visitation rates are up, and visitors spend handsomely on services - large increase in commercial forest recreation businesses - recreational focus is off hunting and fishing and onto nature appreciation
Participatory Processes	<ul style="list-style-type: none"> - continuing wide range of opportunities for participation in forest decisions - increasing numbers of people get involved and public influence is high
Forest Employment	<ul style="list-style-type: none"> - numbers of traditional forest jobs way down - large increases in forest jobs related to recreation and water enterprises - Aboriginal share of forest employment quadrupled since 2000
Wood Harvests	<ul style="list-style-type: none"> - annual industrial harvest nationwide down from 180 to about 140 million m³ - decreases due to weak markets and low investments in silviculture - on balance, climate change has also helped us grow wood faster
Wood-processing Industries	<ul style="list-style-type: none"> - dismal period 2000-2020, but fortunes of innovators are bright - bioenergy has not flourished, newsprint way down - traditional markets still served, but new markets in Africa and Latin America
Non-Wood Forest Products	<ul style="list-style-type: none"> - strongly increased harvest levels, especially commercial country foods - by and large, harvest rates are still sustainable, due to regulation and control
Markets for Forest Services	<ul style="list-style-type: none"> - carbon markets exciting for two decades - then failed because of foresters' inability to hold carbon in hinterland forests - water markets have emerged and become quite vibrant - biodiversity markets are vibrant, bringing much income to woodlot owners

(Note: text in italics is common to all four scenarios)

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B1. Introduction

Canada has long been described as a forest nation. For ages before Europeans arrived to settle in North America, Aboriginal peoples exercised strong relationships with the land. For many, the forests were the lifeblood of economy, society and spirit. Over recent centuries, settlers from Europe built up a series of wood-using enterprises based on Canada's forests, making Canada one of the world's top producers and exporters of wood-based forest products through much of the 20th century.

In this year 2050, marking the half-way point in the 21st century, what can we say about the kinds of changes we have witnessed in Canada's forests and forest sector since 2000? For long-time observers, the changes have been most interesting, and some surprising. Contrary to what a lot of pessimists expected, many of the changes have been positive and warmly welcomed by Canadian society. As discussed below, a few have been unhelpful but Canadians do not seem overly concerned about them.

The purpose of this paper is to summarize trends and developments in Canada's forests and the forest sector during the period 2000-2050. We have based our account partly on the data sets assembled through provincial state-of-the-forest reporting exercises and the Canada Forest Information Program (CFIP), and partly by interviewing a few dozen forest-sector old-timers who have followed developments closely as far back as the turn of the century. The trends and developments are first put into the context of a suite of major drivers of change, followed by synopses of key indicators commonly used to track the Canadian forest and forest-sector situation.

B2. Drivers of Change

To understand how and why the Canadian forests and the forest sector have changed so dramatically in the past fifty years, we shall examine a suite of major agents of change that act upon the forests and forest sector. Below we look at a dozen such drivers, charting their paths over the past five decades and inquiring into the ways in which each driver has influenced the Canadian forest and forest-sector scene.

B2.1 Climate Change

The present climate is indeed quite different from that of year 2000. Fortunately for humankind, the actual changes in climate have more or less mirrored the predictions of least conceivable change as envisaged back in the early 2000s. This had been due to two factors: (a) overestimates of the role of non-CO₂ greenhouse gases (such as methane) and underestimates of the role of oceans in absorbing CO₂; and (b) successful transitioning of the world economy off fossil-based

fuels and onto renewable (mostly solar, wind, and hydro) and non-carbon, non-renewable sources (mostly nuclear). Constant bickering over the Kyoto Protocol during the 2010s led to a much more comprehensive agreement on fossil-fuel production and use with the Sydney Protocol, signed in 2024 and still in force today. As expected though, even with such positive developments in weaning ourselves off fossil fuels, changes in climate are still notable (Table 1). Of most serious implication for Canadian forests are:

- (a) increased mean winter temperatures, which have led to reductions in snow packs and length of time the ground is snow-covered (especially in central and eastern Canada);
- (b) an increase in hot summer days, which has worsened the effects of high-ozone days in urban areas;
- (c) an increase in high-rain events, which is increasing the rates of erosion and flash floods in areas of steep slopes (especially in BC); and
- (d) an increase in number and intensity of storms in Atlantic Canada, with the attendant forest blowdowns.

Table 1. Regional changes in key climate variables. Changes are defined as means for the period 2040-2050 minus means for the period 1990-2000.

Climate Variable	Region of Canada						
	BC Coast	BC Interior	Prairie Provs	North ON & QC	South ON & QC	Maritimes	NL
Mean Jan Temp	2 C incr	3 C incr	3 C incr	3 C incr	3 C incr	2 C incr	2 C incr
Mean Jul Temp	1 C incr	2 C incr	2 C incr	2 C incr	2 C incr	1 C incr	1 C incr
Days over 35C Max T	50% incr	50% incr	50% incr	50% incr	50% incr	50% incr	50% incr
Total Precipitation	10% incr	no change	10% decr	no change	no change	10% incr	10% incr
Prop. Precip as Snow	10% decr	10% decr	20% decr	40% decr	50% decr	40% decr	40% decr
Large Precip Events	50% incr	50% incr	50% incr	50% incr	50% incr	50% incr	50% incr
Wind-storm Events	20% incr	20% incr	20% incr	20% incr	20% incr	40% incr	40% incr

B2.2 Geopolitics

During the past fifty years, the peoples of the world have apparently increased in amicability. The data show clearly that, while local skirmishes continue in various hotspots around the globe, no countries anywhere are participating in wars against other countries. The progression of orderly development and global trade in the past decades has had the expected effect of shifting

the economic balance of power to Asia. What were emerging market economies back in 2000 have indeed emerged, and they dominate world commerce. Consider this - in 2005, what we called then the E7 countries (China, India, Brazil, Russia, Indonesia, Mexico, and Turkey) had purchasing power representing only 75% of that of the former G7 countries (US, Japan, Germany, UK, France, Italy, and Canada) ; today that E7 figure is 25% larger than the G7!

B2.3 Global Energy

After oil hit the USD 200/barrel level in 2008 (SuperRupees 6.8/barrel using today's standard trading currency), world fossil-fuel prices have more or less tracked inflation because demand did not skyrocket, as predicted by some, and supply is ample. Demand containment is explained by dramatically reduced war activities, worldwide conservation efforts, major strides in the energy efficiency of buildings and transportation, and incredible increases in the use of nuclear and renewable energies. As noted above, bioenergy never really took off, as many analysts fifty years ago thought it would and should. Not only was demand for bioenergy sluggish through the entire half-century, but its needs have been met largely from existing agricultural production, and society continues to favour leaving timber-harvest residues in the woods to rot and replenish soils.

B2.4 Air Pollution

Compared to what they were fifty years ago, Canada's rural ecosystems today are said to be in reasonably good condition. In its 2049 annual report on the state of Canada's ecosystems, the Canadian Forum on Ecological Integrity, a scholarly think-tank based at the University of Manitoba, says this:

"Canada's ecosystems face continuing challenges from the changing climate, but other stressors are actually reduced. A reduction in use of fossil fuels, major switches in energy sources from fossil fuels to alternatives, and more-stringent regulations have, over the decades, reduced the pollution burden in Canada's major urban centres such as the BC lower mainland and southern Ontario. There have recently been sharp declines in depositions of airborne sulphur and nitrogen pollutants, and ozone episodes are much less frequent than even 25 years ago."

B2.5 Invasive Species

A particularly optimistic sign in relation to invasive species is the apparent success of the revamped Canadian Invasive Alien Species Agency (CIASA) to hold some potentially serious invasive alien species in check. The emerald ash borer, coming into southern Ontario at the turn of the century from the USA, decimated ash populations in Ontario and Quebec, but this had little effect on the forest-products industry. On the east coast, the brown spruce longhorned beetle was declared eradicated in 2019, and the Japanese knotweed, seemingly unstoppable in its spread throughout Acadian forests in the 2010s, was more or less brought under control in the last decade. (As an aside, the importance of community involvement in bringing Japanese

knotweed under control is considerable, and represents just one of thousands of examples across the country recently where local people have pitched in together to solve these kinds of problems.) On the west coast, the green fir short-eared sawfly, found first in Stanley Park in 2032 and suspected to have arrived from east Asia, has been contained to the southern mainland. CIASA, unlike its forerunner the Canadian Food Inspection Agency, has been well-funded in the past couple of decades, and positive results are apparent with no new major invasive alien species ruining any significant part of Canada's forests.

B2.6 Global Forest Products Demand and Wood Supply

Global consumption of roundwood has risen modestly since 2000, when it was 3.3 billion m³, to 4.6 billion m³ in 2049. Actually, per-capita consumption of wood-based products has fallen in recent decades. The factors behind this trend are complex, and include: (a) sagging household incomes in most developing countries; (b) increasing recognition of the non-timber values of forests; (c) increasing loss of interest in wood-based products compared to high-tech materials; and (d) the tremendous success of nuclear, wind, and solar technologies and efficiency gains in satisfying global energy demands. Populations in developing countries have been successfully weaning themselves from firewood as their major source of energy, and in developed countries, bioenergy, as noted below, has remained a relatively small player in the overall energy mix.

The global wood-supply situation reminds one of the circumstances a hundred years ago when there was plenty of wood to satisfy needs. Today, countries well endowed with forests meet their own needs plus those of nearby countries with little. Global demand for products made from Canada's wood sank through the 2000s and 2010s and has never recovered to those heyday levels of the late 20th century. This has meant that total roundwood harvests in Canada have plummeted to roughly two thirds of the country's total sustainable harvest levels, which themselves have fallen by 25% over the past fifty years. It's a strange situation - there is plenty of wood to be harvested, especially given the stability of forest area and rising rates of wood productivity in the forests, but fewer people seem to want that wood flowing into the economy. Enthusiasts for the concepts of ecosystem-based management have few challenges these days because it is easy to find quality roundwood to meet contemporary demands without compromising the ecological integrity of the forests.

B2.7 Technology

Technological innovation continues to amaze most onlookers. Back at the turn of the century, it was said that 50% of the products on the market in one decade had not even been invented two decades earlier. That proportion is now more like 90%. Developments in nanotechnology, biotechnology, materials technology and others have taken us to a state where the Canadian forest-products industry looks today nothing like it did fifty years ago. Then, volume ruled and efficient technology was used to reduce unit costs. Today, value rules so that the products Canadians want from their forests can be made from much smaller volumes of roundwood. Plaudits to the Canadian Fibre Industry Board (C-FIB) for its insight and foresight in pushing the National Fibre Research Network (originally the Canadian Fibre Centre) to focus on

technological innovation rather than cost control.

Much like the clustering of computer technology firms in the late 20th century, forest technology clusters have formed in Canada in the last few decades. Two of note in Canada, now world-class facilities drawing in researchers, technophiles and entrepreneurs from around the world, are FibreTech University in Timmins, ON, and InnoFibre Research Park in Prince Albert, SK.

B2.8 Industry Profitability

The forest-products industry today can be divided roughly into two lots: the firms that innovated and transformed their product lines from commodities like lumber and pulp-and-paper into high-tech products like composite building materials and high-quality paper, and those that didn't. The high-tech companies are doing reasonable well in today's economic climate, and the remaining commodity producers are, as they were several decades ago, still operating at the margin. The expectations articulated by many back in the 2000s that the forest industry was a sunset industry were not entirely correct, but the industry today is smaller and much transformed.

B2.9 Demographics

Canada's population grew from 30.9 million in 2000 to 45.9 million people today. During that period, total birth rates have been roughly at replacement levels. Aboriginal populations in Canada still have birth rates way above replacement levels, but the rest of Canada has birth rates below replacement. Immigration, arguably essential for the economy given domestic labour shortages as the population ages, accounts for essentially all the population growth - Canada has admitted a 300 thousand new citizens to the country each year since 2000.

The urbanization trend of the late 20th century abated somewhat as people's interest in living downtown or in suburbia shifted. According to Statistics Canada, 85% of the population lives in urban areas - this number has remained relatively stable for fifty years. Although all major cities in Canada have grown, expansions of populations in small-town Canada and in rural forested areas have been particularly strong. This is true for rural areas that are about two hours' drive from cities - not so for towns and municipalities that are, so to speak, miles from nowhere. Thus, some forest-based rural communities in Canada's hinterland have still witnessed some out-migration.

B2.10 Societal Values

How do Canadians view the world and behave in their relationships with each other and with forests compared to back in 2000? Have there been noticeable dynamics in their values and attitudes? A recent study at Laval University sheds insight on these questions. As perhaps evident above, one development is that Canadians have become demonstrably more cooperative with each other. Volunteerism is alive and well, and people flock to collaborative ventures, bringing with them what appears to be unbridled enthusiasm for group process and the potential synergies gained by working together. Another development relates to consumption behaviour.

People's demand for services has risen in relation to that for goods, even though we are still said to represent a consumption-driven society. But while our overall rate of goods consumption remains high, we have generally shifted toward products that are much more sustainably produced. The new economic mantra in sustainability discourse is The Natural Way, which replaced The Natural Step in 2029.

The Laval study also inquired about people's values with regard to forests. It confirmed earlier speculations that people's interest in forest services such as biodiversity protection, water regulation, and air purification is rising in both expressed and revealed preference. Rural and urban dwellers alike have great concern for the health of forests, and even urban people express continued concern over Canada's vast boreal forests.

B2.11 Governance

Forest governance at the turn of the century was dominated by provincial governments and industry. However, signs were already evident of a gradual shift. The advent of forest certification brought more power to environmental groups, and the concept of community forests was being heralded by socialist academics and experimented with by a few provincial governments. Given the industrial transformation to a low-volume, value-added production mode, and the need for provincial governments to pay even stronger attention to urban economies and health care, both the traditional power-holders have been enthusiastic about divesting their authorities over forests to other interests.

Three developments characterize the governance shift. One is the deeding of provincial Crown land to local, forest-based communities. In 2000, communities across Canada owned a total of 52,000 hectares of timber-producing forest land. Today, that number is a staggering 40 million hectares (see Table 2). The second development is the granting of comprehensive forest-management licences to communities in places where the once-dominant forest-products industries have either left town or become low-volume, high-tech manufacturers. The timber-dominated licences of the past have been replaced with broad resource-management licences, in most cases giving their holders rights to timber, water, wildlife, surface minerals and recreation. Just like the terms of the industrial timber licences, the new resource-management licences all require extensive public consultations during the preparation of management plans. The third development is the dramatic expansion of Aboriginal lands in Canada (see below).

Table 2. Proportion of total forest land (excluding urban forests) by ownership category.

Year	Ownership Category				
	Federal	Provincial	Private	Community	Aboriginal
2000	23	71	6	0	0
2010	23	71	6	0	0
2020	20	69	6	1	4
2030	18	57	6	6	13
2040	17	49	6	10	18
2050	16	46	6	11	21

B2.12 Aboriginal Empowerment

The 21st century has been one of great progress in reconciling relationships between Canada's Aboriginal peoples and the rest of the population of the country. One can point to continuing clear messages from the frequent court decisions we've had over the past decades - two or three cases per decade on various matters of Aboriginal and treaty rights, and Aboriginal title, in relation to land and natural resources. Fortunately, the judges handed down judgements that really gave clarity as to how to interpret earlier treaties, agreements, constitutions, arrangements and such.

Progress has been strong across Canada. Aboriginal peoples in the north, BC and Labrador have witnessed especially strong gains in empowerment. Huge expanses of the Canadian boreal forests in the timber-producing zone have been turned over to Aboriginal ownership, amounting to about 80 million hectares. Due to this and strong economic-development initiatives across the country, Aboriginal peoples are demonstrating success in a wide range of forest-based commercial enterprises, and socio-economic conditions in most Aboriginal communities have improved substantially.

B2.13 Conflict over Resources

A profound shift in people's behaviours characterizes Canada's forests and forest sector in these mid-century times. The shift to much greater local control over forest ecosystems and resources, coupled with the greatly reduced timber-harvest levels across most of Canada, have dramatically lessened the amount of apparent conflict over resource use. To be sure, local difficult situations continue to crop up here and there, especially over issues like the siting of facilities to produce renewable energy (e.g., wind turbines, solar collectors, small hydro generators), but by and large it is a time of relative calm. Environmental, community, industrial and provincial government people are seeing things so similarly with respect to forest management that, following the merger of the CSA, FSC and SFI certification systems in 2019, certification was abandoned altogether in the early 2030s as an unnecessary cost on forest owners.

B3. Evolution of Canadian Forests and Forest Sector

Forest analysts worldwide have developed systems of tracking the state of the forests and forest sector with sets of so-called criteria and indicators. Original sets for Canada were developed in the 1990s under the auspices of the Montreal Process and the Canadian Council of Forest Ministers. The C&I systems have evolved significantly during the past half-century, but the basic structures have remained intact. Here, we examine how Canada's forests and forest sector have responded to the driver forces described above and to the various policies put in place since 2000.

B3.1 Forest Ecosystem Sustainability

B3.1.1 Biodiversity

Biodiversity has remained the primary bellweather of forest condition since the 1980s. The Global Convention on Biological Diversity, with its genesis way back in 1992, has been repeatedly re-affirmed by the United Nations, especially in the substantial revision of 2027. Recent publications from the Canadian Biodiversity Conservation Network (CBC Network) refer to the forests getting a well-deserved rest from the timber-harvest pressures of the late 20th century and early part of this century. There is little need for continuing discussions about expansion of the nationwide system of forested protected areas - the gradual lowering of timber harvests has permitted, by 2045, an astounding tripling of protected areas to 35% of Canada's total forest landscape!

These developments have led to improvements in forest biodiversity in terms of average stand age and average number of tree species per stand. Based on the best national forest-inventory data available at each time, average stand age was calculated to be 50.6 yr in 2000, but 73.8 yr in 2050. This could only really happen with large increases in old growth. Average number of trees species per stand was 2.2 in 2000 but 3.9 in 2050. Clearly the forest has become much more mixed at the fine scale. Climate change can be credited to a large degree for this trend.

Vigilance on the species-at-risk situation has paid off. The most recent report of the Canadian Council on Species at Risk (CCSR; formerly COSEWIC) shows that the trend of increasing listings that characterized the 2000s to the 2020s levelled off in the 2030s. Recovery planning and subsequent vigorous actions taken by governments, ENGOs, the private sector, and significantly the general citizenry, starting in the 2010s, has finally resulted in fewer numbers of species in the endangered category (and not because of extirpation or extinction!). The gradual recovery of woodland caribou across Canada's northern forests has been most welcome indeed. However, some high-profile species are still in trouble - e.g., mainland moose in Nova Scotia, and polar bear in the north - and while this is tragic, the fact that these are charismatic megafauna helps keep the species-at-risk issue high in the public and political consciousness.

B3.1.2 Ecosystem Condition and Productivity

In terms of the ecological integrity index (EII, developed in 2029), we can only extend our reach back to 2030 because we lack the appropriate measurements to calculate the index. However, the last twenty years of EII calculations show an exciting increase of the index from 685 EIU to 968 EIU today. All components of the index have either remained essentially stable or improved during the period.

As for forest disturbances, these are among the EII components that have remained stable. While the actual rates of fire, diseases, insects and windthrows are up considerably because of climate change, the government ecologists responsible for maintaining the EII have downgraded the relative importance of these factors because they are increasingly seen as good things from a forest-health point of view. The pattern of increased forest disturbances is not uniform across Canada. Fires continue to threaten some western Canadian forests, whereas insects are now ravaging trees more in the east than in the west. Windthrow is especially acute in the Maritimes, but most of the downed trees don't burn but rather rot quickly because of the high humidity and increased precipitation brought by the changing climate.

Forest regeneration continues to be a concern in relation to forest condition. Climate change has brought some harsher conditions for newly established and establishing stands, especially in droughty areas, but most of them eventually regenerate. Given lower timber-harvest levels nationally, people seem happy to live with this situation and are reluctant to take strong and expensive regeneration treatments to accelerate regeneration. Only some 5% of harvest areas receive regeneration assistance such as planting. This has resulted in a more natural forest across the country because exotic species and genetically modified trees are virtually unheard of in contemporary Canadian forestry.

B3.1.3 Water and Soil

In the early 2000s, water was widely cited as the main resource and environmental issue of the 21st century. So it is, but governments in Canada have been able to resolve most water quantity and quality problems. A number of factors lie behind the progress. First, riparian and watershed management guidelines, untested when prepared and implemented some decades ago, have proven today to be adequate for watercourse protection. Second, the scare of human-health problems (remember Walkerton?) if we don't manage water better has led to large increases in the financial resources - both private and public - put toward source-water protection. Finally, advances in air-pollution control have led to reduced depositions of deleterious substances into forest and water ecosystems.

The only issue with respect to forest soils in Canada today seems to be a continuing problem with erosion in the steep countrysides of BC. The increase in large rain events has had the effect of increasing erosion associated with roads and harvest areas. While foresters and engineers are quick to fix the problems, they seem unable to prevent them in the first place.

B3.1.4 Carbon Cycles

There was widespread anticipation in the 2000s and 2010s by the public, informed mostly by well-meaning but naive environmental groups, that stronger forest conservation would actually lead to Canada's forests storing more and more carbon from the atmosphere. In actual fact, the dramatic lowering of timber harvests and concomitant increase in forest protected areas has led to a situation quite the opposite. The Canadian Government's Carbon Budget Model 8 clearly shows that, from decade to decade, Canada's forests are a small net source of carbon. Annual fluctuations are high due to differences year to year in forest disturbances, but the overall trend is for Canada's forests to be losing carbon slowly. Under the Sydney Protocol, it became necessary for Canada to implement even more nuclear and non-biomass renewable energy than it ever wanted to.

B3.2 Social and Community Sustainability

B3.2.1 Amenity Values

Forest-based recreation, measured in terms of person-visits to registered establishments as well as estimated expenditures on recreational activities, has increased markedly over the last fifty years, well beyond that accounted for in the 50% increase in Canada's population. People seem to be flocking to the woods in droves, assisted by the continuing affordability of gasoline. Their recreational pursuits have tended away from hunting and fishing, hallmark forest activities of the 20th century, toward nature observation and ecological appreciation. The businesses associated with forest recreation have proliferated right across the country, especially Aboriginally owned companies. These latter companies are successfully marketing, in both domestic and international markets, the early ways of life of Aboriginal people and the continuing intense spiritual and cultural connections Canada's Aboriginal peoples maintain with their forests.

B3.2.2 Participatory Processes

Canadians have enjoyed such abundant opportunities to participate in forest decision-making processes for so long (since the 1980s) that this type of activity has become part of the normal way of life. Academic literature from the early 2010s was predicting that people would eventually tire of collaborative forest problem-solving - they would soon see better ways of spending their precious spare time rather than ingesting the routine chicken dinners served up at committee meetings and then discussing some benign forest issues with uncaring civil servants and resigned industrial foresters. Quite the contrary has emerged. Discourse on forests - at all levels and in all quarters of the country - is plentiful, civil, interesting and influential. Participants by and large have risen to the occasion by learning how to behave well in collaborative settings and indeed they show a remarkable penchant for accommodation. Such trends would probably have developed anyway, but the continuous efforts of the university-based NGO called Professors Promoting Public Participation Processes (P⁵), set up at McGill University in 2017, has doubtless helped.

B3.2.3 Forest-related Employment

Employment associated with Canada's forests has improved in quality but decreased in quantity in the first half of this century. In the woods, the reductions in timber harvests have obviously put many forest workers out of a job, and this had been painful for many rural communities across Canada. Also, in conventional industries, the number of jobs per unit of wood processed has gone down, due mainly to continued technological developments and mechanization. With lower timber throughput in these types of industries, these jobs are also way down compared to the situation in 2000. Tourism- and recreation-related jobs, on the other hand, and employment in high-tech value-added industries are both way up. As well, because willingness of forest visitors to pay reasonably well for guides and other recreation-related services, the new recreation-industry jobs are well-paid, even if still below timber-related jobs. As noted above, with the ever-expanding Aboriginal population, especially in northern forested areas, and the steady out-migration of non-Aboriginal youth to Canada's big cities, the Aboriginal share of forest-based employment has quadrupled since 2000.

B3.3 Economic Sustainability

B3.3.1 Wood Harvests

Through much of the last half of the 20th century, calculated sustainable timber-harvest levels from Canada's forests hovered around the 230-240 million m³/yr mark, and actual harvest levels remained significantly below. Indeed, at the turn of the century, actual harvesting was averaging about 180 million m³/yr. This is clearly explained by the declining fortunes of the wood-products industry, and the reductions in harvest levels by governments concerned about overall forest sustainability.

Global net wood demand changed that picture significantly during the last five decades. While calculated sustainable timber-harvest levels are still relatively high today (i.e., even with the expansion of protected areas and full reliance on unassisted natural regeneration, it sits at 180 million m³/yr), actual harvests have slid down to an average of 140 million m³/yr for the past decade. Most predictions are for this to be about the bottom for the century, with harvests picking up closer to the sustainable harvest level by the 2070s. For 2100, Rosy Futures Inc. of Calgary is predicting harvest levels to breach the 200 million m³/yr mark.

B3.3.2 Wood-processing Industries

The dismal decades of the 2000s and 2010s led to more dismal decades for the commodity producers and a fairly healthy situation for the high-tech value-added producers. The Canada-US lumber dispute, now almost two centuries old, continues to plague Canadian lumber producers as US firms try to hold their own in the soft market situation. The value of shipments last year amounted to NAD 60 billion (the USD and CAD joined in 2027), a slight increase from the roughly CAD 40 billion in 2000. Newsprint is virtually gone, and composite materials have taken a commanding position.

With a 50% increase in the population of Canada, a much greater proportion of our forest-based material is staying in the country. But of what we do export, the USA share is way down to 60%, Europe has gone slightly up to 12%, Asia slightly up to 9%, but big proportional increases have come from Africa, and South and Central America.

B3.3.3 Harvests of Non-Wood Products

With continuing reasonably good health of Canada's forest ecosystems, production of non-wood goods is unimpaired. Harvest levels for most such goods - e.g., country foods (e.g., berries, mushrooms, nuts, plants), craft materials, medicinals - have risen dramatically what with visitation rates to forests having increased so much. In most cases, they are still below sustainable harvest levels, but some ecologists are concerned about the rates of mushroom harvesting, especially on Vancouver Island and Prince Edward Island. Whether such harvest rates could jeopardize forest health is hotly debated. Part of the rising fortunes for many Aboriginal communities spread across Canada's north is related to their success in selling non-wood forest products into urban markets.

B3.3.4 Markets for Forest Services

Markets for forest carbon were a spectacular hit back in the 2010s, but as soon as Canada's forests were deemed to be overall net emitters, that market pretty much vanished by around 2040. However, water rights became a hot commodity with a forest water-rights market having been established in 2037 at the Regina Stock Exchange. A host of small and medium-size enterprises became established, many associated with community forests and Aboriginal forest companies. The predictions in the 2000s that water would eventually become a big business were right - hundreds of Canadians have become wealthy in the water business.

In the 2010s and 2020s, much discussion took place about starting up some biodiversity markets associated with Canadian forests. The managers of community forests and Aboriginal forests, in particular, were able to convince developers throughout the world that their corporate reputations would be enhanced if they would invest in maintenance of forest biodiversity in Canada. It has turned out to be a lucrative enterprise, especially considering that the forest managers have to do so little to maintain the biodiversity of their forests! Truly an example of sustainable development - good the environment, good for the economy!

B4. Conclusions

Making predictions about the future - in particular the future we are concerned with here, the forests and forest sector - is a risky venture at the best of times. Our ability to foresee the future with any useful clarity is restricted to the very short term. However, our forests are far too cherished for us to sit idly by. We must consider seriously their long-term future and the policies needed to shape them and use them so that we can speak positively about the forests and our relationships with them as the year 2100 approaches in fifty short years. What Canada needs now is a policy-planning exercise that generates a small set of radically different yet plausible

scenarios of how the forests and forest sector could develop through the decades to 2100. These will serve as a sound basis for enriched policy discussions dedicated to an even stronger pursuit of sustainability.