Mission Possible: A Canadian Resources Strategy for the Boom and Beyond
by Gilles Rhéaume and John Roberts

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This volume is one of a set of four volumes comprising the final report of The Canada Project, Mission Possible: Sustainable Prosperity for Canada:
• Volume I—Mission Possible: Stellar Canadian Performance in the Global Economy
• Volume II—Mission Possible: A Canadian Resources Strategy for the Boom and Beyond
• Volume III—Mission Possible: Successful Canadian Cities
• Volume IV—Mission Possible Executive Summary: Sustainable Prosperity for Canada (an executive summary of Volumes I, II and III).

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About The Canada Project

The Canada Project is a three-year program of research and dialogue designed to help leading decision-makers chart a policy course that will improve Canada’s standard of living and position within North America and the world. Spearheaded by The Conference Board of Canada and launched in January 2003, The Canada Project actively engaged private and public sector leaders in setting national policy direction. Forty-five companies and organizations invested in the project, providing invaluable financial, leadership and knowledge support.

As with all the research produced over the three-year term of The Canada Project, the final report, Mission Possible, is aimed at elevating the level of public debate about Canada’s standard of living and position within North America.

For more information about The Canada Project, please visit www.conferenceboard.ca/canadaproject.
CONTENTS

Preface ................................................................. i
Foreword by Janice Gross Stein ................................... iii

Chapter 1—Introduction ........................................... 1
Growing Demand Fuelled by Changing
Demographics and Rising Income .......................... 1
Meeting Competitive Challenges ........................... 2
Looking to the Next Decade and a Half ..................... 2
Focusing Individually and Collectively ..................... 2
Canada’s Resource Sectors and Sustainable Prosperity5

Chapter 2—Forest Products Sector: Opportunity
Knocks, but Renewal Must Open the Door .................. 9
Snapshot of the Issues ............................................. 9
Sector Overview ................................................... 9
Opportunities and Challenges .............................. 11
Industry Actions to Strengthen the Forest Products
Sector .............................................................. 19
Government Position on Renewal ........................... 23
What Other Countries Are Doing ........................... 25
Summary ............................................................ 25
Going Forward ..................................................... 26
Recommendations to Renew the Forest
Products Sector .................................................... 29

Chapter 3—Agri-Food Sector: Unleashing Innovation,
Improving Competitiveness .................................. 31
Snapshot of the Issues ............................................. 31
Sector Overview ................................................... 31
Opportunities and Challenges .............................. 32
Government and Industry Actions to Strengthen
the Agri-Food Sector ........................................... 42
Summary ............................................................ 43
Going Forward ..................................................... 45
Recommendations to Make the Agri-Food
Sector More Innovative and Competitive ............... 47

Chapter 4—Mining Sector: Boosting Exploration
to Open New Mines ............................................. 49
Snapshot of the Issues ............................................. 49
Sector Overview ................................................... 50
Opportunities and Challenges .............................. 52
Government and Industry Actions to Strengthen
the Mining Sector ................................................ 65
Summary ............................................................ 68
Going Forward ..................................................... 68
Recommendations to Boost Mineral Exploration
to Open New Mines ............................................. 71

Chapter 5—Energy Sector: Becoming a Clean Energy
Superpower ....................................................... 73
Snapshot of the Issues ............................................. 73
Sector Overview ................................................... 74
Opportunities and Challenges .............................. 80
Government and Industry Actions to Strengthen
the Energy Sector ................................................ 94
Summary ............................................................ 95
Going Forward ..................................................... 96
Recommendations to Make Canada a Clean
Energy Superpower ............................................ 98

Chapter 6—Conclusion ............................................. 101
Forest Products: Time to Renew ............................. 101
Agri-Food: Time to Make the Sector More
Innovative and Competitive ................................. 103
Mining: Time to Expand Domestic
Mineral Exploration ............................................... 105
Energy: Time to Become a Clean
Energy Superpower ............................................. 106
Dealing with Common Issues ................................. 109
Limited Windows of Opportunity to Act ................... 111
Summary of Recommendations for a Canadian
Resources Strategy for the Boom and Beyond .......... 111

Appendix A—Bibliography ....................................... 114
Appendix B—The Canada Project Research
and Dialogue Activities ......................................... 131
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The Canada Project had its genesis in 2002 at The Conference Board of Canada’s annual Canadian Conference—a meeting of senior public and private sector leaders at which participants are invited to share their most pressing concerns about Canada’s present challenges and future prospects.

Many of the leaders at this meeting raised the same underlying issue: that Canada was floundering in a state of public policy drift at a time that called out for national strategic action in the face of rising global competition. And thus, The Canada Project was born.

Now, almost four years later—thanks to the $2.4 million invested by business and government organizations, the $1.0 million contributed by the Social Sciences and Humanities Research Council of Canada and the effort and expertise invested by some of Canada’s top researchers and professionals—we present this four-volume compendium of the results of our work. The ambitious task of synthesizing all the research and analyses produced under the banner of The Canada Project required us to focus on what was both essential and new. Much of the original research has been released over the course of the project in 27 separate studies and reports. (See Appendix “The Canada Project Research and Dialogue Activities.”) Mission Possible: Sustainable Prosperity for Canada summarizes our findings in a comprehensive overview. It delivers an integrated set of 76 recommendations in support of seven closely linked strategies for moving forward. Many of these recommendations are consistent with emerging public policy thinking; others are more provocative.

I want to thank my exceptional team of colleagues who, led by Brenda Lafleur, Director of The Canada Project, contributed to this enterprise. All were diligent and thorough in analyzing and weighing policy choices and in selecting priorities for emphasis. Special thanks to my volume co-captains, Glen Hodgson and Gilles Rhéaume.

I also want to thank Janice Gross Stein for agreeing to write the Foreword. Her thoughtful thematic summary of our key messages will help readers absorb this research-laden body of work.

The timeliness of this publication—coinciding with new governments and new leadership in Ottawa and in many provinces and cities across the country—is fortuitous. It arrives at a moment when there appears to be an emerging consensus among Canadians on two themes: that Canada must strive for a global-best level of excellence in embracing the competitiveness challenge, and that it must adopt a sustainability perspective in so doing.

I hope that Mission Possible will be widely read by leaders at all levels and in all sectors. Above all, I hope it succeeds in driving policy debate in constructive directions and contributes to a national resolve to undertake the actions necessary to build a sustainable and prosperous future for Canada.

Anne Golden
President and Chief Executive Officer
January 2007
Foreword
by Janice Gross Stein

Janice Gross Stein is the Belzberg Professor of Conflict Management in the Department of Political Science and Director of the Munk Centre for International Studies at the University of Toronto. She is a Fellow of the Royal Society of Canada. Her most recent publications include Networks of Knowledge: Innovation in International Learning (2000); The Cult of Efficiency (2001); Street Protests and Fantasy Parks (2001); and Canada by Picasso (2006) as a Conference Board Scholar-in-Residence. She was the Massey Lecturer in 2001 and a Trudeau Fellow. She was awarded the Molson Prize by the Canada Council for outstanding contribution by a social scientist to public debate. She is an Honorary Foreign Member of the American Academy of Arts and Sciences. In 2006, she was awarded an Honorary Doctorate of Laws by the University of Alberta and received the Order of Canada.

Canada’s future economic prosperity is at risk. This is a hard argument to make in a country that today enjoys low unemployment, a strong dollar, declining debt and a booming resource economy. Canadians are likely to be skeptical of an argument that points to serious challenges ahead and makes an urgent case for strategic investment today to assure sustainable prosperity tomorrow. Yet this is precisely the argument The Conference Board of Canada makes in this four-volume report. It does so in compelling language as it examines the challenges Canada faces in the global economy, in our resource sectors, and in our cities. In all three areas, our performance is slipping.

Canada lags behind most developed economies in productivity growth.

We are becoming less competitive. In just two years, we have slipped from 3rd to 12th place in comparative measurements of macroeconomic and microeconomic performance, according to the results of benchmarking by the Conference Board. Canada lags behind most developed economies in productivity growth. Our resource sectors require significant new strategic investment if they are to meet global competition, and our biggest cities are starved for investment in comparison with global cities elsewhere. In vital sectors of our economy, we are not keeping up with our competitors.
The future demands not only an improvement in productivity, but a productivity that is sustainable. Across the board, Canada must invest in development that meets the needs of the present without compromising the ability of future generations to meet their needs. A central theme running through every volume is the imperative to design sustainability into the economic architecture that we are building for the future. Across the country, Canadians understand that protecting the environment from further damage is not a problem for tomorrow, but a challenge for today. Our record, unfortunately, does not reflect this awareness. Here too, Canada is underperforming and underperforming badly. Without serious attention to economic and environmental sustainability, Canada puts its society and its quality of life at risk. This report speaks with a clear voice. Sustainability matters. It must become one of the yardsticks against which we measure productivity.

**Sustainability matters. It must become one of the yardsticks against which we measure productivity.**

*Mission Possible*, a large-scale and in-depth review of Canada’s economic performance and potential, issues a clarion call. It calls for strategic investment by governments, corporations and people. Canada must be “smart” in its choice of priorities, its policies and its investments if Canadians are to retain their quality of life. It is not the federal government alone that faces the challenge. It is all three levels of government—federal, provincial and municipal—and all sectors of society—public, private and voluntary—that have to work together to develop priorities, translate these priorities into strategies, and make the kinds of strategic investments that are required. We need to develop new habits of collaboration across the three levels of government and with society, and we need to do it quickly. The mission is possible only if the mission is national.

**GLOBALIZATION AND SUSTAINABLE PROSPERITY IN CANADA**

Globalization—the connections and processes that cross borders—is the hallmark of the 21st century. The global economy rewards knowledge, innovation, investment and trade. The signature of this phase of the global economy is the integrated global supply chains that distribute production around the globe in search of higher efficiency and lower costs for each component of the final product or service. Close to one-third of world trade today is intra-firm trade. In this globally integrated economy, Canadian companies must compete vigorously for international investment and trade if they are to prosper.

**North American economic integration is slowing, and, in a much more anxious security environment, the United States is thickening its borders.**

Because of our geography, our rich resource endowment and our heavy dependence on the U.S. market, many believe that Canada has very little direct exposure to globalization. We are insulated, Canadians believe, by the North American market. This report tells us otherwise. Growth in our exports to the United States has slowed in recent years, and the growth that has occurred was largely due to the energy and other resource sectors. The growth in exports that are unrelated to energy—in the automotive sector and in manufacturing—has been weak. North American economic integration is slowing, and, in a much more anxious security environment, the United States is thickening its borders. The North American Free Trade Agreement (NAFTA) has lost its dynamism, its momentum and, in part, its legitimacy, at least for the moment. The Canada–U.S. relationship will continue to deepen, but the glittering promise made by the architects of North American free trade has not been fully achieved. Canadian investors are looking increasingly to other dynamic markets, notably in Europe, Latin America and Asia.

Canadians know that we must pay attention to the United States—that we must manage our relationship carefully and well. The United States is simply too
important to our collective well-being for us to do otherwise. But the Conference Board tells an unexpected story. It tells us clearly that we need to wear bifocals: we need to look out to the world, without taking our eyes off the United States.

In this generation, Canadians are looking beyond North America to the world. Our competitors are global. So are our market opportunities.

Canada is experiencing globalization in all its critical sectors. Volume II of this report demonstrates over and over again that in the resource sectors—forestry, agriculture, mining and energy—our competitors are global. So are our market opportunities. China, India, Russia and Brazil, to mention only the obvious, are shaping our markets and competing with our firms. Our most competitive firms are tightly linked into global supply chains. Our cities benchmark themselves against global competitors. And we measure our productivity against the performance of others. In this generation, Canadians are looking beyond North America to the world.

THE BALKANIZATION OF OUR ECONOMIC SPACE

Every volume of this report emphasizes the adverse consequences to Canadians of chopping up our national economic space. The non-tariff barriers to interprovincial trade, mobility and investment are at times so severe that they inhibit the kinds of east–west connections that characterize our deep connections outside Canada. People cannot move easily to work, some industries cannot recruit easily, students face difficulties in transferring credits from one post-secondary institution to another, and supply chains across provincial borders can face obstacles that global supply chains have eliminated. In an age of global mobility, it simply makes no sense to add degrees of difficulty to the movement of people, goods and services from one province to another.

The costs and consequences of this balkanization of our national economic space are not always obvious. The Conference Board tells a striking story about our cities. Hub cities within provinces play an essential role in sparking economic growth in their own province. This pattern of convergence within provinces—not across provinces—is at least partly due to the chopping up of Canada through interprovincial barriers.

Canadians living in the early part of the 21st century, in an era where markets are global, where the Internet is ubiquitous, and where people move and travel at unprecedented rates, have nevertheless allowed a thicket of provincial barriers to stand largely untouched. In the 21st century, the irony should be obvious: we are dividing and separating ourselves even as we are connecting more deeply with others. Our national economy is being stifled by barriers that we ourselves have allowed to stand. As a result, we have a “chopped-up” economy, poorly suited to compete and prosper in a global economy. This is a problem that governments in Canada can and must fix.

STRATEGIES TO MOVE CANADA FORWARD

In a globally connected world, how can Canadians build sustainable prosperity? This report highlights seven important strategies:

• putting in place a comprehensive national strategy to increase our lagging productivity;
• creating an integrated national market;
• investing in and supporting a workforce that is equipped to meet the challenges of the global economy;
• adopting strategic investment and trade policies;
• sharpening our foreign policy priorities;
• investing in our resource industries so that they are competitive and sustainable; and
• investing strategically in our major cities so they can fulfill their potential as engines of sustainable national growth.

Common to all seven strategies are the imperative to increase productivity in sustainable ways, the necessity to develop knowledgeable and skilled workers and managers, the importance of redesigning our fiscal and regulatory architecture, and the urgency of special treatment for our major cities.
A NATIONAL STRATEGY TO INCREASE PRODUCTIVITY

Canada must develop a comprehensive national strategy to increase our productivity in ways that are sustainable. The data in this report are alarming. Compared to the U.S. economy, only one-fifth of the Canadian economy is more productive, while the other four-fifths are less productive. How can Canadian productivity be improved? There is a great deal that we can do. We need to open industries to competitive pressures, we need to improve the level and quality of capital intensity, we need to encourage organizational and managerial innovation, and we need to reform our tax system to encourage lower-income Canadians to stay engaged in the labour market. We do not, by and large, need to work longer; we are a hard-working country. In a global knowledge economy, we need to work “smarter.”

To work smarter, Canadian governments and companies must invest in research and development and work together to create a climate that is even more supportive of risk-taking and innovation. We are better at innovation than we generally think. Canada ranked fourth globally on a measure of innovation in 2004 and, according to benchmarking by the Conference Board, slipped to fifth in 2005 behind only Finland, Sweden, the United States and Iceland.

We do not, by and large, need to work longer; we are a hard-working country. In a global knowledge economy, we need to work “smarter.”

Canadians are good at diffusing innovation through our openness to foreign ideas, technological cooperation and partnering with foreign inventors on patents. We also have high penetration of broadband technology, an important platform for exchanging ideas. These are all important assets in the global market for ideas. But we lag behind the top global performers in business investment in research and development and in the commercialization of inventions and ideas. We are not leaders in scientific and engineering publications, and we invest significantly less than some of our competitors in our universities. We need research scientists in universities working with their counterparts in the corporate sector to bring innovative products to market and carve out a place for Canadians at the high end of the value chain. If we want to maintain our current standard of living, raising productivity through significant strategic investment in research and development and in post-secondary education is an imperative.

Improving the quality and access to training and education is a refrain that is replayed in the discussion of the Canadian economy, our resource industries and our cities.

Working smarter also means investing in the research and development of sustainable technologies that reduce damage to the environment and society. Volume II, on resources, speaks about the importance of sustainable extraction, management and renewal of our resource endowments. Whether it is forestry, agri-food, mining or energy, all require a full accounting that considers the consequences of resource extraction for the environment. Volume III, on cities, underlines the importance of sustainability in the rebuilding of our badly frayed urban infrastructures.

A SKILLED AND KNOWLEDGEABLE WORKFORCE

The Conference Board pays a great deal of attention in this report to the importance of a skilled and knowledgeable workforce. This kind of workforce is critical to increasing our productivity, to the development of sustainable technologies, and to the re-engineering of our resource industries. Without a high-quality workforce, none of these will happen. It is no surprise that improving the quality and access to training and education is a refrain that is replayed in the discussion of the Canadian economy, our resource industries and our cities. Every volume speaks to the importance of strategic investment in education, in lifelong learning, and in the development of the skills that Canadians will need as global value chains proliferate and deepen.
The Conference Board also worries about an aging demographic that threatens every sector of the Canadian economy and could compromise the quality of life of the next generation. Although immigration can help to address the looming shrinkage of the workforce, it alone cannot solve the shortfall caused by an aging population. But we can do much better at integrating immigrants and helping them to take full advantage of the skills they bring. This report speaks to the importance of immigrants in Canada: their contribution to our productivity, their global connections, and the contributions immigrants can make to the quality of Canadian life if their credentials, education and training are properly recognized.

Although immigration can help to address the looming shrinkage of the workforce, it alone cannot solve the shortfall caused by an aging population.

To compensate for an aging population, governments at all levels and businesses will have to create incentives so that educated and experienced people continue to work. Educational institutions will have to become more flexible so that lifelong learning becomes a shared experience across the generations. Governments will have to invest significant resources to provide the best available education to our young people. Although governments have increased funding for post-secondary education in the last several years, Canada’s universities are still significantly under-funded compared with those of our international competitors. The German government has just chosen three among its many universities to receive special funding so that they can become internationally competitive. In a globally competitive environment where post-secondary institutions educate young people, contribute to lifelong learning, spark research and development, jump-start innovation and build global connections, one size can no longer fit all. Here, as elsewhere, Canada will have to abandon a cherished myth of equal treatment for all its institutions. The importance of strategic investment in education, of differential treatment to build excellence, jumps out of every volume of this report.

REDESIGNING OUR FISCAL AND REGULATORY ARCHITECTURE

Canada is living with 19th-century architecture in the 21st century. Its fiscal arrangement grows out of a rural experience, and is not responsive to the massive shift of population to Canada’s major cities and to the settlement of immigrants in the largest cities. A rigid fiscal structure has produced ongoing arguments about redistribution and health spending while urban infrastructure decays, funding for education declines relative to other countries, and Canada invests less than it should to prepare itself for the coming century. Despite years of effort, governments have been unable to adapt fiscal structures or to innovate. They usually give up in frustration and make do. The fiscal framework has been the handmaiden of the balkanization of the Canadian economy. There is no doubt that institutional rigidities have been a significant drag on our capacity to innovate and to excel.

Governance is the default factor in Canada’s success in the next decade. Without good governance, nothing will go right.

Every volume of this report bemoans the regulatory mess in Canada. Overlapping and misaligned regulations at the federal and provincial levels impose serious costs, do not contribute as well as they might to public safety and environmental stewardship, hamper the mobility of people and capital, and stifle innovation and experimentation. The burden of costly and inefficient regulation will drag productivity down and discourage investment and immigration. In essential areas—capital markets and securities—we have failed, largely because of provincial rivalries, to build the kind of national regulators that global investors have come to expect and depend upon.

Governance is the default factor in Canada’s success in the next decade. Without good governance, nothing will go right. Good governance is about far more, however, than governments. It is the coming together of corporate leaders, voluntary organizations and governments.
to work together on sustainable forests and environmentally responsible mining. It is coalitions of citizens, corporate leaders, university presidents, and city officials working together to improve the quality of life in our major cities. It is giving our major cities the requisite money and power to become powerful engines of the national economy. Everything that needs to happen in Canada will happen only when all three sectors of society actively work together to change public policy, innovate and create value.

We are living with architecture built for our earlier rural past—an architecture that fits badly with the new urban Canada.

INVESTING IN CANADA’S MAJOR CITIES

The Conference Board makes clear in this report that strategic investment in our major cities is urgent. Nowhere is the gap between Canada as a global society and our political, fiscal and regulatory architectures more apparent than in our largest cities. Canada, like other societies, has transformed itself from a rural to an overwhelmingly urban society, but we are living with architecture built for our earlier rural past—an architecture that fits badly with the new urban Canada. Urbanization is likely to accelerate. Immigrants who bring valuable skills with them and compensate—at least in part—for our aging population, generally settle in Montréal, Toronto and Vancouver. Yet these cities have little voice in settlement policy or immigration policy. Indeed, Canada’s cities are not officially recognized in federal–provincial discussions and are considered creatures of the provinces. This may have made sense a hundred years ago, but it makes absolutely no sense today. Not only do cities have no official representation, they have no access to taxes that grow as the economy grows. Less than 12 per cent of total government revenues goes to municipalities. Generally reliant on property taxes and user fees, Canadian cities cannot make the kinds of basic investments in urban infrastructure, transportation and waste management required to build sustainable ecologies for the future.

If Canada’s largest cities are to become world-class centres of design, architecture and culture, and attract young, talented, creative people, they will have to do more than invest in physical infrastructure. They will have to sustain vibrant cultures and become centres of excellence in education so that they can take advantage of the global networks that power great cities and drive Canada’s economy forward. Cities today are the principal sites of innovation and production of knowledge-intensive goods and services. They must have the resources—from their province and the federal government—to invest in people so that they are socially as well as environmentally and economically sustainable. The reality of Canada’s cities today is far from this picture of excellence. What can be done to help Canada’s cities?

Canada’s prosperity depends on the success of our major cities. Governments at all levels must flow resources to major cities, which have special potential and face distinctive challenges.

The Conference Board makes the argument clearly and unequivocally: Canada’s prosperity depends on the success of our major cities. Above all, Canadians must recognize that the major cities need and deserve special assistance, and that these investments will benefit everyone. As the German government did recently with its universities and as European countries are doing with their core cities, governments at all levels must flow resources to major cities, which have special potential and face distinctive challenges. If they do not, neither our cities nor our economy will be globally competitive. We are also unlikely to sustain the arts and culture that are so important to Canadian identity.

No longer, the Conference Board insists, can we continue to interpret equality as equal per capita. That is not a popular argument to make in this country, where “fair”
is intuitively understood as “the same for everyone.” If we continue to invoke old language and avoid differentiation, we will continue to starve our cities, and everyone will lose. This is a tough but compelling argument. It deserves very serious attention.

Nor can Canada allow itself to be hobbled by an outdated fiscal and political architecture. Governments at all levels, the private sector and the voluntary sector must pool resources to work together on the shared challenges of urban finance, urban infrastructure, urban ecology and urban governance.

Urban transportation is in especially urgent need of investment. People, goods and services must be connected in ways that are both efficient and sustainable. The gridlock we currently face is a drag on our productivity, a disincentive to come to our big cities, and deeply damaging to the environment. Without major investment in the transportation infrastructure of our biggest cities, Canada will meet none of its basic goals.

People, goods and services must be connected in ways that are both efficient and sustainable.

The Conference Board also underlines the importance of viewing cities as urban ecosystems and developing industrial processes to promote the reuse of industrial by-products and waste. Cities contribute significantly to air and water pollution, greenhouse gas emissions, and overflowing landfill sites. Eco-industrial systems transform open-loop systems—where resources become waste—to cyclical closed-loop systems—where waste products become inputs for new processes. Governments at all levels will have to work together to align incentives and regulation so that industry can experiment with innovative eco-industrial systems.

**STRATEGIC INVESTMENT**

This report by the Conference Board speaks with a refreshing voice because, in the final analysis, it is about excellence. It does not ask: what does Canada have to do to maintain the status quo? It asks: what do Canadians have to do to excel? In a world where we are competing with the very best, where yardsticks are now globally made, how can Canadians do much better than we have done in the past? How can we be truly excellent? That is an important question for Canadians to ask.

To be excellent, we need to get the fundamentals right. We are richly endowed, with natural resources, with people, with cities that could be the very best even if they are not now, with a few world-class post-secondary educational institutions. Our challenge—and our responsibility—is to make the most of these endowments, to provide the highest-possible level of stewardship of our resources, our people and our institutions, to differentiate when we need to build excellence, and to measure our performance against the very best in the world. 🌿
HIGHLIGHTS

- This second of three volumes comprising the final report of The Canada Project looks at how Canada can prosper from the projected growth in global demand for natural resources while improving its environmental performance and ensuring the well-being of communities.

- The volume describes the global market opportunities and main domestic challenges of four major resource sectors in Canada—forest products, agri-food, mining and energy.

- Canada’s environmental performance is less than desirable and, although progress has been made, more must be done. Its resource industries can contribute to a Canadian sustainable prosperity that integrates economic development and the protection of the environment and the public.
CHAPTER 1

Introduction

Global demand for natural resources has escalated in recent years and is likely to continue to grow for at least the next decade or so. As a result, Canada is well positioned to prosper from its resource base: vast forests, significant agricultural land mass, large water volumes for hydro power production, and substantial mineral and oil sands deposits. But there is a catch to this opportunity to take advantage of expanding markets for natural resources: it comes with a limited-time offer. Careful, strategic investments in natural resource sectors—investments that consider the protection of the natural environment and the public—are required now to lock in gains.

Canada is well positioned to prosper from its natural resource base, but there is a catch to this opportunity—it comes with a limited-time offer.

GROWING DEMAND FUELLED BY CHANGING DEMOGRAPHICS AND RISING INCOME

For the most part, the world’s emerging economies have fuelled the growth in global demand for natural resources. As noted in Volume I of Mission Possible: Sustainable Prosperity for Canada, the economies of China and India have grown rapidly in recent years, and they are likely to continue to do so for at least the next 15 years, spurring job creation and expansion of the middle class. China’s middle class currently comprises about 200 million people—a number that is likely to double by 2010. India’s comparatively smaller middle class of some 90 million people is growing rapidly as well. Typically, members of middle-class households have discretionary income to spend and desire a modern lifestyle and its associated comforts. In their quest to fulfill these desires, this consumer group is putting pressure on natural resources markets worldwide.

Canada is prospering by shipping forest, agricultural, mineral and energy products to domestic, U.S. and international markets.

Meanwhile, the economies and populations of Canada and the United States have also been expanding. The housing boom of the past decade has been instrumental in significantly increasing demand for wood products and copper, and increased consumer spending on durable goods has boosted the demand for mineral products in general. Energy consumption has caught up with supply, and new sources of energy are being sought by these economies. Together, population growth and rising personal income have also increased the demand for higher-value food products.
And Canada is prospering by shipping forest, agricultural, mineral and energy products to domestic, U.S. and international markets.

MEETING COMPETITIVE CHALLENGES

Because of our small population and significant resource base, Canada is a large exporter of resource goods but it is certainly not the only one. Australia, Brazil, Russia and Sweden—among others—are major exporters and formidable competitors. They are not only eroding Canada’s market share in its existing markets, but also edging their way into promising new markets, such as China.

A number of issues must be resolved if Canada’s resource sectors are to meet their full potential in the pursuit of current global opportunities.

How long the economic expansion in Canada and the U.S. will last is hard to tell, but an economic slowdown, if not a recession, is likely to occur during the next decade. Canada’s resource sectors can certainly enjoy the current growth in North American demand for their commodities, but they also must prepare for the eventual slowdown and potential temporary downturn.

A number of issues must be resolved if Canada’s resource sectors are to meet their full potential in the pursuit of current global opportunities. Innovative solutions and strategic investments will be essential. Governments will need to create a better business setting while keeping protection of the public’s safety and interests—and of the natural environment—top of mind. Central to the protection aspect of this business pursuit is a high-functioning regulatory system that addresses both the approval of energy and other resource sector projects and the negative impacts of production activities.

LOOKING TO THE NEXT DECADE AND A HALF

This report addresses the question of how Canada can maximize its opportunities from the projected growth in demand for natural resources over the next 10 to 15 years to achieve longer-term prosperity and well-being. It focuses on four major natural resource sectors:

- forest products
- agri-food
- mining
- energy

These sectors were chosen not only for the choice global market opportunities within them, but also because they have considerable resources that can be exploited in a sustainable way. The criterion of sustainability disqualified fisheries and water as suitable sectors. Fish stocks are currently at levels that do not permit significant export expansion (see box “The Atlantic Canadian Cod Fishery: A Faustian Bargain Come Due”), and bulk water exports would create major ecological problems. In fact, Canada could actually face future major water shortages in high-demand regions (see box “Blue Gold: Canada’s Water Resources”).

This report looks at how industry and governments can cooperate to maximize opportunities in a way that ensures sustainability.

FOCUSBING INDIVIDUALLY AND COLLECTIVELY

For each of the chosen natural resource sectors, this report looks at how industry and governments can cooperate to maximize opportunities in a way that ensures sustainability. There are opportunities in all four sectors, but interestingly, they are not currently on an equal footing. Buoyant conditions in the mining and energy sectors contrast starkly with the current difficult economic conditions in the forest products and agri-food sectors.
The Atlantic Canadian Cod Fishery: A Faustian Bargain Come Due

The circumstances leading to the collapse in the 1990s of the North Atlantic cod stocks and the announcement in 1992 of a moratorium on fishing activities provide a cautionary tale about the perils of political interference in scientific advice provided to policy-makers.

The ecological effect of tainted advice was the extinction of the northern cod as a commercially viable resource. The subsequent socio-economic impacts in Atlantic Canada were profound. Approximately 30,000 people immediately found themselves out of work, and provincial economies were left reeling. The federal government’s aid package provided relief, but the depletion of the cod stocks renders the future of numerous rural Atlantic Canadians uncertain.

The 10-year moratorium has passed, and still, nearly 15 years later, the cod stocks are nowhere near commercially viable levels. The impact in Newfoundland and Labrador alone has caused its population to decline for the first time in the province’s history of more than 500 years, despite expanded activities in the oil and gas industry.

Although the role and impact of natural factors associated with the Earth’s changing climate remain contentious, the role of politicians and of advisors from the Department of Fisheries and Oceans (DFO) in the collapse of the stocks cannot be ignored. The seeds of destruction of the northern cod stocks were sown in the immediate aftermath of the creation of the 200-mile limit in 1977.

Securing the 200-mile limit led to an overexpansion in fishing activities. The number of fishing licences issued to Canadians increased to about 7,500 in 1981 from approximately 5,800 in 1974. In subsequent years, fishing vessels’ capacity grew, and the number of fish plants rose to 246 in 1992 from just 53 in 1970. The expanded activities were based partly on pragmatic electoral considerations but were grounded in insufficient and inaccurate scientific information that was often politicized. In lieu of disinterested scientific advice, scientific data and analysis were filtered through political and economic considerations.

The fishery had long been a lifeline for numerous rural communities in Atlantic Canada. Increases in cod prices in the 1980s meant that the political pressures and rewards for expanded fishing activities were significant. And once those activities were established, retrenchment entailed electoral risk for politicians.

Exacerbating matters, scientific research at DFO led, in the late 1980s, to inaccurate depictions of the relative health of the cod stocks and flawed projections regarding the future of this resource. Rather than using macro-level ecosystem analysis, DFO relied on trawler data related to catch per unit of effort (CPUE) as an indicator of the stocks’ relative health. Returns indicated that the stocks were increasing. However, increasing net sizes were not considered a mitigating factor in determining CPUE, and the methodology underestimated fish mortality rates—an error not identified for five years.

Inaccurate projections in the 1980s led to large portions of the stocks being allocated to foreign nations in the interests of domestic trade and diplomatic objectives. The benefits of those arrangements accrued to other parts of the country and not directly to the places most directly affected by the collapse of the stocks.

Tragically, the dissenting opinions expressed by inshore fishermen who questioned the optimistic assessments and projections were dismissed by DFO and decision-makers as self-interested arguments on the part of participants. More credence was given to offshore fishing companies that spoke the same language as the policy-makers and whose information served as the basis for scientific assessments of the health of the stocks.

The years following 1992 saw DFO’s science budget slashed, with deleterious effects on research into fish-stock ecology. “Cod science” is no longer a priority for DFO, which in 1995 lost funding for its $33-million northern cod science program. DFO cutbacks also led to the non-replacement of scientists who left or retired from the organization. As a consequence, federal and provincial policy-makers currently lack the scientific capacity to adequately support and monitor a sustainable fishery. For example, fishery scientists still lack historical and current data on biomass trends for cod stocks and do not know whether the stocks represent a single unit or comprise multiple groupings.

If policy-makers and industry participants are to receive adequate scientific information for consideration, the gathering of scientific data must receive substantial public investment. At the same time, scientists must be free to acknowledge data uncertainty and to “speak truth to power” without fear of consequences.

Decisions taken long before the announcement of the 1992 cod moratorium were the ones that had the longer-term ecological impacts that nearly wiped out the cod stocks. This story of mismanagement clearly illuminates the importance of accurate, objective and disinterested scientific inputs into the policy-making process and of the need to consider the opinions of those directly involved in harvesting natural resources.

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FOREST PRODUCTS

The report starts with Canada’s forest products sector, which has two main subsectors: wood products and pulp and paper. To compete in the global marketplace and to capture new market opportunities, this sector requires renewal. While the wood products subsector has benefited from the North American housing boom over the past several years, it has also been tested by the “softwood lumber dispute” with the U.S. and will need to be resilient during the downturn. The major challenge will arise in the pulp and paper subsector, where small, older mills struggle to compete against new, larger global rivals. This report focuses on those older mills and what Canada must do to ensure the sector’s sustainability.

AGRI-FOOD

The agri-food sector has the potential to gain from robust global demand for food products. Growing consumer demand for higher quality and more variety allows for competition based on the features of food products and not just on their price. This trend definitely exists in industrialized countries, but it is also occurring in emerging economies as personal incomes in those locales rise. The agri-food sector is also poised to provide possible solutions to environmental challenges—for example, biofuels as new, clean energy sources. However, current trade barriers, as well as market structures that stymie innovation, are preventing Canada’s agri-food sector from achieving its full potential. This report focuses on the opportunities and barriers and suggests steps toward achieving a vibrant agri-food sector that is successful in the global market and protects the public and the environment.

Blue Gold: Canada’s Water Resources

By global standards, Canada is awash in fresh water. More than 20 per cent of the world’s supply is located within Canada’s national boundaries. But having water and being able to use it to satisfy anthropogenic demand are two different things. The Conference Board of Canada’s 2005–06 Performance and Potential report discusses three reasons Canada should keep a keen eye on its “blue gold.”

First, a large portion of Canada’s freshwater resource cannot be considered renewable, nor is it easily accessible. It is not renewable because much of it has accumulated underground over millennia or is locked in glaciers, snow or ice sheets. It is not accessible because about 60 per cent of it flows northward, away from the country’s southern border and the major population centres where more than 85 per cent of Canadians live. Indeed, substantial portions of the watersheds in British Columbia, Alberta, Saskatchewan and Ontario must already contend with water scarcity because of large anthropogenic demand.

Second, Canada is not exempt from future water scarcity. Climate change has already affected the hydrology of British Columbia. In Hope, for example, one-third of the cumulative annual flow of the Fraser River now runs 11 days earlier than it did a century ago. This has resulted in even more water during the spring runoff (a low-demand period) and less in the summer (a high-demand period). The riverbanks also have to endure greater erosion stress. In other regions of the country, the impact of climate change on anthropogenic water use is similar. Variations in water availability—whether they result from increased precipitation and evaporation, changing snow packs, earlier glacial melts, warmer river temperatures or reduced soil moisture—will force water managers across the country to closely monitor their regions’ water budget.

The 2005–06 Performance and Potential report identifies international trade as the third reason why Canadians should keep close tabs on their water resources—namely a concern that water will become a “tradable commodity” and subject to the provisions of the North American Free Trade Agreement. Despite action from the federal and provincial governments, and proposals for a Great Lakes Basin Sustainable Water Agreement by the Council of the Great Lakes Governors, there is some worry that population growth in the U.S. could lead to creation of a “water pipeline” from Canada. That concern may be overstated. Advances in conservation, improvements in desalinization technology and the distance from Canada to U.S. markets have made bulk water exports a higher cost option for addressing continental water scarcity. Today’s response to water scarcity is not trade or diversions, but rather improved management and governance of water resources. These efforts should also include widespread implementation of metering and pay-for-use.

For these three reasons, Canada must protect its watersheds from wasteful and environmentally damaging withdrawals and must remain vigilant about bulk water diversions.

Source: Hoover et al., “Pursuing Sustainability.”
MINING
To tap into growing global markets for metal and mineral products, the mining sector needs to increase the number of operating mines in Canada. However, making headway on this task is difficult for a few reasons: exploration has lagged in the past decade, metal reserves are declining, and a consolidation wave is currently sweeping the sector. The time lags between discovery of a new mine and production start-up are lengthy, in part because of time-consuming environmental reviews. Before companies can thrive in today’s minerals boom, this major challenge must be addressed. This report concentrates on the steps that will be required for Canada’s mining sector to flourish and to continue making progress on its environmental performance.

ENERGY
Discussion of the energy sector in this report centres on the oil and gas, coal, and electricity industries (nuclear, hydroelectric and other renewable electricity generation sources). The oil and gas industry encompasses oil and gas production primarily from the oil sands in Alberta, the conventional oil reservoirs beneath the Grand Banks off Newfoundland and Labrador, and new gas finds in Alberta and the Nova Scotia offshore. For Canada to gain from these rich mineral-fuel resources, substantial new investments in production and pipeline transmission will be required. New sources of natural gas can also be secured by investing in liquefied natural gas (LNG) regasification plants that draw on foreign supply. Adequate transportation infrastructure will also be vital to moving these energy products to market.

The country’s supply of electricity will have to expand to respond to growing domestic and U.S. demand. In hotspots such as the city of Toronto and Vancouver Island, the electricity supply is problematic, and solutions are urgently required. Newfoundland and Labrador and Quebec want to develop their hydroelectric resources to meet internal demands and to capitalize on opportunities in the export market. Manitoba and British Columbia have significant untapped hydroelectric potential that could be similarly developed.

Canada has achieved major reductions in environmental emissions. Despite the progress, more needs to be done, and more can be done.

The energy sector must also address environmental challenges—for example, improving air quality and reducing greenhouse gas emissions (GHG). This report examines ways in which Canada’s energy sector can benefit from the projected growth in demand, while overcoming its challenges and meeting environmental policy objectives.

CANADA’S RESOURCE SECTORS AND SUSTAINABLE PROSPERITY
Many observers view Canada’s environmental performance as less than leadership quality. In the Conference Board’s Performance and Potential report of 2005–06, we scored our performance in this area as middle of the pack among a peer group of countries. Admittedly, we have achieved major reductions in environmental emissions and have adopted improved practices over the past several decades. Yet Canada remains the largest (or nearly the largest) per capita emitter of greenhouse gases, generator of solid waste, user of water, user of energy . . . and the list goes on. Despite the progress, more needs to be done, and more can be done. “More” can be achieved only by ensuring that all developments, decisions and activities in the resource sectors are viewed through the lens of sustainable prosperity.

The concept of sustainable prosperity attempts to ensure that Canada can continue to be a healthy, wealthy and stable place to live and work for generations to come. Aspects of productivity, societal cohesion and environmental integrity form its core. In that way, it mirrors the concept of sustainable development, or sustainability. While there are many definitions and approaches to the
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Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.¹

This concept is widely understood to embody three fundamental principles—economic growth and prosperity, environmental protection and enhancement, and the protection of social systems and human rights. Before the Brundtland Commission report, these principles were not generally seen to be interdependent.

Canada has been able to prosper by developing and exporting resources. But this growth has come with a cost.

Economic growth is essential to the proper operation of any society, and blessed with a vast endowment of natural resources for its small population, Canada has been able to prosper by developing and exporting these resources. But this growth has come with a cost.

A natural resource economy discharges a large amount of waste products into the environment, and a prosperous population consumes and disposes of products at a great rate. The result is our high per capita waste rankings in international benchmarking studies. For the past several decades, Canada has been reducing these wastes through technological and regulatory means, but they remain at high levels, and Canada must continue to reduce them in the future. All four of the sectors addressed in this volume are significant dischargers of waste and emissions, and these discharges have been the subject of regulatory and voluntary reductions by the respective sectors. In some cases, very significant reductions have been achieved for specific pollutants.

Nevertheless, more needs to be done in each sector and this volume discusses some of the approaches that Canada can take to effect these changes.

The current opportunity to boost prosperity through our resource sectors must be balanced with the need to minimize or eliminate negative environmental and social impacts.

The social side of sustainability is harder to measure quantitatively than the economic side. However, it is clear that industrial pollution and food safety are real issues that must be addressed. It is also clear that some business decisions, such as closure of operations, can have negative effects on local communities. Further, new resource projects close to populations bring the positive aspects of economic well-being but can have negative impacts on other local economic activities and quality of life.

The Conference Board has long advocated that economic growth, environmental integrity and social cohesion are inextricably linked. Based on this tenet, then, the current opportunity to boost prosperity through our resource sectors must be balanced with the need to ensure that negative environmental and social impacts are minimized or eliminated.

All components of society have a role to play in this regard. As an agent for society, governments’ key role is to ensure that developments are managed to extract the greatest prosperity for the least negative impact. This task is tricky but doable and requires two fundamental tracks. The first is integrating policy for development and protection through regulatory and measurement systems to make sure that sustainability is considered and delivered. Second, governments and industry need to focus on improving technology to reduce the environmental impacts of resource developments. This volume discusses both.

¹ Brundtland, Our Common Future, p. 43.
HIGHLIGHTS

- Although Canada remains the largest exporter of forest products, its forest products sector has old and small pulp and paper mills. It is also facing higher costs, a high Canadian dollar and increased offshore competition.

- To enhance its international competitiveness and improve its performance, Canada’s forest products sector will need to continue to shut down uncompetitive mills, modernize others, transform mills to produce new product lines (such as biochemicals) and perhaps construct some large, world-scale mills.

- To encourage ambitious investments, governments will need to remove trade barriers to the interprovincial movement of logs, improve flexibility in their timber tenure systems, allow uncompetitive mills to close, and permit consolidation and rationalization of the industry.

- Mill closures cause economic and social strain for affected communities, and industry and governments can help these communities have effective economic redevelopment strategies in place.

- Industry and governments will need to continue their work in improving air quality in mill towns, which is the sector’s most important environmental challenge.
At first glance, the forest products sector appears to be doing well. As Table 1 shows, this sector makes substantial contributions to Canada’s gross domestic product (GDP), employment and exports. In 2005, Canada was the world’s largest producer of newsprint and the largest exporter of newsprint, wood pulp and softwood lumber. (See Table 2.) But rising global demand for forest products is now being supplied by a growing number of international competitors. Canada has witnessed increased competition from other temperate-zone producers as well as from producers in warmer climes. As a result, our share of world exports has dropped for both newsprint and pulp in recent years.

The sector also faces the challenges of improving its environmental performance as well as managing the social repercussions of mill closures. This chapter offers an overview of the current state of the forest products sector and its future prospects, in addition to suggesting ways Canada’s forest products, sector and the communities that currently depend upon it can ensure their prosperity well into the future.

### Rising global demand for forest products is being supplied by a growing number of international competitors, reducing Canada’s share of exports for newsprint and pulp.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Canadian Forest Products Sector, Key Statistics, 2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contribution to GDP</td>
<td>$32 billion</td>
</tr>
<tr>
<td>Share of national GDP</td>
<td>2.9 per cent</td>
</tr>
<tr>
<td>Exports</td>
<td>$42 billion</td>
</tr>
<tr>
<td>Share of total merchandise exports</td>
<td>9.6 per cent</td>
</tr>
<tr>
<td>Direct employment</td>
<td>339,900 persons</td>
</tr>
<tr>
<td>Share of national employment</td>
<td>2.1 per cent</td>
</tr>
</tbody>
</table>

Source: Statistics Canada.

### SECTOR OVERVIEW

The forest products sector can be divided into two main subsectors—wood products, and pulp and paper products. The key wood products are softwood lumber, structural panels, engineered wood products, and value-added wood products such as millwork (for example, doors and windows). The principal pulp and paper products are newsprint, printing and writing papers, and market pulp.

### WOOD PRODUCTS

The lumber industry within the wood products sub-sector has benefited from the latest North American housing boom but has been sorely tested by the long dispute with the U.S. over softwood lumber.
Nevertheless, the recent softwood lumber agreement should ease some of the pressure, and the sector should enjoy good access to the large U.S. market, where more than 80 per cent of Canada’s softwood lumber is sold. This rosy picture is tempered by the downturn in U.S. housing starts, in the fall of 2006, which resulted in numerous sawmill closures.

North American demand outstripped the continent’s supply, leaving the door open for offshore producers to increase their market share.

In the face of trade pressures, Canada reduced its softwood lumber production in 2005 by 1.9 per cent from 2004 levels. North American demand outstripped the continent’s supply, leaving the door open for offshore producers to increase their market share. U.S. imports have been steadily increasing from producers in Europe (Germany, Austria and Sweden) and the southern hemisphere (New Zealand, Chile and Brazil). As a result, Canada’s market share in the U.S. decreased slightly to 33.8 per cent from 34.2 per cent in 2004.¹

But increased offshore competition is not the only reason for the decrease in Canada’s market share in the United States. Trade disputes have also contributed, with duties as high as 27 per cent being collected on Canadian softwood lumber exports.² Although the duties have now been reduced, producers in other countries gained competitive ground because they were unaffected by the softwood lumber tariffs.

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### Table 2
Forest Products Sector in Canada, 2005

<table>
<thead>
<tr>
<th>Commodity</th>
<th>World Production Ranking</th>
<th>World Export Ranking</th>
<th>Exports</th>
<th>Destinations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Position</td>
<td>Share (per cent)</td>
<td>Position</td>
<td>Share (per cent)</td>
</tr>
<tr>
<td>Total forest products</td>
<td>—</td>
<td>—</td>
<td>First</td>
<td>16</td>
</tr>
<tr>
<td>Softwood lumber</td>
<td>Second</td>
<td>18</td>
<td>First</td>
<td>37</td>
</tr>
<tr>
<td>Newsprint</td>
<td>First</td>
<td>20</td>
<td>First</td>
<td>44</td>
</tr>
<tr>
<td>Wood pulp</td>
<td>Second</td>
<td>15</td>
<td>First</td>
<td>25</td>
</tr>
<tr>
<td>Other</td>
<td>—</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
</tbody>
</table>

Sources: Natural Resources Canada; United Nations Food and Agriculture Organization; Statistics Canada.
In the late fall of 2006, a settlement to the softwood lumber dispute was accepted on both sides of the border. This negotiated truce is expected to endure for up to seven years.

By the end of this decade, China will require an estimated 70 million tonnes of paper per year, representing an annual growth rate of 13 per cent, compared with 2 to 3 per cent for Europe and North America.

PULP AND PAPER PRODUCTS
The pulp and paper subsector shows an economic malaise that has persisted for at least 10 years and that is aggravated by competitive, technological and environmental challenges.3 In addressing their challenges, pulp and paper producers have already made difficult decisions: consolidating or closing operations (which have removed approximately 4.8 million tonnes of pulp, paper and newsprint from the market), upgrading aging pulp and paper mills with the latest technological features, and shifting from newsprint production to higher-value or entirely new products.

While Canada exports more wood pulp than does any other nation—accounting for 25 per cent of world total exports—there has been virtually no growth in our exports of this product over the past decade. Recent increases in Canadian pulp exports to China were offset by declines to Europe, Japan and the U.S.

The pattern of world demand for newsprint has changed more substantially than demand for wood pulp. Since 1990, North American demand has declined by 17.1 per cent. And while European and Asian demand increased, these regions account for a relatively small proportion of Canadian exports.4 Overall, newsprint exports fell over the past decade by an average of 2 per cent per year.

3 A more detailed analysis can be found in Hoover et al., “Pursuing Sustainability.”

OPPORTUNITIES AND CHALLENGES

THE RISE OF CHINA
China’s remarkable economic growth has created high demand for raw materials and finished products, including pulp and paper products. By the end of this decade, China will require an estimated 70 million tonnes of paper per year, representing an annual growth rate of 13 per cent, compared with 2 to 3 per cent for Europe and North America.

Because of poor forest management, 80 per cent of China’s forest companies have exhausted their mature timber resources. As domestic demand exceeds local supply, China is expected to become a net importer of forest products, with a market for industrial timber and pulp and paper second only to that of the United States. Rising prosperity among China’s population has created such a demand for market pulp that analysts expect it to surpass that of any other country by 2008.

China also imports raw timber to fuel its forest products sector. More than 70 per cent of those imports are manufactured into wood products—such as furniture—to supply the global market.5 Low labour and production costs in China’s wood-processing industry have allowed it to expand and remain competitive, and investments are being made in the entire supply chain to further develop this industry. Exports of manufactured wood products to the U.S. and the European Union (EU) from China have increased substantially—to the point where China has now become the second-largest exporter (after Canada) of wood products to the U.S.6

The Chinese government is attempting to restore the forest base and boost future domestic forest production by initiating a massive program of subsidies for fast-growing pulpwood plantations (to supply the domestic market) and by funding forest restoration and protection. However, environmental and logistical factors are

5 White et al., China and the Global Market.
6 Forest Products Association of Canada, Competition and Consolidation, p. 5.
Currently preventing forest plantation targets from being met, and government policies have banned or reduced production from natural forests.

Developing countries with a competitive advantage owing to cheap land, adequate soil and rainfall, and a year-round growing season will compete with Canada to become key suppliers to the Chinese market. Currently, the major suppliers to China are Russia, Malaysia, New Zealand, Indonesia, Papua New Guinea, Australia and Thailand. However, forests across East Asia are under stress. To feed rising demands in China, logging has dramatically increased in the countries of this region. For example, at current cutting rates, it is estimated that the natural forests in Papua New Guinea will be logged out in 13 to 16 years.\(^7\) Owing to its geographic advantage and access to Chinese ports, Russia has been increasing its presence in the region; its 2003 exports of softwood logs to China were 14 times the 1997 level.\(^8\)

**Developing countries with a competitive advantage derived from cheap land, adequate soil and rainfall, and a year-round growing season will compete with Canada.**

### Increased Global Competition

International competition in the forest products sector’s export market has risen markedly for every market, not just China. Traditionally, Canada’s major competitors have been the U.S. and Scandinavian countries. Yet between 1990 and 2000, the number of countries exporting newsprint grew to 57 from 33, and the number of countries exporting solid wood products rose to 180 from 111.\(^9\) Substantial export growth in Brazil, Chile and New Zealand has brought added competition for Canada. World exports of forest products from outside North America (Russia and countries in Europe and the southern hemisphere) have increased by 26 per cent overall since 1990.\(^10\)

Output from Russia’s forest products sector declined during the early to mid-1990s, but the country has been showing signs of recovery in recent years. Today, Russia has an abundant, high-quality and inexpensive wood-fibre supply—complemented by low labour and energy costs—and it has become the world’s largest roundwood exporter. Still, its forest products sector is dominated by low-value-added products and lacks the necessary domestic and foreign capital to transform that situation.

**Between 1990 and 2000, the number of countries exporting newsprint grew to 57 from 33, and the number of countries exporting solid wood products rose to 180 from 111.**

Realizing this, the Russian government has pledged to increase the value of production for the sector over the next two decades to US$100 billion from the current level of US$10 billion, through government investments and policy changes to permit foreign investment.\(^11\) Russia currently supplies timber and pulp to both European and Asian markets. But the country’s potential to play a larger role in world forest and paper markets depends on its ability during the coming years to capitalize on its tremendous fibre supply and on the pace of its planned transformation.

In developing countries, producers have been steadily increasing the size and number of “fast-wood” forest plantations in response to Chinese demand.\(^12\) These plantations have higher per-hectare yields and much shorter “rotation” periods (the time from planting to harvest) than their run-of-the-mill counterparts. Fast-wood plantations are harvested within 20 years of being planted, whereas traditional plantations have a 20- to 30-year rotation in tropical climates and a 40- to 80-year rotation in temperate climates. For example, Indonesia—one of the countries transforming its forest products sector in this manner—was home to 1.4 million hectares of fast-wood plantations in 2001, and the largest forest products companies are planning major plantation expansions.

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\(^7\) White et al., *China and the Global Market*, p. 13.


\(^11\) Ibid.

New pulp mills, larger than those in Canada, are being built in developing countries, bringing an associated increase in efficiency through technological advances. Consequently, pulp prices are continuing their long-term downward trend. The global stock of hardwood is double that of softwood, and the hardwood pulp manufactured in the southern hemisphere has a lower cost of production and can be sold at a discount price, compared with softwood pulp.13

In recent years South America’s pulp and paper industry has been increasing its market share: in 2004, sales and net income increased 23 per cent and 46 per cent, respectively, over 2003. Low fibre and labour costs, technologically advanced mills and fast-growing eucalyptus trees have been fueling the industry’s growth in Brazil, Argentina, Uruguay and Chile. Brazil, currently producing 4.8 million tonnes of pulp per year, is now the world’s third-largest producer, behind Canada and the United States. South America’s forecast annual growth rate in pulp production—4 per cent until 2010—rivals that of Eastern Europe and Asia and makes it the leading region of growth.14 In the next few years, construction of new mills in Uruguay, Brazil and Chile will extend the continent’s overall capacity to 12 million tonnes annually.15 Meanwhile, advanced paper machine technology will allow hardwood pulp to be used in a number of new products, permitting producers in the southern hemisphere to compete in markets typically dominated by Canadian softwood pulp. In the coming years, this region will give Canada some stiff competition.

In Eastern Canada, producers of softwood pulp are significantly affected by higher wood-fibre and energy costs.

But Canada’s forest products sector faces serious hurdles to remaining competitive. One challenge for the sector stems from factors that have made Canadian firms high-cost producers: high fibre, labour and energy costs. To remain competitive in a global market, Canada’s mill operators are striving to become low-cost producers in order to better endure low market prices.

In Eastern Canada, producers of softwood pulp are significantly affected by higher wood-fibre and energy costs.16 Wood-fibre costs, including those for road building and maintenance, and harvesting and hauling, were 60 per cent higher there in 2004 than in Western Canada. Fibre costs in Ontario and Quebec are among the highest in the world, along with those in Germany and Japan. The average cost per cubic metre (m$^3$) of wood delivered to the mill is estimated at $55 in Ontario compared with $35 globally.17 Average delivered log costs are higher for North America than for other regions. (See Chart 1.) The differential can be attributed to higher labour costs, more difficult terrain and longer hauling distances. These high costs contributed to the sawmill closures in Eastern Canada in the fall of 2006.

13 Yong, Sector Focus, p. 4.
14 Greenbaum, “South America’s Road to China.”
15 Ibid.
Cost allocations also vary. For example, in Ontario the forest products sector has been bearing the full cost of building and maintaining access roads, but this is not the case in British Columbia or in most other producing areas.18

As a major consumer of energy, Canada’s forest products sector has been hit by rising prices for energy. Electricity constitutes one-third of the total operating cost for newsprint and thermo-mechanical pulp facilities,19 and compared with domestic and U.S. competitors, Ontario firms face high electricity rates. This situation is partly attributable to the elimination of energy price protection by the Ontario government, which caused electricity prices in the province to increase by 30 per cent from 2000 to 2004.20 Nevertheless, Canada’s electricity prices are still among the lowest in the world. (See Chart 2.)

Labour costs vary among South American, Asian, European and North American mills. Producers in the southern hemisphere enjoy lower labour costs than those incurred by North American producers, while labour costs in the EU are 20 per cent higher than in North America and about 100 per cent higher than in South America and Asia.21

The domestic forest products sector’s major input costs (fibre, energy and labour) are priced in Canadian dollars and are therefore vulnerable to exchange rate shocks. In mid-2006, the Canadian dollar was 30 per cent stronger against the U.S. dollar than it was in 2003. The higher Canadian dollar, rising energy costs and increased fibre prices have all contributed to numerous mill closures across the nation.
Canada’s relatively old and small pulp and newsprint mills are also contributing to a dampening of the forest products sector’s competitiveness. Overall operating costs are higher than those of newer mills in competing countries. Canada is fighting youthful competitors with old mills. Provincial governments have historically intervened to retain older, higher-cost mills in the hope of sustaining forest communities, but this support has only contributed to the decrease in the sector’s overall competitiveness. The forest products sector is also falling behind on research and development, and its return on capital employed is lower in Canada than in other producing regions. Consequently, the sector is struggling to attract investment, and mills are not being renewed.

**SOCIAL IMPACTS OF MILL CLOSURES**

The number of mills in Canada has declined over the past decade, resulting in the displacement of thousands of workers. In 2001, the economies of more than 300 communities across Canada relied on the forest products sector. From 2001 to mid-2006, 108 mills across the country either partially or fully closed, putting 17,000 people in 85 communities out of work and devastating their communities. (See Table 3.) Because the forest products sector also supports indirect jobs, recent mill closures have reduced the number of those jobs in forest-related services, engineering and technology, further affecting forest-reliant communities.

With the high average age of the workforce, it is not surprising that many of these displaced workers are finding it difficult to successfully retrain and find new employment. To sustain the local economy, affected communities are attempting to retain displaced workers through diversification and retraining. Provincial governments have responded and offered support in the form of provincial re-employment programs and support for regional and community economic diversification strategies as well as for employment action centres and committees.

For the 28 Ontario communities recently affected by mill closures, the Ministry of Training, Colleges and Universities created the Adjustment Advisory Program.

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**Table 3**

Effects of Mill Closures, 2001 to 2006

<table>
<thead>
<tr>
<th></th>
<th>Atlantic Canada</th>
<th>Ontario</th>
<th>Quebec</th>
<th>Western Canada</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Closures (partial and full)</td>
<td>6</td>
<td>37</td>
<td>31</td>
<td>34</td>
<td>108</td>
</tr>
<tr>
<td>Communities affected</td>
<td>6</td>
<td>28</td>
<td>27</td>
<td>24</td>
<td>85</td>
</tr>
<tr>
<td>Workers displaced</td>
<td>1,289</td>
<td>5,431</td>
<td>4,795</td>
<td>5,718</td>
<td>17,233</td>
</tr>
<tr>
<td>Product removed from the market</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pulp (tonnes)</td>
<td>491,000</td>
<td>685,000</td>
<td>300,000</td>
<td>615,000</td>
<td>2,101,000</td>
</tr>
<tr>
<td>Paper (tonnes)</td>
<td>0</td>
<td>815,000</td>
<td>128,000</td>
<td>445,000</td>
<td>1,388,000</td>
</tr>
<tr>
<td>Newsprint (tonnes)</td>
<td>260,000</td>
<td>165,000</td>
<td>396,000</td>
<td>535,000</td>
<td>1,356,000</td>
</tr>
<tr>
<td>Lumber (thousands of board feet)</td>
<td>0</td>
<td>253,000</td>
<td>70,000</td>
<td>160,000</td>
<td>483,000</td>
</tr>
</tbody>
</table>

Source: The Conference Board of Canada.

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22 Hoover et al., “Pursuing Sustainability.”


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This program reviews employment options for displaced workers and plans steps for re-employment. The Ministry works with industry and labour and with municipal, provincial and federal partners to create labour market development initiatives in Northern Ontario.

In Atlantic Canada, there have been six mill closures, displacing nearly 1,300 workers.

The downsizing of the Weyerhaeuser mill in Dryden, Ontario, resulted in a $21-million loss to the local economy and the displacement of 385 workers. In response, a local Community Adjustment Partnership was formed by the Northwest Training and Adjustment Board, which recommended a diversification plan to invest in and promote value-added wood products, mining development, energy production, training and tourism.

In Atlantic Canada, six communities have been affected by mill closures, which displaced nearly 1,300 workers, including the 300 displaced in October 2005 when Abitibi-Consolidated closed its Stephenville mill in Newfoundland and Labrador. The provincial government is actively working on economic diversification opportunities, including agri-food and small-scale manufacturing, and it has commissioned a study to identify opportunities for value-added products in the Labrador forest products sector. Other Atlantic provinces are engaged in similar actions to assist communities that have lost mills.

The British Columbia forest products sector generates more than 250,000 direct and indirect jobs for the province, and 24 of 63 local areas depend on the sector. Over the past five years, 24 mill closures have resulted in almost 4,000 displaced direct workers. The provincial government currently has no transition strategy or program for aiding them. However, in 1999, Forest Renewal BC, a Crown corporation formed by the provincial government, invested $30 million over a two-year period in communities facing forest job loss resulting from sector restructuring. As part of its mandate, this new organization initiated a Forest Community and Worker Transition Strategy in a number of communities to provide re-employment assistance for displaced workers and to identify new business opportunities for the community.

When faced with the possibility of a mill closing, provincial governments are reluctant to accept that outcome because of the impact on the communities. (See box “Case Study: Lessons From the Mining Sector.”) The very nature of these facilities and the direct and indirect employment that they deliver make them large contributors in small towns—for example, Liverpool, Nova Scotia—and even in larger cities, such as Thunder Bay, Ontario. So, when faced with the prospect of a mill closure, provinces frequently organize loans or equity investments from the public purse to support the weakened operation. This action usually keeps the mill going, but it does nothing to postpone obsolescence or improve competitiveness. At best, it buys a few years of tortured operation; however, in the main, the sector—which is technology-driven and needs to continually renew itself—is weakened. (See box “Case Study: Skeena Cellulose.”) Provinces would do far better by permitting these mills to close. They could then encourage investment in new, competitive mills and provide focused transition assistance for the community.

When faced with the possibility of a mill closing, provincial governments are reluctant to accept that outcome because of the impact on the communities.

ENVIRONMENTAL CHALLENGES

Since 1990, the forest products sector has greatly improved its environmental performance. Water consumption has been slashed by 34 per cent, and waterborne and airborne discharges have been reduced. Effluent treatment systems and in-plant controls installed in the 1990s have improved effluent quality by more than 90 per cent, and chlorinated dioxin and furans have been lowered to non-measurable levels.

Since 1992, pulp and paper mills have cut their particulate emissions per tonne of output by 50 per cent, their sulphur dioxide emissions by 20 per cent, and their total

24 "Social Problems Rise."
The Conference Board of Canada

17

Case Study: Lessons From the Mining Sector

With mill closures becoming a new reality, the forest products sector would be wise to heed the lessons learned from mine closures across Canada—closures that have resulted in worker and community effects similar to those that will befall mill workers and their communities. At one time, the mine in Faro, Yukon, produced 10 per cent of the world’s zinc, contributing 12 to 15 per cent of Yukon’s GDP. Over the past few decades, the region has suffered a series of mine closures and reopenings under new ownership. In 1998, the Anvil Ridge lead–zinc mine closed suddenly, and by 2000, the community’s population had fallen to 250 from 925.

The territorial government provided worker severance and retraining packages, and the local government used a community plan to promote economic diversification. Although economic diversification into service, tourism and home-based jobs occurred, the local population remained low in 2005 at 360. The reactive approach taken by the territorial government was clearly not very successful in providing economic diversification for the community, as a number of displaced workers were forced to seek employment elsewhere.

In contrast, the community of Tumbler Ridge, British Columbia, was guided from its inception in 1976 by a detailed development plan. This plan was sufficiently comprehensive to anticipate the eventual decline of the coal resource. The Quintette mine closed without warning three years ahead of schedule in 2000, and the Bullmoose mine closed in 2003. Combined employment from the mines amounted to 70 per cent of local jobs. As a result of the closures, the population declined to a low of 1,900 in 2000 from the 1991 peak of 4,800. However, the transition plan provided the municipality with physical, social and political resources to facilitate a successful restructuring after the mines closed. A community task force developed an economic diversification strategy that included tourism, oil and gas, and regional services. With implementation of the strategy, the population of Tumbler Ridge has steadily increased and was estimated in 2006 at approximately 3,500 residents.

These and other examples from the mining sector provide lessons for the forest products sector—most notably, that the sector should work with resource-dependent communities to prepare for the eventual possibility of a mill closure. Although there is not a direct transfer of practice, the mining sector’s experience is a source of learning to be tapped.


These improvements are welcome and significant, but much remains to be done. Air quality is currently the greatest environmental challenge for the forest products sector. Pulp and paper mills release air contaminants such as particulate matter, sulphur oxides, nitrogen oxides and volatile organic compounds, all of which harm local air quality and increase risks to human health.

The Forest Products Association of Canada has led a multi-stakeholder group (with representatives from industry, the federal and provincial governments, environmental groups and Aboriginal groups) to develop a 10-year action plan to reduce air pollutants and shape the air-quality management agenda for pulp and paper operations across Canada. The aim was to improve air quality in mill towns, while matching the timing of the emissions control investment with the plant and equipment renewal.

Air quality is currently the greatest environmental challenge for the forest products sector.

This multi-stakeholder effort was intended to create favourable conditions for further investments at pulp and paper mills to improve air quality. For example, two mills in Prince George, British Columbia, will fuel a modern cogeneration plant with biomass that used to be incinerated in air-polluting beehive burners. The electricity thus produced will sustain mill operations and generate enough additional power for 39,000 homes.

odorous gas emissions by 45 per cent. The sector has also made progress toward reducing greenhouse gas emissions. Since 1990, these emissions by the sector have decreased by 30 per cent, and it has committed to achieving a further reduction of 15 per cent by 2010.

29 Ibid., p. 29.
Case Study: Skeena Cellulose

The Skeena Cellulose pulp mill in Prince Rupert, British Columbia, has been the subject of a long-running closure and bailout story. In 1997, then-owner Repap Enterprises Inc. had accumulated $600 million in debt for the Skeena operation, and it filed for protection from creditors. Eventually, with the exit of private sector banking interests, a provincial Crown corporation purchased 65 per cent of the company—including its term and operating loans—and provided funding under a capital expenditure loan agreement.

At full production, Skeena directly and indirectly provided employment for 6,500 people in Prince Rupert and surrounding areas. A mill closure would have terminated Skeena’s high-paying jobs, so the provincial government provided funding to support the struggling mill. Eventually, the Crown corporation exhausted its $100-million line of credit, and the provincial government provided funding to ensure that contractors received payment.

In 1998, Skeena emerged from creditor protection, only to cease operation in 2001 because of outdated technology, poor timber supply and labour troubles. Between 1998 and 2002, the provincial government incurred $323.3 million in costs.

In February 2002, NWBC Timber & Pulp Ltd. agreed to purchase Skeena and its subsidiaries from the provincial government. The company planned to restart operations later that year after a major overhaul. Although the City of Prince Rupert offered a $20-million loan, adequate financing was not secured, and the mill fell into receivership.

In 2005, SunWave Forest Products Ltd., a unit of China Paper Group, purchased the Skeena Cellulose pulp mill for $3.3 million. SunWave is expected to invest $100 million to produce 350,000 tonnes of pulp annually, with 80 per cent of the output supplying paper operations in China. The company and the municipality negotiated an agreement under the province’s new community charter legislation. As a result, the company will receive a five-year tax break, and future taxes will reflect pulp prices and the mill’s production volumes. In exchange, the China Paper Group will donate money to the municipality through an Economic Development Partnership Agreement.

The decision by the provincial government to financially support Skeena Cellulose failed to recognize environmental sustainability and economic viability. Skeena’s pulp mill required a significant harvest from the forest to support its operations at a time when the timber supply in the region was declining in volume and quality. Although the pulp mill had gone through several upgrades, a significant capital investment was required to improve its technological efficiency. In 1999, it was estimated that, because of high costs and low pulp prices caused by the arrival of new, low-cost producers in countries such as Brazil, Chile, Indonesia and New Zealand, the mill lost between US$130 and US$250 on every tonne of pulp produced.

In future, provincial governments should use a set of environmental, social and economic criteria to judge whether to intervene.


REGULATORY AND POLICY CHALLENGES

Because of significant discharges emanating from production facilities, the pulp and paper subsector is subject to stringent environmental regulation. Streamlining and other improvements in regulatory system operations are always on the agenda for the subsector, but particularly in times like the present, when profitability is challenging. As noted above, the subsector is currently working with the federal and provincial governments, environmental groups and others to develop an approach to emissions that improves air quality in mill towns, while permitting the subsector to address its renewal challenges. As it strives to renew itself, regulations that affect the development and redevelopment of manufacturing sites will become even more relevant.

Before constructing and operating new facilities or upgrading pulp and paper processes, forest companies must meet federal and provincial environmental requirements and obtain mandated approvals. In Ontario, under the Environmental Protection Act, a Certificate of Approval is required from the Ministry of the Environment for facilities that release emissions into the atmosphere and that store, transport, process or dispose of waste. In addition, both Ontario and British Columbia require a Permit to Take Water for facilities using water in production. Pollution control objectives in British Columbia require that pulp and paper mill operators obtain waste discharge permits before they can release effluents to the air, water and land. Similar permits are required from the Quebec Ministère du
Développement durable, de l’Environnement et des Parcs (MDDEP). Renewal projects or altered pulp and paper facilities may be required to obtain a combination of permits from provincial authorities.

British Columbia, Quebec and Ontario have harmonization agreements with the Canadian Environmental Assessment Agency.

Environmental assessment may be required under provincial or federal legislation. A new or modified facility with electricity generation capacity and a new chemical manufacturing facility exceeding a designated production capacity may be required to undergo an assessment. In Quebec, the Environmental Quality Act does not require a full environmental impact assessment for modification of an existing pulp mill; however, a Standard Certificate of Approval has to be obtained from the MDDEP.

Renewal projects may also be subject to a federal environmental assessment under the Canadian Environmental Assessment Act. Projects that receive federal financial assistance or that are constructed on federal lands are required to undergo an environmental assessment. British Columbia, Quebec and Ontario have harmonization agreements with the Canadian Environmental Assessment Agency, allowing the environmental assessment processes at both the federal and provincial level to be met through a single, coordinated procedure. But no matter how well coordinated the procedures, these assessments require time and resources; the time period varies depending on the particular case. Longer lead times in some jurisdictions could create a reluctance to develop biorefineries.30

Additional environmental approvals at the federal level may be required for facilities generating innovative bio-products. Under the New Substances Notification regulations of the Canadian Environmental Protection Act (CEPA), the health and environmental effects of new substances—including biochemicals and biopolymers—must be assessed before manufacturing involving these substances can commence in Canada. CEPA is the guiding legislation for the protection of air and water quality in Canada, and it contains a list of toxic substances (including pulp and paper effluents) that are subject to risk assessments and management measures. One area in particular that CEPA has yet to rule on is the ethanol manufacturing process, which emits volatile organic compounds and carbon monoxide.

To compete effectively, Canada’s forest products sector must invest in both renewal and transformation.

As the forest products sector moves into the future, project review processes must reflect the learning gained from years of experience with process and technical issues so that environmental protection and economic incentive can be appropriately balanced during new project development.

INDUSTRY ACTIONS TO STRENGTHEN THE FOREST PRODUCTS SECTOR

To compete effectively, Canada’s forest products sector must invest in both renewal and transformation. Renewal investments will modernize or upgrade equipment in order to efficiently and consistently create variations on traditional products to satisfy modern needs. For example, upgrades or alterations may lead to the production of a new grade of paper or a new lumber bundle size. Transformation investments will fundamentally alter industry processes, creating brand new ways to manufacture traditional products or entirely new products.

MAKING THE MOST OF AVAILABLE RESOURCES

Regardless of the fates of today’s mills, their owners, their workers and their communities, the forest will continue to grow in the boreal regions of the country. Should we derive economic benefits from such a vast resource? The answer is a resounding “yes,” but only in a prudent, sustainable manner. To protect our country’s forest resources, harvest levels are regulated and all harvested areas must be reforested. Each province

30 Fransham, interview.
and territory sets an annual allowable cut based on the sustainable growth rate of the particular forest area, with the goal of maintaining biological diversity while considering economic opportunities and social impacts.\textsuperscript{31}

Chart 3 shows that annual softwood harvest levels remained relatively steady from 1994 to 2004, averaging 155 million m\(^3\) per year, about 23 million m\(^3\) below the potential wood harvest. While hardwood harvest levels increased by 61 per cent in that period, from 23 million m\(^3\) per year to 37 million m\(^3\), they were still well below the potential harvest of 60 million m\(^3\) per year.

Making the most of available resources also entails better use of forest residues. A recent biomass inventory by the BIOCAP Canada Foundation—a publicly and privately funded research organization dedicated to developing a biologically based economy—indicates that 60 million tonnes of forest residues are available for various bioproduct and bioenergy applications in Canada. According to BIOCAP, future improvements in forest management practices could result in the production of an additional 300 million tonnes of forest biomass.\textsuperscript{32} Most of this biomass originates as residues from sawmills, and most of it is found in Ontario, British Columbia and Quebec.\textsuperscript{33} In 2004, estimates suggested that 2.7 million “bone-dry tonnes” of mill residue in the form of sawdust, chips and shavings were available for use in producing bioproducts.\textsuperscript{34} Together with pulp mill residues such as sludges and bark, sawmill residues can be used to help revitalize the forest products sector.

A recent inventory indicates that 60 million tonnes of forest residues are available for various bioproduct and bioenergy applications in Canada.

THE CASE FOR “SUPER MILLS”

Canada’s available forest resources could be processed in very large “super mills” in order to make Canadian producers competitive with large-scale producers elsewhere in the world. (Currently, Canadian pulp and paper mills are significantly smaller and older than those operated by their international competitors.) Large-scale paper machines and pulp mills are the new international industry standard.\textsuperscript{35} In South America and Asia, pulp and paper producers have an abundant, fast-growing wood supply for these mills. As a result, production output capacities in these regions have surpassed those of Canadian mills.

In 2005, production commenced at a 900,000 tonne per year bleached eucalyptus pulp mill in Brazil.\textsuperscript{36} A mill on the Uruguay–Argentina border will soon supply 1 million tonnes of pulp annually to Europe and Asia.\textsuperscript{37} A new pulp mill located on Hainan Island in southern China produces 1 million tonnes of bleached hardwood kraft pulp annually.\textsuperscript{38} In contrast, Canadian pulp mills (mechanical and chemical) have, on average, an annual production capacity of 204,000 tonnes per mill (2003 figures).\textsuperscript{39}

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{chart3}
\caption{Potential Versus Actual Wood Harvest (millions of cubic metres)}
\end{figure}

\textsuperscript{31} Calculation of the annual allowable cut are based on the following factors: the land base; the growth rate of trees; losses due to fire, insects and disease; accessibility; economic conditions; environmental considerations; silvicultural investment; the degree of protection; and management objectives. Natural Resources Canada, \textit{The State of Canada's Forests 2004–2005}, p. 31.

\textsuperscript{32} Wood and Layzell, \textit{A Canadian Biomass Inventory}, p. 2.

\textsuperscript{33} (S&T)\textsuperscript{2} Consultants Inc. and Meyers Norris Penny LLP, \textit{Economic, Financial, Social}, p. 73.

\textsuperscript{34} Natural Resources Canada et al., \textit{Estimated Production}, p. ii.


\textsuperscript{36} Webbolt Company, “Stora Enso Is Exploring.”

\textsuperscript{37} Oy Metsä-Botnia Ab, “Uruguay Project.”

\textsuperscript{38} Aker Kværner, “Highest Mark.”

\textsuperscript{39} Romain, interview.
One of Canada’s largest producers of northern bleached softwood kraft pulp is located on Vancouver Island. Its annual capacity is 400,000 tonnes.40

**Scale matters in this business. To compete with the newer, international, million-tonne super mills, Canadian mills must reach similar scales.**

Mills producing newsprint have also grown in size in other countries. In 2004, the average capacity of Canadian newsprint producers was 285,000 tonnes per mill. Two of Canada’s larger operations produced 589,000 and 460,000 tonnes annually. Although these facilities surpass the Canadian average, the world’s largest newsprint mill, located in Japan, can produce more than 1 million tonnes annually.41

Scale matters in this business. To compete with the newer, international, million-tonne super mills, Canadian mills must reach similar scales. According to the Pulp and Paper Products Council, Canada’s total production of market pulp and newsprint was 10.8 million and 7.8 million tonnes, respectively, in 2005.42 In theory, 10 pulp and 7 newsprint super mills could produce the same amount of product as Canada’s 72 mills do currently.

This sounds like a simple solution, but there is nothing simple about the transition from one scenario to the other. Building large mills involves choosing sites for the new facilities, shutting existing mills (which carries its own set of issues), and finding methods of supply and transportation for the raw material. The terms of the necessary investment must be attractive, and investors must be satisfied that an adequate return is possible. Both government policy and economic reality affect the possibility of satisfying these needs.

Pulp and newsprint mills can use a mixture of sawmill residues, chips and logs for their feedstock. Historically, in most provinces, trees harvested on Crown land (about 95 per cent of total Canadian forest land) have been assigned to specific lumber or pulp mills for processing to retain employment in the province. After the lumber has been produced, the chips remaining are shipped to pulp and newsprint mills. In some cases, those mills also use logs as raw material. The slow-growing trees typical in Canada make it necessary for additional wood fibre for large mills to be hauled from great distances. The optimum positioning of potential super mills will therefore be dictated by the location of the available wood resource and the cost of long-distance hauling.

**Provincial trade and tenure policies militate against building large mills.**

Depending on the location and mix of raw material required, operators of super mills could be required to obtain their supply from neighbouring provinces, a scenario impeded by provincial timber tenure systems that do not permit logs to be shipped across the provincial border. Wood chips are not typically affected by interprovincial boundaries. However, since logs used to produce lumber are allocated to specific mills and are affected by interprovincial boundaries, the new pulp mills could face long haul distances for wood chips. Thus, provincial trade and tenure policies militate against building large mills.

In Ontario, there is no legislative prohibition of cross-border log movement, but there is an informal understanding that logs in the northeast are offered first to Ontario mills. From Quebec, logs do not flow easily to Eastern Ontario because the tenure rules in Quebec assign wood resources to specific provincial mills.43 In New Brunswick, external mill operators in other provinces may legally access timber resources on private land, but provincial regulations governing Crown land do not encourage interprovincial log trading.44 Under the Crown Lands and Forests Act, Crown timber is meant to be used in New Brunswick wood-processing facilities; but the legislation does provide for the export of Crown fibre if it is deemed—through a legislated

40 Pope and Talbot, “Harmac Pulp Mill.”
41 Pulp and Paper Products Council, “Newsprint Producers Association.”
42 Ibid., Canadian Pulp and Paper Industry, pp. 1–9.
43 van Kooten, “Forest Economics.”
44 MacFarlane, interview.
approval process—that there is no internal market.\textsuperscript{45} Recent timber tenure reforms in British Columbia have eliminated the practice of assigning logs to specific mills.\textsuperscript{46} Still, no clear trend has yet emerged regarding the opening of provincial borders to unrestricted trade in logs.

To make production room for large new mills, other smaller and older mills would have to close, something that provinces have been reluctant to permit because they wish to preserve the jobs in existing mills. Provinces have in the past used economic measures to support such mills. But with those smaller mills competing for raw material and bidding up the price, large new mills are less attractive to investors and are unlikely to be built. Furthermore, the history in competition policy circles has been to avoid large-scale concentration in Canadian mills.

The above factors illustrate the difficulty of even approaching the idea of building world-scale pulp and newsprint facilities in Canada today. Nevertheless, super mills would provide Canadian forest products operators with the opportunity to be more competitive on a global scale. Changes in employment protection, interprovincial trade policies and forest tenure systems, must occur to make investments in new mills of greater scale more attractive for the subsector.

\textbf{RESEARCHING EMERGING TECHNOLOGIES}

Industry groups have been actively involved in identifying and researching emerging technologies that have the potential to diversify the conventional lumber and pulp and paper businesses. More specifically, they have focused on creating energy from wood waste and chemicals from fibre, and on developing a forest biorefinery.

For example, the Canadian Forest Innovation Council, an executive body of senior industry and government representatives, has identified two transformative technologies for expanding bioenergy production in Canada: thermochemical conversion and bioconversion. Using forest biomass and mill residues, these technologies can disassemble feedstock into intermediate and basic components to produce energy, fuels, and value-added chemicals and materials.

Industry groups have been actively involved in creating energy from wood waste and chemicals from fibre, and in developing a forest biorefinery.

The forest biorefinery concept aims to produce biofuels, energy and biochemicals in addition to traditional pulp and paper products. New process stages can be added to existing pulp mills, or a new facility can be constructed to generate products in addition to pulp and paper. (See Table 4.) Underused mill residues can be processed on site to derive products directly, to increase the efficiency of energy generation, or to create intermediates that can be processed into end products at other facilities. Cellulose, hemicellulose, lignin and extractives can be separated and processed into a range of biochemicals. Rising oil and gas costs for biochemical production are making forest-based feedstocks an attractive alternative.

In 2006, the Canadian Forest Innovation Council hosted a forum to identify and prioritize transformative technologies capable of producing biochemicals and bioenergy. Industry researchers, policy-makers, industry stakeholders and academics determined the time frame required to achieve technical viability of these technologies, as outlined in Table 5.

To facilitate sector renewal through forest biorefineries, a range of technical and organizational barriers must be overcome. One of the primary hurdles (because of important technical issues), as indicated by the Canadian Pulp and Paper Network for Innovation in Education and Research, is the integration of co-product manufacturing

\textsuperscript{45} Ibid.

\textsuperscript{46} Haley and Nelson, \textit{British Columbia's Crown Forest Tenure System}, p. 15.
into current pulp and paper mills. Further research into process and product development will no doubt prove valuable on the planning side, but in the field, various industrial sectors will have to collaborate, and forest products companies will need to expand their focus to partner with companies that have experience in biochemical and biofuel production. Interestingly, while Canada’s typically small pulp and paper mills usually hinder competitiveness in conventional pulp and paper products, they may be an asset in the move to biochemical and biofuel production. Small mills may have greater flexibility to make the transition. In a pulp mill biorefinery, new product lines can be added to existing facilities that already have the infrastructure to process wood waste.

Canada’s typically small pulp and paper mills may be an asset in the move to biochemical and biofuel production.

Co-product production from forest biomass also faces competition from agricultural feedstock and a possible lack of specialty skills in the current workforce. Governments can play a key role in stimulating the necessary renewal and development by establishing or amending policies and by creating and providing appropriate incentives.

GOVERNMENT POSITION ON RENEWAL

As owners of 90 per cent of the forest and as beneficiaries of its use, Canadian governments have an abiding interest in the long-term economic prospects of the forest products sector and are actively involved in the discussions concerning sector renewal. They are supportive of, and have committed themselves to, funding programs and initiatives to spark that renewal.

Table 4
Potential Biorefinery Processes and Products, 2005

<table>
<thead>
<tr>
<th>New Processes</th>
<th>New Products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wood extraction</td>
<td>Hemicelluloses and sugars</td>
</tr>
<tr>
<td>Wood extract conversion</td>
<td>Ethanol, polymers and other chemicals</td>
</tr>
<tr>
<td>Wood pyrolysis</td>
<td>Resins, wood composites and carbon products</td>
</tr>
<tr>
<td>Wood/black liquor gasification</td>
<td>Syngas</td>
</tr>
<tr>
<td>Gas conversion</td>
<td>Electricity, renewable transportation fuels, methanol, dimethyl ether and hydrogen</td>
</tr>
</tbody>
</table>

Source: Closset et al.

Table 5
Expected Time Frame to Implement Forest Products Sector Transformative Technologies, 2006

<table>
<thead>
<tr>
<th></th>
<th>0 to 2 Years</th>
<th>10+ Years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biochemicals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Co-products in pulp mills</td>
<td>Dedicated biochemical mills</td>
<td></td>
</tr>
<tr>
<td>Bioplastics</td>
<td>Lignin chemicals from trees</td>
<td></td>
</tr>
<tr>
<td>Cellulose fibres from trees for other material purposes</td>
<td>Pharmaceuticals and nutraceuticals from trees</td>
<td></td>
</tr>
<tr>
<td>Bioenergy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biofuels from the bioconversion platform</td>
<td>Biofuels from the thermochemical platform</td>
<td></td>
</tr>
<tr>
<td>Biomass power and cogeneration</td>
<td>Gasification to recover chemicals for gas/steam turbine</td>
<td></td>
</tr>
<tr>
<td>Pyrolysis oil as an energy feedstock</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Canadian Forest Innovation Council.

In 2006, the federal government announced a two-year funding initiative to support Canada’s forest products sector. This $400-million investment will encourage the long-term competitiveness of the sector, assist with forest worker adjustments and address the mountain pine beetle infestation in British Columbia.

**Canadian governments have an abiding interest in the long-term economic prospects of the forest products sector.**

To encourage renewable energy production, the federal government provides, under the *Income Tax Regulations*, an accelerated capital cost allowance for companies producing energy from wood biomass. Cogeneration equipment used by pulp and paper facilities is also eligible for an accelerated capital cost allowance under these regulations, and equipment installed between February 2005 and 2012 will qualify for an accelerated depreciation rate.\(^\text{48}\) The 2006 Budget confirmed the federal government’s commitment to expanding this program to include cogeneration systems that produce energy from spent pulping liquor (a by-product of the pulping process). Pulp and paper facilities now have an incentive to generate clean electricity from heat and to reduce reliance on external energy sources.

The provincial governments of British Columbia, Ontario, Quebec and New Brunswick have announced renewal funding to support industry innovation, value-added manufacturing, cogeneration, electricity production from biomass and bioproduct development. (See Table 6.) The commitment of these provinces should yield far-reaching benefits: new biorefineries and pulp and paper mills with additional co-product streams will create direct and indirect employment for communities across Canada, revitalizing regional economies; biochemicals and biomaterials can lessen Canadians’ reliance on oil and gas as a feedstock; and renewable bioenergy and biofuels will help the country to reduce greenhouse gas emissions.

**The confirmation of the federal government’s commitment gives pulp and paper facilities an incentive to generate clean electricity from heat and to reduce reliance on external energy sources.**

<table>
<thead>
<tr>
<th>Ministry/Government</th>
<th>Initiative</th>
<th>Funding ($ millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ontario Ministry of Natural Resources</td>
<td>Forest Sector Prosperity Fund</td>
<td>150</td>
</tr>
<tr>
<td>Ontario Ministry of Natural Resources</td>
<td>Loan Guarantee Program</td>
<td>350</td>
</tr>
<tr>
<td>Ontario Ministry of Natural Resources</td>
<td>Alternative Energy Pilot Project: Mobile Forest Biorefinery</td>
<td>0.8</td>
</tr>
<tr>
<td>Government of British Columbia</td>
<td>Forestry Innovation Investment Ltd.</td>
<td>3.2</td>
</tr>
<tr>
<td>British Columbia Ministry of the Environment</td>
<td>Clean Air Research Program</td>
<td>Ongoing</td>
</tr>
<tr>
<td>Quebec Ministry of Natural Resources</td>
<td>New Direction for Forestry in Quebec</td>
<td>450</td>
</tr>
<tr>
<td>Government of New Brunswick</td>
<td>Five-Year Forestry Action Plan</td>
<td>250</td>
</tr>
</tbody>
</table>

Source: The Conference Board of Canada.

\(^{48}\) Government of Canada, “Regulations Amending.”
WHAT OTHER COUNTRIES ARE DOING

Since 1997, the EU has been working toward the following objective: by 2010, renewable energy will provide 12 per cent of its total energy requirements. In 2005, the European Commission initiated a coordinated Biomass Action Plan to promote the use of biomass for transportation, heating and electricity generation. Additionally, European Commission Directive 2003/20/EC is expected to increase the share of biofuels sold in the EU to 5.57 per cent in 2010, from 2 per cent of all fuels in 2005.

Research and development into second-generation biofuel technologies is already well advanced in Europe, with three pilot plants established in Sweden, Spain and Denmark. The European Commission is continuing to position the production of energy from biomass and the improvement of process technologies as long-term research priorities. The Biomass Action Plan supports investment in research on biofuels from wood waste and in campaigns to inform forest operators about energy from wood material. As a component of this action plan, the EU has developed a Strategy for Biofuels to improve the competitiveness of those products.

In the U.S, the Energy Policy Act (2005) provides grants to offset the cost of purchasing forest biomass for production of electricity, heat and transportation fuels. Those whose facilities produce these co-products can receive a maximum of US$20 per green ton of biomass delivered. In addition, producers are encouraged to invest in projects that develop or research opportunities to improve biomass utilization. Projects that generate electricity from biomass, create jobs, expand small businesses and develop cleaner technologies for biomass utilization are eligible for a government grant up to a maximum of US$500,000.49

In 2004, the U.S. introduced a national renewable fuels standard that mandates a rise in domestic biofuel use to 28.4 billion litres by 2012.50 In addition, the ethanol fuel federal tax credit of US$0.52 per gallon is valid until 2010 and provides additional incentive for producers. To supply mounting ethanol production demand, the U.S. government has committed to funding research into additional biofuel sources, including wood waste.

SUMMARY

The forest products sector in Canada is currently in choppy waters. While lumber exports have increased, pulp exports have not grown and newsprint production has declined significantly. And, although the lumber industry has just managed to resolve, for a time, the long-standing trade dispute with the U.S., it has lost long-term North American market share to offshore competitors. Furthermore, a recent decline in U.S. housing demand has taken a toll on the industry, forcing closures in Eastern Canada. The pulp business is facing increased competition from large new mills in foreign countries. On the domestic front, increased fibre and energy costs are biting into industry margins, and the soaring Canadian dollar is making Canadian forest products more expensive internationally.

In the U.S, the recent Energy Policy Act provides grants to offset the cost of purchasing forest biomass for production of electricity, heat and transportation fuels.

Although Canada remains the largest exporter of forest products in the world, Canadian companies are finding that the low profitability stemming from higher domestic costs, a high Canadian dollar and offshore competition is making it difficult for them to renew their facilities. This is particularly true in the pulp and newsprint industry, which has seen a large number of mill closures in the

50 Agra CEAS Consulting and F.O. Licht, How Canada Ranks, p. 3.
past five years. And there are likely more to come as the
industry establishes a new economic base from which to
maintain and enhance its international competitiveness.
This endeavour involves two tracks: renewal of existing
facilities to make them more modern and economically
competitive; and transformation of the industry’s prod-
uct line to include biochemicals, bioenergy and other
non-traditional products. A third possible track is to
facilitate the construction of world-scale mills. To do
so would require modification of provincial forest policy
and federal competition policy so that companies can
properly evaluate the possibility of establishing these
large facilities.

Government policy changes could remove barriers
that impede investment in large-scale super mills
or new bioproduct facilities.

This will not be an easy road, as more mills will close
and challenging investment decisions will have to be
made. Although the sector bears the responsibility of
making the final decisions, government policies can
assist the renewal efforts by improving the business
climate. As an example, government policy changes
could remove barriers that impede investment in large-
scale super mills or new bioproduct facilities.

In the past five years, numerous mill closures have caused
social and economic strain for rural communities across
the country and have displaced a significant number of
direct workers. Social problems have been amplified
by an aging workforce whose members are difficult to
retrain and re-employ.

Provincial governments have implemented employ-
ment and economic diversification strategies in ailing
forest-dependent communities, but an economic trans-
formation in the sector is long overdue—especially in
the pulp and paper subsector—and government policy
has been impeding progress toward that transformation.
Industry and governments together must detect the early
warning signs of mill closures and determine whether
a closure will occur. Open communication will allow
communities and workers to prepare for a closure so
that effective economic redevelopment strategies can
be put into place.

Regardless of the state of the sector, our forests will
continue to flourish, and the resource will be sufficient
to supply a renewed and transformed forest products
sector. However, a truly renewed and transformed sector
will take time. Widespread commercialization requires
that the technologies to generate biochemicals, biofuels
and bioenergy be developed, but a number of technical
and organizational challenges stand in the way. These
challenges—such as integrating new bio-products into
existing facilities, securing investor confidence and
building strong partnerships with other industrial sec-
tors—must be met. Governments will have to be nimble
in their actions—by creating new regulations and author-
izing approval mechanisms that reflect the urgency of
reviving the forest products sector and placing it on the
path to a positive future.

A truly renewed and transformed forest products sector
will take time.

GOING FORWARD

MAKE THE POLICY ENVIRONMENT MORE FLEXIBLE

The forest products sector requires a policy environment
that promotes self-renewal through existing and new
products. Given favourable economic conditions, building
a small number of super mills could be a viable option
that would allow the Canadian pulp and paper subsector
to be more competitive with large-scale producers in
other countries. To encourage the ambitious investments
required, trade barriers that prevent the interprovincial
shipment of logs will have to be removed; provinces will
have to make their timber tenure systems more flexible
and allow smaller mills to close; and competition policy
will have to accept the reality of new, larger mills.
Governments will have to change their approach and allow uneconomical mills to close so that the remaining mills can thrive and grow; in the past, they have intervened to prevent the closure of some facilities. Provincial governments should instead focus on assisting communities with the necessary transition. Federal competition authorities have raised concerns about company mergers that would have increased the competitiveness of the sector by rationalizing and consolidating facilities. In this regard, government policy needs to be flexible so that the sector can rationalize and consolidate as necessary to increase overall competitiveness.

Governments and industry should continue with the work they have initiated to improve air quality in mill towns and complete this work in a time frame that permits the sector to renew itself. The cooperative multi-stakeholder approach can effectively achieve real improvements at costs that are reasonable and in time frames that are tuned to address community concerns and the sector’s financial needs.

Governments and industry should continue with the work they have initiated to improve air quality in mill towns and complete this work in a time frame that permits the sector to renew itself.

**UPDATE THE FOREST MANAGEMENT PROCESS**

Forest allocations and timber tenure systems typically restrict harvested wood for use in lumber or pulp production. This stipulation should be updated to permit log use for non-traditional products, such as biofuels, bioenergy and biochemicals. Forest biomass is already available in large quantities for alternative uses; however, a national biomass inventory is currently lacking. A government–private sector partnership could be formed to conduct a national biomass inventory, and that inventory could include the characteristics of the forests (fibre and other qualities). Information of this sort would allow forest producers to direct the resource toward tailored end products and to renewed and transformed facilities accordingly.

Current provincial timber tenure regimes link the access to fibre resources with specific mill facilities, thereby limiting facility size and dictating the location of facilities. If mills are to be able to increase their production capacity, provincial tenure regimes will have to be altered to accommodate the closure of some mills and the enlargement of others as well as the reassignment of existing fibre resources to supply the larger mills.

Governments should play a key role in the actual deployment of the technologies rather than just focusing on their development.

**INVEST IN RESEARCH AND DEVELOPMENT**

While overall investment in R&D has been sluggish in the forest products sector, research in emerging technologies has been extensive. However, governments should play a key role in the actual deployment of the technologies rather than just focusing on their development. As for investments in R&D, biomass energy, biofuels and biochemical technologies deserve more attention.

An immense opportunity currently exists in British Columbia for the federal and provincial governments to assist in the transformation process of the forest products sector. In this region, with the mountain pine beetle infestation devastating large tracts of timber, the industry’s efforts to salvage the logs have rendered the current supply of logs far in excess of what is required to maintain local processing operations. The public and private sectors should capture this opportunity to develop a forest-based biorefinery. Collaboration between the Canadian Forest Service and the provincial government, and with the private sector, would be beneficial. Such a partnership could develop a biorefinery in British Columbia to utilize the additional fibre volume harvested as a result of the mountain pine beetle infestation.

**ENCOURAGE CAPITAL INVESTMENT**

The forest products sector requires capital investment if it is to develop larger facilities to compete in the international market. Additionally, in a renewed and transformed sector that produces a wide range of new
bioproducts and bioenergy, significant capital investment in new technologies will be necessary. Currently, poor returns and government policies that place high marginal tax rates on capital investment make investors reluctant to bankroll the sector. Government policies should therefore be amended to eliminate provincial capital taxes and enhance the federal capital cost allowance.

Industry must collaborate with the community and with various governments to anticipate closures and announce them in advance to give the community the maximum amount of time possible to adjust.

ANTICIPATE MILL CLOSURES

Provincial governments have typically taken a reactive rather than proactive approach to mill closures. Better detection of the early warning signs of a mill closure would allow measures to be taken to lessen the impact on displaced workers and communities. Long-term economic planning to diversify the industry base should ideally encourage sustainable economic development for the community. Overall, the federal and provincial governments must become adept at monitoring the factors that influence the sector’s operations—including industry trends, commodity prices and government decisions—in order to anticipate mill closures. Preliminary, pre-closure work by local governments, communities and industry can then start. In addition, industry must collaborate with the community and with various governments to anticipate closures and announce them in advance to give the community the maximum amount of time possible to adjust.

But the status of the forest as a renewable resource may make predicting mill closures difficult. Moreover, mill managers are reluctant to admit failure and publicize problems to their investors as this would affect their market position and value. Nevertheless, current trends demonstrate that mills will close. For a successful transition, the forest products sector must collaborate with governments and affected communities to examine and adopt the best available knowledge and practices, gained through experience in the forest products sector and in other resource sectors such as mining.

Governments should provide financial incentives for producers that generate energy from wood biomass and should amend Canada’s energy policy framework to facilitate the sale of excess electricity generated from biomass.

ENCOURAGE ADOPTION OF BIOMASS ENERGY

Canada has tremendous potential to generate renewable energy from its available wood resource. Government policies can play a large role in increasing biomass energy generation. To complement the accelerated capital cost allowance for biomass energy, financial incentives should be provided to producers that generate energy from wood biomass. For instance, governments should implement a financial incentive for biomass energy equivalent to that for wind power, and it should expand the Renewable Power Production Incentive to include energy from forest biomass. A grant program for biomass energy development similar to that established by the U.S. Energy Policy Act program, or a national biomass action plan similar to that created by the EU, could foster biomass energy expansion in Canada. In addition, Canada’s energy policy framework should be reformed to facilitate the sale, at competitive prices, of excess electricity generated from forest biomass.

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51 Walisser et al., “The Resilient City.”
52 Ibid.
RECOMMENDATIONS TO RENEW THE FOREST PRODUCTS SECTOR

The Conference Board of Canada recommends that:

1. Provincial governments allow industry to close uncompetitive mills, but industry must collaborate with government and affected communities to make the transition.

2. Governments eliminate interprovincial barriers to the movement of logs, reform the timber tenure system, and modify taxation and competition policy to support investments in much larger mills than currently exist in Canada.

3. Governments and industry increase investments in research and development to develop new products, including biomass energy, biofuels and biochemicals.

4. Governments provide financial incentives like those provided for wind power to expand biomass energy in Canada and governments reform energy policies so that excess power generated from forest biomass can be sold at competitive prices.

5. Governments and industry continue the work they have initiated to improve air quality in mill towns. 🌿
### HIGHLIGHTS

- **New opportunities are emerging for the Canadian agri-food sector due to increased demand for high value-added products both in developed countries and from the emerging middle class in developing countries such as China and India.**

- **The agri-food sector can benefit from these global market trends if it succeeds in greater product innovation. But the sector will need to improve the way in which consumer information flows throughout the supply chain, and Canadian regulatory agencies will need to assess new products and inputs in a timely way.**

- **Food safety is critical to the viability of Canada’s food exports and the protection of the Canadian public. It requires effective systems that can track products from the farm to the consumer, regulatory regimes that are effective and efficient in ensuring food safety, and a sector that can respond to changing consumer health and nutritional needs.**

- **The agri-food sector’s impact on water through its use and discharge is its greatest environmental issue, but it can be addressed by regulation and best management practices. There can be environmental benefits from the protection of natural capital (such as wetlands) but such protection must be properly valued and farmers compensated for their protection.**

- **Trade liberalization is essential, and the stalled Doha Round of negotiations is a setback. Canada has applied little pressure to move the World Trade Organization talks to a successful conclusion. But it will need to take a stronger position at future negotiations in favour of further trade liberalization of agri-food if the sector is to meet its future potential prosperity.**
When average Canadians think of this sector, they normally think only of primary agricultural production—products like wheat and cattle that are produced on farms. However, primary agricultural production represents only a small part of a large and integrated sector that includes processing and distribution activities as well. The Canadian agri-food sector is one of the largest sectors in Canada; it provided one in eight jobs and contributed 8.1 per cent of gross domestic product (GDP) in 2004. (See Table 7.)

The environment in which Canadian commercial farmers and the production and distribution chain of agri-food sectors competes is changing rapidly. Some of the factors driving structural changes within the sector include changing consumer demands, technological change, global economic growth, trade liberalization, declining commodity prices and rising farm expenses.

New opportunities are emerging for the Canadian agri-food sector due to increased demand for traditional commodities from developing countries, and due to increased demand for new, high value-added products from consumers willing to pay more in developed countries and from the emerging middle class in developing countries such as China and India. However, there are also challenges—related to trade barriers, overlapping and cumbersome regulatory review systems, and a lack of communication along the agri-food value chain—preventing the sector from taking advantage of the global growth in demand.

### Sector Overview

The agri-food sector can be divided into five main subsectors: food services, food retail and wholesale, food processing, primary agriculture, and input and service suppliers. The largest subsectors are food services (5.1 per cent of total employment and 1.5 per cent of GDP) and food retail and wholesale (3.6 per cent of employment and 2.4 per cent of GDP). (See Chart 4.) The relative contribution of the primary agriculture subsector to GDP and employment declined significantly over the past half century—from 18 per cent of employment in 1955 to 1.8 per cent in 2004—although the value of agricultural production in absolute terms tripled.

### Table 7

<table>
<thead>
<tr>
<th>Contribution to GDP</th>
<th>$104.5 billion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Share of national GDP</td>
<td>8.1 per cent</td>
</tr>
<tr>
<td>Exports</td>
<td>$26.5 billion</td>
</tr>
<tr>
<td>Share of total merchandise exports</td>
<td>5.8 per cent</td>
</tr>
<tr>
<td>Direct employment</td>
<td>2,100,000 persons</td>
</tr>
<tr>
<td>Share of national employment</td>
<td>13 per cent</td>
</tr>
</tbody>
</table>

Source: Unpublished data provided by Agriculture and Agri-Food Canada.
The relative economic importance of the agri-food sector varies by province—from highs of 10.2 per cent of GDP in Prince Edward Island and 9.7 per cent in Saskatchewan to a low of 1.9 per cent in British Columbia.

On average, Canadian food exports have risen by 5 per cent annually, outpacing global food exports.

The Canadian agri-food sector is highly trade oriented. Between 1990 and 2003, global agri-food exports grew by 73 per cent and Canadian agri-food exports, by 83 per cent—from US$10.9 billion to US$19.9 billion. On average, Canadian food exports have risen by 5 per cent annually, outpacing global food exports, which have been growing by 4.5 per cent annually. Most of the growth has occurred in meat, specialty grains, oilseed products, and processed fruits and vegetables. Export markets will continue to be a growth opportunity, but major challenges must be addressed.

In 1995, Canada’s exports accounted for 3.2 per cent of total global agri-food export value. The country’s export value share peaked in 2001 at 4.3 per cent; it then decreased to 3.7 per cent in 2003, partly because of the discovery of a case of bovine spongiform encephalopathy (BSE, or mad cow disease), which led to the closure of many borders to Canadian beef and cattle, and partly because of the drought in 2002–03 that severely affected Canada’s grain and oilseed exports.

Historically, the U.S. has been Canada’s leading customer for agri-food exports. Currently, it accounts for more than 60 per cent of Canadian agri-food trade. Canada’s next largest customer is Japan, followed by the countries of the European Union (EU). This pattern has changed little over the past 10 years, and, under the North American Free Trade Agreement (NAFTA), is unlikely to change significantly in the future. However, the value of Canada’s agri-food exports to other international markets is growing faster than the value of its exports to the U.S., showing that Canada is diversifying into new international markets, even as the U.S. remains vital to Canada’s agri-food trade.

OPPORTUNITIES AND CHALLENGES

SEGMENTATION OF THE CONSUMER MARKET

Segmentation—that is, a demand among customers for certain consistent attributes in their food—is becoming a feature of the consumer market in many countries, including developing countries with a growing middle class. Sought-after attributes include organic production, local sourcing, consumer-ready portions and variety in package sizes. Increasingly, assurances about production processes are also being sought: Is the product safe? Does it contain genetically modified organisms (GMOs)? What environmental processes are involved? Is animal welfare considered during production?

This trend in segmentation has allowed the agri-food sector to compete for market share on qualities other than lowest cost. In many cases, such competition requires tracing systems and identifiable attributes of the products. Much of Canada’s agri-food sector is gearing up to ensure that products are traceable back to the farm of origin. Traceability not only addresses

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1 World Trade Organization, Statistical Database.
liability issues with respect to food safety, but also permits products to be marketed based on identifiable and preservable attributes.

Trade growth in agri-foods is being driven by these value-added products. Canadian value-added agri-food exports as a share of total agri-food exports increased from 52 per cent in 1990 to 80 per cent in 2004.

**ECONOMIC GROWTH IN DEVELOPING COUNTRIES**

Global economic growth is projected to remain strong at 3.2 per cent annually between 2006 and 2015. However, economic growth in developing countries is expected to average 5 per cent annually during the same period. As incomes in those developing countries rise, the demand for and imports of higher-value food products—especially red meats, vegetable oils and prepared foods—are likely to strengthen. This strong economic growth in developing countries is evidenced by the increased livestock and meat production within those countries. More trade in livestock feeds might therefore be expected.

**Canadian value-added agri-food exports as a share of total agri-food exports increased from 52 per cent in 1990 to 80 per cent in 2004.**

Although global population growth rates are expected to slow to 1.1 per cent annually by 2015, population growth in developing countries will remain higher than that in the rest of the world. Demand for higher-value foods from countries such as Canada will therefore become even more important as the developing countries’ share of world population increases to more than 81 per cent by 2015.

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2 United States Department of Agriculture, *USDA Agricultural Baseline Projections.*
3 Ibid.
4 Morgan, “Global Food Consumption Shifts.”
5 United States Department of Agriculture, *USDA Agricultural Baseline Projections.*

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**EMERGENCE OF BIOFUELS**

Canada’s commitment to reduce greenhouse gas emissions has stimulated interest in the production and use of biofuels such as ethanol and biodiesel. These clean-burning alternative fuels are made from renewable feedstocks: corn and wheat for ethanol, and soybeans, canola and rendered animal fats for biodiesel. Canadian governments, like those in Brazil and the U.S., are likely to subsidize early development of the biofuels industry until it proves (or fails to prove) its economic worth.

An increase in the use of biofuels could provide the agri-food sector with new sources of revenue arising from increased demand for feedstocks.

At 15 billion litres and 14 billion litres respectively, Brazil and the U.S. led the world in ethanol production in 2004. Agricultural, energy, environmental and tax policies enacted in Europe have led to the widespread production and use of biodiesel on that continent. Biofuel production in Canada is much less developed than in Brazil, the U.S. or Europe; Canada produced just 245 million litres of ethanol in 2004.

An increase in the use of biofuels could provide the agri-food sector with new sources of revenue arising from increased demand for feedstocks. For the moment, however, the prices of ethanol and biodiesel remain higher than those of traditional gasoline and diesel fuel, discouraging their use. The primary factors influencing production cost include the cost of feedstock and the state of technological developments. Biofuels will provide a major market opportunity for the agri-food sector only if governments make it so, by implementing measures such as subsidies to producers or regulations that mandate a proportion of biofuels in gasoline.

6 Canadian Renewable Fuels Industry, “Ethanol.”
7 (S&T)² Consultants Inc. and Meyers Norris Penny LLP, *Economic, Financial, Social Analysis.*
TRADE LIBERALIZATION

International trade is extremely important to Canada’s agri-food sector. One of Canada’s natural advantages is its favourable ratio of arable land to population. The country’s high ratio—one of the highest among developed nations—offers opportunities for major growth in agri-food through exports. Agricultural commodities such as beef, pork, food grains, feed grains, oilseeds, pulses, and fresh and processed fruit and vegetable products are traded internationally in competition with products from other countries.

Canadian bulk exports of raw product to the U.S. have not grown, but exports of consumer-oriented products have increased by a factor of almost six.

Recent growth in agri-food exports is chiefly a result of trade liberalization through the Canada–U.S. Free Trade Agreement (FTA) and the Uruguay Round of the World Trade Organization (WTO) negotiations, both of which improved market access to the United States. The most recent round of WTO negotiations—the Doha Round—was expected to further increase this access through a combination of improvements: lowering tariffs, reducing domestic farm subsidies and completely phasing out export subsidies. However, a successful outcome seems unlikely, as the July 2006 talks in Geneva reached an impasse on the issues of market access for agricultural and non-agricultural products, as well as agricultural domestic support.

Tariff removal on several high-value food categories has meant that Canada currently has more access than before to U.S. markets for processed and higher-value agri-food products. Canadian bulk exports of raw product to the U.S. have not grown, but exports of consumer-oriented products have increased by a factor of almost six. (See Chart 5.) Clearly, Canada has the ability to respond to the marketplace when opportunities arise.

TRADE ACTIONS

Contrasted against this vibrant background of opportunities and successes created by trade liberalization are the increased number of trade actions taken against Canada in the agri-food sector. Oddly, liberalized trade with the U.S. creates threats as well as opportunities for Canada. These threats dampen agri-food investment, and the difficulty of convincing the U.S. to redress trade policy disputes in areas such as softwood lumber and cotton is beginning to cast doubt on the fundamental structure of the international trading system. Uncertainty, in turn, jeopardizes the potential of all countries—and especially trading nations like Canada—to achieve gains from liberalized trade.

HIGH TARIFFS AND SUBSIDIES

Canada wants improved market access through a global reduction in agri-food tariff levels. Such a reduction would be significant because trade in farm and food products—particularly those supplied by Canada—encounters material barriers. For example, recent (2005) estimates from the United Nations Food and Agriculture Organization indicated that bound tariff rates—rates that are enforceable under the General Agreement on Tariffs and Trade—for beef, pork and dairy products averaged 65 to 75 per cent across 106 countries. Some tariffs exceeded 300 per cent. And tariffs in most countries are higher on value-added products than on raw products.

Tariffs distort production patterns, but the distortion amplifies when tariffs are disproportionately high on downstream products. For example, Canada exports...
canola to Japan, but not canola oil, because Japanese oil tariffs are prohibitive. Investment in oilseed crushing in Canada is thereby curtailed, and productivity in the crushing industry is reduced because of limited economies of scale. Most processes are weight losing—that is, the final product is lighter and therefore cheaper and easier to transport than the raw product. Transporting the bulkier oilseed requires larger transportation facilities, and high processing costs in the Canadian crushing industry lead to less canola being grown and processed in Canada. The same pattern applies to almost all agricultural products that face trade-distorting tariff structures.

**Tariffs distort production patterns, but the distortion amplifies when tariffs are disproportionately high on downstream products.**

Similarly, agricultural production subsidies pose a major concern for Canadian products that are traded internationally. In particular, the subsidies paid to U.S. grain growers under that country’s 1996 and 2002 farm bills distort market signals and remove risk. The result is excess production. Prices of subsidized products then fall because the farmers who receive the subsidies have no incentive to reduce production during a market glut. Prices then drop in countries where subsidies are lower, such as Canada. (See Table 8.) This trade pattern is a major contributor to the decline in Canadian net farm income.

The data in Table 8 reveal that very little changed after 1988 for Japan, the EU and the U.S., despite a supposed increase in market access and reduction in subsidies following the Uruguay Round of the WTO negotiations. On the contrary, Canada and other countries clearly made major adjustments.

**SUPPLY MANAGEMENT**

Canada’s distinct treatment of certain commodities (e.g., dairy, eggs and poultry) through supply management can create a real dichotomy at the trade negotiating table, with Canada arguing for improved market access for its internationally traded products, while trying to protect supply-managed industries. As supply-managed foods are protected by relatively high tariffs (roughly 150 per cent for poultry products and 250 per cent for dairy products), tension arises over the two opposing interests during negotiations. Ultimately, a trade-off is made between maintaining the wealth of the few and the opportunity of the majority.

**Protecting supply-managed commodities clearly weakens Canada’s ability to secure trade liberalization elsewhere.**

Proponents of regulated, supply-managed commodities have made the case that supply management should be fully defended at the negotiating table. However, protecting supply-managed commodities clearly weakens Canada’s ability to secure trade liberalization elsewhere. Supply-managed commodities represent about 22 per cent of gross farm income and an even smaller percentage of the number of farms.

The Doha Round of the WTO negotiations would have had many implications for this two-track system. The Doha Round planned to focus on reducing tariffs, a move that would have made Canada’s supply-managed industries more vulnerable to international competition.

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Before the Doha Round of negotiations broke off, countries had agreed to the complete phase-out of export subsidies by 2013. Proposals that were still on the table included:

- reductions of between 60 and 80 per cent on production-distorting domestic farm subsidies;
- reductions of 55 to 70 per cent in tariffs on agricultural and food products;
- designation of some product lines as “sensitive” to retain relatively more protection (Canada’s supply-managed commodities would more than likely have been classified “sensitive”);
- elimination of legal support for state trading entities such as the Canadian Wheat Board; and
- a six-year phase-in period for the proposed changes.

Implementation of these changes would have proven to be a major boon for the Canadian agri-food sector, allowing agri-food commodities more access to export markets. The removal of export subsidies and domestic farm subsidies would have reduced unfair competition.

One result of the changes likely would have been slightly higher and more variable commodity prices, because the reduction in subsidies should have led to a reduction in production by the subsidized countries. Clearly, farmers would have had more incentive to reduce production in response to falling prices of their commodity. As noted earlier, U.S. farm programs in particular virtually eliminate any incentive to reduce production when prices are low. More volatility would have been added due to fluctuating demand or supply in importing and exporting countries.

The suspension of the Doha Round of negotiations is a major setback for Canada’s agri-food sector, given that its growth potential resides in exports. Such agreements do not favour Canadian agri-food interests. Whether any specific component of the Canadian market is of sufficient size or attraction to warrant significant commitment toward liberalization by an agreement partner is doubtful. Our bargaining power in bilateral arrangements such as these is likely to be weak. Canada would be much better off as a full participant in a broader negotiation that decided trading rules for all participants simultaneously.

**FOOD SAFETY**

The safety of Canada’s food production is critical to the viability of the agri-food sector. The future prosperity of this sector depends on the growth of its export markets, and major safety problems with food exports—whether real or perceived—can have a devastating impact on exports. For example, the 2003 BSE case cost the Canadian cattle industry in excess of $2 billion. Between 1998 and 2004, the EU shut down imports of genetically modified (GM) oilseed and GM food products, costing the Canadian sector in lost sales. When the EU lifted the sanctions, but introduced stringent licensing rules for GM food products in 2004, the costs of licensing increased dramatically.

The future prosperity of the agri-food sector depends on the growth of its export markets, and major food safety problems can have a devastating impact on exports.

The bottom line is that food safety is critical to agri-food exports. Traceability becomes essential either because of foreign-country requirements (such as those found in the EU for GM food products) or because of the need to respond quickly to contain a problem (such as with the 2003 BSE case). Having systems that can track products from farm to plate is invaluable in assuring an importing country that food origins can be confirmed, which alleviates fears of contamination. Such tracking systems are also essential for any health issue, even domestically. For example, contamination of food with *E. coli* results in serious disease outbreaks that occur with alarming speed. These outbreaks must be quickly suppressed. Robust tracking systems that can single out the specific
source and deal with it directly are effective in limiting health consequences for consumers and damage to the producer community.

In addition to tracking systems, adequately staffed, credible regulatory agencies, research institutes and public laboratories are critically needed to assure the overall safety of the food Canadians consume—for not only existing products, but also new ones being developed. With producers introducing multiple new products, additives and inputs every year, oversight of food safety is taxing our current regulatory system.

The Canadian population expects the food they eat to be safe, but eliminating all risks is impossible. The optimal approach is to minimize risk and when a problem occurs, to take quick and decisive action. This approach can apply both to disease outbreaks and to long-term health problems that are traced back to an ingredient in a product. For example, in recent years, concerns have arisen about the long-term health consequences of consuming trans fats. In Canada, mandatory labelling and consumer awareness of the potential health consequences of consuming this type of fat have led food manufacturers to reduce or eliminate trans fats in their products.

Another phenomenon related to nutritional and food safety concern is the consumer market segmentation that has developed as a result. The differentiation of products to appeal to the various market segments will persist as stories of specific health concerns are highlighted and refuted in the media. Definitive scientific conclusions related to these concerns have not been drawn and are unlikely to be drawn in the near term because of myriad interacting concerns and claims. In the meantime, a series of products is filling specific market niches—some quite large—that service these particular concerns.

In general, food safety and nutritional awareness are increasingly entering the mainstream. Industry has responded by providing a variety of options such as:
- products that contain no GMOs;
- organically grown products; and
- products made with a minimal effect on the natural environment or on animal welfare.

Food safety will remain a major issue for all markets. Governments, regulatory agencies and research institutes must take a vigilant stand in ensuring the safety of the consuming public, but without putting an unnecessary burden on industry.

**Farm debt levels are rising in Canada, and as farm incomes drop, more farmers are seeking income from external sources.**

**REDUCTIONS IN NET FARM INCOME**

Farm incomes in Canada are under immense strain. Whether calculated on a nominal or real basis, net farm income in Canada has decreased. This is due to a combination of a downturn in the real prices of farm products and an increase in farm input and equipment costs. The result is that farm debt levels are rising, and as farm incomes drop, more farmers are seeking income from external sources. Not surprisingly, the number of farms in Canada is diminishing: the latest census data show a decline of 11 per cent between 1996 and 2001. The trend is toward fewer but larger operations.

Poor net income dominates the components of the farming industry that rely on exports—the non-supply-managed segments—because Canadian farmers in these industries are not subsidized to the same level as the farmers in Europe and the U.S. with whom they must compete.

**LAGS IN PRODUCTIVITY**

The food processing subsector of Canada’s agri-food sector suffers from low productivity levels. Ever since the implementation of the FTA, labour productivity in various Canadian food processing segments has
been lagging behind that of their U.S. counterparts. One reason is relatively low fixed capital investment, because labour productivity in this sector is essentially a function of the capital (i.e., the plant and equipment) that the labour force must work with.

Productivity analysis—using the ratio of the value of output over employee hours worked—shows that although investments have been made in some Canadian food processing segments, they have not been sufficient to improve Canada’s competitiveness relative to that of the U.S.

Many of today’s market opportunities are found in food product improvements developed for segmented consumer markets, both domestically and abroad.

Productivity may also be lagging at the farm level in Canada. While exact measures are difficult to find in this sector, one study compared yields and costs per tonne of feed grains produced in Canada, the U.S., Brazil and Argentina, and found that Canada was falling behind its competitors. If this is the case, the competitiveness of the livestock industry will be affected at some point, because the price of feed grains is typically that industry’s major cost of production.

INNOVATION

The Canadian agri-food sector has traditionally approached innovation from a productivity perspective: the aim is to increase output and reduce cost per unit. Efforts to improve production efficiencies through innovation are laudable given the sector’s poor productivity performance. Innovation could also be pursued in logistics and supply chain management—areas in which current practices are limiting competitiveness—however, process improvements do not typically result in the novel products or product enhancements valued by consumers.

Many of today’s market opportunities are found in food product improvements developed for segmented consumer markets, both domestically and abroad. The latter market—consumers in developing countries experiencing rapid income growth because of industrialization—is especially attractive. But even in industrialized countries, consumers are constantly seeking greater variety in food offerings and are becoming more discerning about the types of food they want to buy. Those interested in taking advantage of these global agri-food opportunities should invest time, energy and money in developing and commercializing new food products.

The ability to create new products, however, is hindered by the lack of effective communication and information sharing all along the value chain. From the farmers who produce the basic commodities, through marketing research organizations, to the eventual sellers of the products, the types of trading relationships in place today are preventing collaboration. Development of new food products requires that all players understand the needs of customers and be involved in the innovation process.

INNOVATION

The ability to create new products is hindered by the lack of effective communication and information sharing all along the value chain.

Greater product innovation stems from greater information sharing and cooperation. Vertical integration and collaboration between and among farmers, food processors, distributors and retailers can contribute significantly to the innovation process. Individual farmers and agri-business firms, both large and small, can then become active participants in the quest for new food products that fulfill consumer preferences.

10 Stiefelmeyer, A Comparative Analysis.
11 Ibid.
12 Martin et al., The 2002 U.S. Farm Bill.
13 Setala, “Welcome to the New World.”
14 Rural Industries Research & Development Corporation, Supply Chain Management; Food Chain Centre, “Cutting Costs.”
15 Collins and Dunne, “Learning from Others”; Kumar, “The Power of Trust.”
16 Burgelman et al., Strategic Management.
17 English Farming & Food Partnerships, “Farming and Food.”
REGULATORY PRACTICES
In the area of food safety and quality, an efficient and effective regulatory system is essential to protecting our exports and the Canadian public, as discussed earlier. Regulatory agencies have challenges in assessing food safety and quality because of the lack of capacity to assess new products and inputs in a timely way.

Regulations that unnecessarily slow the registration of new food products, crop protection products and animal health products reduce the agri-food sector’s competitiveness and deter new products, inputs and processes that could be beneficial to Canadians and the environment. The influence that Canada’s system of regulatory approvals has over research, development and innovation is increasingly being recognized. Both research results and industry experience demonstrate significant problems in the federal regulatory approval systems for animal health products, seed registration and crop protection products. Canada lags behind other regions—notably the U.S., Australia and the EU—when it comes to clarity of the approval process, consistency in requirements related to data and experimental results, and pace of approval decisions.

The perception of industry experts around regulatory approval is that:

- product registration is considerably more costly in Canada than in other jurisdictions;
- products that are actually superior in efficacy, safety and environmental protection are unavailable or less available in Canada; and
- market opportunities are being lost because the materials that could be used to produce superior and differentiated products are not available in Canada.

Complex Canadian legislation, coupled with a lack of cooperation among government departments, hinders food companies.

For instance, health and nutrition concerns are causing consumers to demand differentiated foods, but the current grading of fresh produce as mandated under the Canada Agricultural Products Act does not reflect those changing consumer demands. Similarly, decades-old labelling standards meant to ensure uniformity in the marketing of meat products are today arguably limiting product innovation. In nations where this practice does not exist, products can be presented in ways that meet the demands of a specific consumer segment.

The multi-level food inspection regulations in Canada are also hobbling food producers that want to meet the demand for differentiated foods. Produce can be marketed in its home province under that province’s local standards; but, to be sold in another province, the same food must meet the additional cost of federal inspection. The investment cost-benefit decision is a simple one, but it acts as a hurdle in the path of producers that want to grow their businesses and expand their markets. In the end, consumers are deprived of market choice at a time when they are demanding food differentiation. Permitting producers wider opportunities to market their goods within Canada would seem to serve both their growth needs and the desires of the market.

Similarly, the extent to which health and nutritional claims can be attached to food products (as legislated under the Food and Drugs Act and Regulations and the Consumer Packaging and Labelling Act) may limit the added value that would draw consumers. The objectives of the legislation—to help consumers make informed food purchase decisions based on label claims and advertisements and to provide consumers with the assurance that any such claims are verifiable—are admirable. But the recent decision by Health Canada to disallow labelling of low- or reduced-carbohydrate food products...

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18 Brethour et al., The Competitiveness Impacts.
20 Gooch et al., International Study.
illustrates a problem: the government urges the sector to differentiate and diversify, but it does nothing to change a regulatory system that rewards sameness and makes innovation costly.\textsuperscript{21}

Policy and legislation developed for an earlier era in agri-food can also have a direct impact on the ability of producers to capture modern market opportunities. Marketing boards that insulate farmers from their customers diminish the flow of information along the value chain. Opportunities for collaborative relationships are reduced, and innovation then lags. One study found that the supply management systems used in marketing dairy and poultry products do not adequately communicate market signals to producers.\textsuperscript{22} Revenue pooling, national product allocation systems that require shared market growth across provinces, significant import barriers, and the price-setting authority exercised by producer boards reduce value chain members’ desire to collaborate. This is an unfortunate consequence, as collaboration can powerfully stimulate innovation.

\textbf{Policy and legislation developed for an earlier era in agri-food can have a direct impact on the ability of producers to capture modern market opportunities.}

\section*{HUMAN RESOURCE SHORTAGES}

Canada faces a growing shortage of skilled labour. The farming and food processing industries require a skilled—and, in some cases, a highly seasonal—workforce. If industry wages fail to rise, agri-food industries will find it more and more difficult to compete for skilled labour.

Recent research suggests that primary agriculture and food manufacturing industries have critical, relatively similar human resource challenges ahead of them.\textsuperscript{23} In an overview of human resource issues in agriculture, researchers at Guelph University identified some overarching themes across the agri-food sector:

- an aging workforce;
- difficulties with recruitment and retention;
- lack of awareness of careers in agri-food and a negative perception of the work; and
- lack of training, especially for management and leadership skills development.\textsuperscript{24}

The challenges of recruiting and retaining quality employees span the entire sector.

The 2001 Census of Agriculture revealed that the average age of Canadian farmers is 51.8 years for men and 50.0 years for women. The average age of workers in the food processing subsector is only slightly higher than that in the general workforce, but the grains and oilseed, confectionary, and fruit and vegetable processing segments have the oldest workforces and face pressures from worker retirement.\textsuperscript{25} The aging of the general workforce will only exacerbate the sector’s difficulties in recruitment and retention.

The challenges of recruiting and retaining quality employees span the entire sector. Because agri-food has not offered competitive monetary or non-monetary incentives, it cannot compete effectively for labour. In 2001, 8 of 10 food processing segments paid wages below the Canadian manufacturing industry average,\textsuperscript{26} and in focus groups conducted across Canada in 2005, farmers acknowledged that the sector is unable to pay wages high enough to attract and retain workers.\textsuperscript{27} Although wages are the clearest market signal that can be presented to potential workers, non-monetary incentives such as flexible hours, paid vacation, career development, and benefits have become increasingly important, and the agri-food sector has been slow in offering them.

\begin{thebibliography}{9}
\bibitem{21} Mussell et al., \textit{Appropriate Regulation}.
\bibitem{22} Martin et al., \textit{Review of Regulated Marketing}.
\bibitem{23} Soucie and Farrar, \textit{Workforce Ahead}; Stiefelmeyer and Mussell, \textit{Environmental Scan}.
\end{thebibliography}

\bibitem{24} Stiefelmeyer and Mussell, \textit{Environmental Scan}.
\bibitem{25} Soucie and Farrar, \textit{Workforce Ahead}.
\bibitem{26} Ibid.
\bibitem{27} R.A. Malatest and Associates Ltd., \textit{Human Resources Issues}.
The segments most affected by labour shortages are those that hire seasonal and harvest labour, particularly in horticulture (fruits and vegetables), farm input supply and food processing. A primary issue is the structure of federal income and social policies, which provide disincentives to work in seasonal and harvest labour for both employment insurance (EI) claimants and other workers, such as retirees, who want extra work on the side. EI in particular influences claimants to seek full-time work rather than seasonal employment.

Difficulties in recruitment and retention are further aggravated by lack of awareness of industry careers and the generally negative perception of the sector as a career choice. Agri-food employment tends to be viewed as consisting of hard physical labour and long hours in exchange for relatively little pay and few benefits. The science and technology-based skills that are now required to succeed in the agri-food sector seem to receive less recognition. But qualified employees with the operational, technical and managerial skills necessary to exploit the technologies and science used in the sector are vitally needed throughout the entire value chain.

**Difficulties in recruitment and retention are further aggravated by lack of awareness of industry careers and the generally negative perception of the sector as a career choice.**

Moreover, despite rapidly improving technologies, tightening regulatory compliance, and a need for enhanced and more complex relationships with customers and suppliers, the agri-food sector lacks a culture of training and ongoing learning. A combination of lack of awareness of programs that are available, programs that do not meet the sector’s exact needs and the changing skills requirements of the sector has resulted in a skills gap, particularly in management and leadership skills.

Investing in human resources pays off. Profitable industries are those that can best afford to improve their human capital. Currently, agri-food (and especially primary agriculture) finds itself in a cycle of low profitability and low investment in human capital, which tends to reinforce low profitability.

**As the challenges of transitioning to sustainable agricultural production have become better understood, the limitations of regulation have become more apparent.**

**ENVIRONMENTAL CHALLENGES**

The need to develop sound environmental management in the Canadian agri-food sector is apparent now more than ever, in both farming and food manufacturing.

The first issue—and probably the most critical—is the sustainability of the water supply. The quantity and quality of the country’s water resources are currently under pressure due to high demand and pollution. Water plays a central role as an input for the agri-food sector. At the same time, agricultural crop and livestock production contributes to the deterioration of water resources. Increased loading of nutrients, pesticides and pathogens into the water supply potentially threatens everyone.

Until recently, legislation and regulation of agricultural practices were the principal (often only) policy tools used to achieve environmental objectives. However, as the challenges of transitioning to sustainable agricultural production have become better understood, the limitations of regulation have become more apparent. Major stakeholders in environmental protection (government, industry and society) have begun to develop

**28 Stiefelmeyer and Mussell, Environmental Scan.**

**29 Ducks Unlimited Canada, Natural Values.**

**30 Environment Canada, “Threats to Water Availability.”**

**31 With the increased use of environmental regulations, the cost of production has increased significantly for agricultural producers. This cost increase can have a significant effect on Canadian competitiveness, particularly in commodities that are based on the lowest cost of production.**
and experiment with other control mechanisms, such as market-based measures, fiscal instruments and voluntary initiatives.  

There is a growing recognition that an accounting system is needed that measures the stocks, flows and economic values (both market and non-market) of natural capital (e.g., agricultural soils and wetlands) and its ecological goods and services (EG&S). Examples of the latter are water filtration, carbon sequestration and wildlife habitat services of wetlands. Benefits provided by natural capital in the form of EG&S are often intangible and are not captured by markets. For instance, it is difficult to quantify the benefit provided by a wetland on a farm in terms of water purification, provision of habitat or aesthetic value. It is similarly difficult to motivate beneficiaries of natural capital to pay for EG&S. Natural capital therefore provides limited potential for revenue generation, and as a result, the benefits of EG&S are not priced and are given too little consideration in the decision-making process.

Internationally, the valuation of natural capital as the source of EG&S is receiving increased focus, and various policy mechanisms to protect natural capital have been implemented. For example, the World Bank notes significant progress in developing techniques for valuing environmental costs and benefits. In addition, a variety of payments and market systems have been developed worldwide to preserve natural capital and its services.

In the near future, these or similar policy mechanisms and valuation techniques are likely to gain more presence in Canada. In fact, recognition is growing among farmers, governments and other stakeholders that EG&S are vital to Canada’s economic and social well-being.

GOVERNMENT AND INDUSTRY ACTIONS TO STRENGTHEN THE AGRI-FOOD SECTOR

Governments and industry are undertaking several initiatives to aid the agri-food sector in creating new markets and to mitigate environmental impacts. Three such initiatives are highlighted here.

The 2003 Agricultural Policy Framework offers programs that provide the Canadian agri-food sector with tools, services and options to strengthen business.

ETHANOL EXPANSION PROGRAM

This program is intended to expand fuel ethanol production and use in Canada and reduce transportation-related greenhouse gas emissions. By 2010, 55 per cent of gasoline-type fuels are expected to include a 10 per cent ethanol blend. As a result, Canada’s production of ethanol should increase to 1.33 billion litres per year, up from the 2004 level of 245 million litres.

AGRICULTURAL POLICY FRAMEWORK

A joint initiative by the federal and provincial governments, the 2003 Agricultural Policy Framework offers programs that provide the Canadian agri-food sector with tools, services and options to strengthen business, increase prosperity, and meet the demands of consumers at home and abroad. This initiative provides assistance under five categories: food safety and quality, environment, human resource renewal, science and innovation, and business risk management.

32 Kerr et al., *Beyond Regulation.*
33 Oleviler, *The Value of Natural Capital.*
34 “Are you being served?” *The Economist,* pp. 76–78.
35 Wildlife Habitat Canada, National Survey.
37 Ibid.
One component of the Agricultural Policy Framework designed to help the Canadian agri-food sector achieve environmental sustainability in the areas of soil, water, air and biodiversity is the Environmental Farm Planning Initiative. Producers are encouraged to develop an environmental farm plan to identify environmental risks and to develop action plans to mitigate those risks on their farms.\(^{38}\)

Another objective of the Agricultural Policy Framework is to encourage producers to develop best management practices (BMPs) to help reduce agricultural risks; improve the supply and quality of water,\(^{39}\) soil\(^{40}\) and air;\(^{41}\) and ensure compatibility between biodiversity and agriculture.\(^{42}\) BMPs show producers how to minimize environmental risks and tend to the long-term health of the land without risk to economic viability.\(^{43}\)

A recent trend in Canadian agriculture is the concept of paying agricultural producers to protect ecological goods and services.

Farmers tend to adopt BMPs according to priority and available funding. Uptake has therefore tended to be greatest for priority BMPs (such as manure management) and BMPs that yield significant on-farm benefits (such as reduced tillage). The literature indicates that some producers fail to adopt BMPs because they lack an understanding of the physical improvement to the environment that can result\(^{44}\) and because poorly designed BMPs or assistance programs make the practices too expensive. Understanding the impact of these BMPs on farm profitability and improving adoption rates requires additional management and economic data that will support better business decisions.

A pilot project in Norfolk County, Ontario, aims to pay producers to provide Canadians with services that produce environmental benefits.

**ALTERNATIVE LAND USE SERVICES**

A recent trend in Canadian agriculture is the concept of paying agricultural producers to protect EG&S. For example, a pilot project in Norfolk County, Ontario—called Alternative Land Use Services—aims to pay producers to provide Canadians with services that produce environmental benefits, such as wildlife habitat and clean air and water.\(^{45}\) If this approach can be shown to produce clear environmental benefits as well as income to farmers, it will be seen as successful. (See box “Government and Growers Help to Reduce Nitrates in the Abbotsford–Sumas Aquifer.”) A similar program is being launched in Manitoba, and Saskatchewan and Alberta are considering implementation of Alternative Land Use Services programs.\(^{46}\)

**SUMMARY**

Projected demographic and economic trends signal global market opportunities for Canada’s agri-food sector into the future; however, if the sector is to benefit, major challenges must first be addressed. Many of these challenges are domestic: lagging productivity, regulatory burden and skills shortages. But among the greatest challenges is the need to pursue further trade liberalization.

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\(^{38}\) Agriculture and Agri-Food Canada, Greencover Canada; Ibid., Canada–Saskatchewan Farm Stewardship; Ibid., Canada–Nova Scotia program; Ibid., New incentives for environmental farm plans in Alberta; Ibid., Environmental farm planning under way; Ibid., New incentives for on-farm environmental practices in Saskatchewan; Ibid., Quebec agricultural producers receive; Ibid., Enhanced environmental farm planning coming.

\(^{39}\) Key priority areas are nutrients, pathogens, pesticides and water conservation.

\(^{40}\) Key priority areas are soil organic matter and soil erosion caused by water, wind or tillage.

\(^{41}\) Key priority areas are particulate emissions, odours and emissions of gases that contribute to global warming.

\(^{42}\) Key priority areas are habitat availability, species at risk and economic damage to agriculture from wildlife; Agriculture and Agri-Food Canada, Federal–Provincial–Territorial Framework Agreement.

\(^{43}\) Agricultural Policy Framework, [slide show].

\(^{44}\) Agri-environmental indicators for water, air, soil and biodiversity have been developed and initiated by Agriculture and Agri-Food Canada to help resolve some of this issue.

\(^{45}\) Bailey, “Environmental Services.”

\(^{46}\) Ibid.
In every food manufacturing industry, Canada’s labour productivity lags behind that of the U.S., and the trend of falling behind shows no sign of letting up. Although less analysis is available at the farm production level, Canada is also clearly losing ground to its competitors in feed grain productivity. Falling feed grain production is an early indicator of a potential similar problem in livestock production.

The safety of food is critical to the viability of Canada’s agri-food sector and the protection of the Canadian public. Well-designed and effectively operated regulatory systems are essential to ensuring the trust in our exports and providing the protection that Canadians demand and need. However, Canada’s current regulatory system must be improved to stimulate more innovation that would benefit Canadians, the environment and the sector. With respect to input regulation, Canada’s relatively small size puts it at a disadvantage. In the case of pesticides, for example, Canada is fundamentally a low-volume user in global terms. The cost of regulation is a disincentive to suppliers to invest in research—or even to register products. Inferior access to inputs means that primary producers and their downstream customers are faced with higher costs and must often use products that are less friendly to the environment than those used by their competitors in other countries.

Increasingly, the sector is also facing a dilemma with respect to marketing regulations, and frequent conflict between innovation and regulated marketing. Marketing boards typically develop regulations aimed at reducing costs and at enhancing markets and equity of treatment for producers of homogeneous commodities. These regulations only serve to impede producers that have new ideas and want to do things differently. But today’s educated consumers are looking for differentiated products and services.
GOING FORWARD

ENCOURAGE GAINS IN PRODUCTIVITY
Governments should foster a business climate that encourages productivity growth. Improved tax incentives on research and development and a tax system more conducive to investment would increase productivity. Investment and productivity growth in the sector would also improve if the existing high regulatory burden were reduced.

Governments should foster a business climate that encourages productivity growth.

REFORM THE REGULATORY SYSTEM
The regulatory system should be reformed to reduce costs and encourage innovation. All indications are that Canadian farmers and processors want a rigorous system that is tough, fast and efficiently uses scientific resources, both domestic and international. Reform of the regulatory system, however, must not act to the detriment of food safety and environmental protection. Governments must continue to be vigilant in protecting the public and the environment, and do it in a more timely way, so that Canada’s agri-food sector can invest, innovate and compete in world markets.

Multiple domestic food and input regulations are hampering the sector’s capacity to introduce new inputs that could improve environmental or productivity performance. They are also causing delays in the approval of new additives and products, and hindering interprovincial food sales. Regulatory processes must be streamlined, and unnecessary duplication and overlap eliminated.

When Canada is reviewing the acceptability of products already available in other countries, the product review should take into account analysis by these countries, allowing Canada to avoid unnecessary repetition. Greater cooperation with food regulatory organizations in other countries would be beneficial.

IMPROVE VALUE CHAIN MANAGEMENT
Opportunities in today’s increasingly segmented marketplace exist, but they will not be realized by using past approaches. Improved management of value chains will be critical to Canada’s ability to compete. Alliances and collaboration are essential for creating differentiated products, and cooperation of that sort requires excellent communication of the desired attributes throughout the value chain. From retailers to processors and farmers, the attributes of differentiated products need to be distinguished and preserved, and consumers deserve assurances that the valued attributes are present in the product. Moreover, all this activity must be carried out at the lowest possible cost. The agri-food sector must improve the management of value chains by increasing collaboration and alliances throughout these chains. By doing so, it will improve efficiency and innovation.

Investment in human resources throughout the sector will help to improve its productivity and competitiveness, and will pique interest in affiliated careers.

DEVELOP HUMAN RESOURCES
Interest in agri-food as a career seems to have waned in Canada recently, but the increase in opportunities for value-added, environmentally sustainable new product development hints at an exciting future. The sector will require people with cutting-edge technological and management skills. Investment in human resources throughout the sector will help to improve its productivity and competitiveness, and will pique interest in affiliated careers:

• Both farms and agri-businesses need to integrate human resource planning more closely with strategic business planning.

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47 The discussion that follows is adapted largely from a recent George Morris Centre publication titled Canadian Agri-Food Policy: What Should Change to Ensure Prosperity for the Sector? That paper was written as part of a George Morris Centre initiative to define what is needed in a new Canadian agri-food policy to support growth in the commercial component of the agri-food sector. Information regarding this ongoing project can be found at www.georgemorris.org.

48 Soucie and Farrar, Workforce Ahead.
Employers must continue to develop the workforce by upgrading technical, operational, managerial and leadership skills.49

*Agri-food management and leadership courses should be made more widely available. The training currently available to agriculture focuses on technical aspects, to the detriment of management and leadership training.*50

The entire agri-food sector has an opportunity to participate in an image improvement campaign that focuses on the new skills needed in the sector and the opportunities thus presented. The result would be a revived view of the farm and agri-business sector as knowledge based, innovative and ecological.

By using better product approval and marketing regulations, governments would improve the sector’s ability to innovate. The prospect of developing and producing new farm, food and bioproducts in a more streamlined regulatory environment would attract a younger workforce.

In other words, environmental sustainability of agricultural practices requires some combination of regulation and economic incentives. Canadian governments have typically used regulation as the principal policy tool to achieve environmental objectives, but movement toward the pricing of EG&S and the structuring of economic incentives to farmers for providing them would likely result in better adoption of BMPs and environmental conservation.

This change would also require improved public planning processes that incorporate the concept of EG&S to pay for the benefits that accrue to society. Thus, agricultural environmental policy must encompass much more than BMPs at the farm level. Public support will have to be mustered for new and innovative approaches aimed at protecting EG&S that would not otherwise be protected by standard farm operating procedures. Optimally, this public support would take the form of private sector investment opportunities in EG&S—for example, tradable credits related to carbon sequestration on farmland.

**FOCUS ON MARKET ACCESS AT THE WTO**

As an exporting nation, Canada must be concerned about market access and unfairly subsidized competition from other countries. Proposals put forward by the U.S., the EU and the Group of Twenty (G20) countries at the WTO negotiations would have, in varying degrees, reduced distorting subsidies and improved market access for Canadian products. From a Canadian perspective, the major issue is the balance between protecting our supply-managed products and benefiting from enhanced market access and reduced subsidization by competitors, especially the U.S. and the EU.

Canada has applied little pressure to move the WTO talks to a successful conclusion. Protecting dairy and poultry has appeared to be the higher priority, given the Canadian Parliament’s all-party resolution of late 2005. This stance is curious in the face of the following facts:

- Almost 80 per cent of primary agriculture revenue relies on export markets.
- With the opportunity to designate goods as “sensitive,” a number of dairy and poultry products could retain some protection.
To further trade liberalization to the benefit of at least most of Canada’s agri-food sector, we will need to take a stronger position at future WTO negotiations. With the Doha Round of talks having hit a wall (some say having collapsed), the future of agri-food trading is unclear. The Doha Round is unlikely to progress until at least 2009. In the meantime, Canada’s agri-food sector is missing out on global market opportunities that hold the key to its future potential prosperity.

**To further trade liberalization to the benefit of at least most of Canada’s agri-food sector, we will need to take a stronger position at future WTO negotiations.**

Canadian agriculture is at a crossroads: a protracted farm income problem is being met with distinct opportunities presented by international trade, collaborative marketing and EG&S. The challenge is to create or adapt institutions, policies and regulations, and to fully participate in crafting international agreements so that the opportunities can be realized to the benefit of farm income.

**RECOMMENDATIONS TO MAKE THE AGRI-FOOD SECTOR MORE INNOVATIVE AND COMPETITIVE**

The Conference Board of Canada recommends that:

6. **Industry improve value chain management through alliances and collaboration that improve efficiencies and quality control.**

7. **Governments remain vigilant in ensuring food safety to protect Canada’s food exports and Canadians, but do so without putting undue burden on the sector.**

8. **Governments facilitate the protection of the environment by not only regulating the sector, but also supporting farmers who protect environmental assets such as wetlands.**

9. **The federal government take a strong stand in favour of further trade liberalization in food, and that it work with other national governments to pursue such an agenda. The suspension of the Doha Round of negotiations should not deter the government from seeking trade arrangements with other countries. 🌍**
HIGHLIGHTS

• Greater mineral exploration efforts than ever before will be required to replenish Canada’s declining reserves if the country is to exploit the long-term growth in demand for metal and mineral commodities. Governments can play a major role through tax policy incentives, the provision of basic geoscience, better land use decision-making and access, and improvements in the permitting process.

• Canada’s major mining companies do not match the scale of the global “super majors,” but several retain the dominant producer position in their own commodity sector. Canada has a large number of junior exploration companies—a strategic advantage because these companies engage in frontier exploration.

• The nature of mining poses potentially significant risks to the environment. Not all companies have the same capacity to provide excellent environmental stewardship. Both industry and governments share the responsibility to ensure that all companies meet environmental objectives.

• New mines will likely be developed in remote areas, close to Aboriginal communities that can become important economic and environmental stewardship partners. Agreements between mining companies and Aboriginal communities recognize each other’s rights and provide an implicit “social licence to operate” that represents the community’s consent to responsible mining. Aboriginal traditional knowledge can be valuable to environmental management practices.
SNAPSHOT OF THE ISSUES

High commodity prices and positive market conditions have kept Canada’s mining sector in prosperous territory in recent years. Robust economic activity in emerging economies, particularly China but increasingly India, is driving demand for Canadian minerals and metals. Substantial interest from foreign investors reflects the strength of Canadian mining companies. The mining sector contributed $27 billion to gross domestic product (GDP)1 in 2005 and employed 189,400 persons. (See Table 9.) It exported almost $45 billion, representing 10 per cent of total Canadian exports.

Although times are good, the sector is not without its challenges. With a lack of exploration activity for over a decade, Canada’s reserves of base and precious metals are declining rapidly. Few new mines are being developed, and possible exploration sites are located in increasingly more remote and environmentally sensitive frontier regions, making exploration and production more costly. The recent upturn in exploration is encouraging, but much more activity will be required to sustain the sector.

Prior to the current boom in demand, Canada’s mining sector had been in survival mode for more than a decade. Mineral exploration activity in the country declined during that time—the combination of low commodity prices and higher costs rendered exploration financially unfeasible. Research and development (R&D) spending was curtailed and academic institutions with mining-related education and research programs found themselves at risk. Entrepreneurial, technical and financial leadership was eroded. Mining came to be viewed as a sunset industry in Canada.

Increasingly during the 1990s, Canadian companies became involved in offshore projects, drawn to easier access world-class deposits in countries with a more

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**Table 9**

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<tr>
<td>Contribution to GDP</td>
<td>$27 billion</td>
</tr>
<tr>
<td>Share of national GDP</td>
<td>2.5 per cent</td>
</tr>
<tr>
<td>Exports</td>
<td>$44.8 billion</td>
</tr>
<tr>
<td>Share of total merchandise exports</td>
<td>10.3 per cent</td>
</tr>
<tr>
<td>Direct employment</td>
<td>189,400 persons</td>
</tr>
<tr>
<td>Share of national employment</td>
<td>1.2 per cent</td>
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</table>

Sources: Mining Association of Canada; Natural Resources Canada; Statistics Canada.

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1 The GDP figure does not include support activities for mining. Statistics Canada provides data only on combined mining and oil and gas support activities.
attractive investment climate. This period saw Canadian companies evolve into major global mineral developers and significant ambassadors for Canada. At the same time, factors emerged worldwide that began to change the way that mining companies did business: activism in civil society, media scrutiny, Aboriginal and community empowerment, and expectations of environmental and social responsibility.

SECTOR OVERVIEW

The mining sector data can be broken down into three main subsectors: mineral extraction; primary metal manufacturing; and non-metallic mineral product manufacturing. (See box “Description of Mining Subsectors.”) As a share of total mining GDP, the primary metal manufacturing subsector is the largest, followed by mineral extraction and non-metallic mineral product manufacturing. (See Chart 6.) Between 1997 and 2005, there was a slight shift in the share of GDP, with mineral extraction losing share and primary metal manufacturing and non-metallic mineral product manufacturing gaining share. The data for an important mining activity are not available—the exploration and development of metals and minerals. Statistics Canada provides only combined data for mining and oil and gas exploration and development. While the charts and tables do not include these data, this chapter does discuss the opportunities and challenges facing mining exploration and development.

In 2005, the mining sector directly employed 189,400 Canadians, down from 205,700 in 1997. The number of workers in mineral extraction decreased significantly—by 23 per cent—during that period. Although this subsector represented 28 per cent of total mining employment in 1997, it now accounts for 24 per cent. (See Chart 7.) The decline was steepest in coal extraction (46 per cent), while metal extraction fell by 35 per cent. Employment in non-metal extraction increased by 13 per cent, reflecting the emergence of Canada as a major diamond producer. Over the same

<table>
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<th>Chart 6</th>
<th>Share of Total Mining GDP (per cent)</th>
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<tr>
<td>Non-metallic mineral product manufacturing</td>
<td>Primary metal manufacturing</td>
</tr>
<tr>
<td>100</td>
<td>90</td>
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<tr>
<td>70</td>
<td>60</td>
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<td>40</td>
<td>30</td>
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<td>10</td>
<td>0</td>
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Source: Statistics Canada.

<table>
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<tr>
<th>Chart 7</th>
<th>Share of Total Mining Employment (per cent)</th>
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<tr>
<td>Non-metallic mineral product manufacturing</td>
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<tr>
<td>100</td>
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<td>40</td>
<td>30</td>
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<td>10</td>
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</table>

Source: Mining Association of Canada.

Description of Mining Subsectors

Mineral extraction: includes the primary mineral production activities of mining and concentrating. These can be divided into metal mining (gold, silver, zinc, nickel, copper, etc.), non-metal mining (granite, limestone, diamonds, potash, etc.) and coal.

Primary metal manufacturing: includes the smelting, refining, rolling, extruding, alloying and casting of primary metals such as copper, nickel, aluminum and steel.

Non-metallic mineral product manufacturing: includes the processing of such products as abrasives, gypsum, lime, cement, glass and ceramics.

Source: Mining Association of Canada.
time period, employment rose in non-metallic mineral product manufacturing—it now represents 32 per cent of mining employment.

Over the last five years, minerals and mineral products have accounted for some 65 per cent of the volume handled at Canada’s ports and some 60 per cent of rail revenue freight.

In 2004, Canada could boast of more than 200 mining establishments (metal, non-metal and coal mines); more than 3,000 stone quarries and sand and gravel pits; and about 50 non-ferrous smelters, refineries and steel mills. Capital investment in mining reached $4 billion in 2005, up 15 per cent from 2004 and 63 per cent from 2003.

Over the last five years, minerals and mineral products have accounted for some 65 per cent of the volume handled at Canada’s ports and some 60 per cent of rail revenue freight. Mining ranks among the top 10 industries in GDP per worker and also drives considerable R&D expenditures. In 2005, $504 million was spent on R&D in the mining and mineral processing industries.

Mining companies leave their mark on communities large and small:

- Corporate headquarters and financial, consulting, technology and educational organizations are located in many urban centres. Toronto is the world’s leading city for mining finance—41 per cent of equity raised worldwide in 2005 was generated through the Toronto Stock Exchange (TSX). Vancouver holds claim to the world’s leading cluster of exploration companies and expertise, while Montréal is home to a number of mining companies and is an important location for mining R&D as well as education.

- Operational centres and supporting supplier and services firms, directly related to past or ongoing mining, operate in many mid-size towns—among them Yellowknife, Northwest Territories; Sudbury, Ontario; and Val d’Or, Quebec.

- Skilled employees live and work in tiny communities such as Esterhazy, Saskatchewan, and Logan Lake, British Columbia, in close proximity to operating mines.

- The mining sector paid some of the highest weekly earnings in the country—average weekly wages in 2005 in the sector were $1,099.

**FINANCIAL LEADERSHIP PRODUCES STRATEGIC ADVANTAGE**

A key strength of the Canadian mining sector is its domination in mining finance and its ability to produce, fund and build mining companies with international interests. The TSX lists 60 per cent of the world’s public mining companies. From 1999 to 2004, Canadian equity financing in the sector totalled US$4.7 billion—47 per cent of the equity raised in the world. Of the 1,200 listed mining companies in Canada, almost 1,000 are junior exploration companies. This large number of companies represents a strategic advantage to Canada over foreign investment centres, because these companies are engaged in frontier exploration.

A key strength of the Canadian mining sector is its domination in mining finance and its ability to produce, fund and build mining companies with international interests.

Canada was the number one country for attracting mineral exploration investment from the late 1970s to the early 1990s. It then dropped to number two when Australia took the lead between 1992 and 2003. In the last couple of years, Canada has regained the top spot, accounting for 17 per cent and 19 per cent of global exploration investments in 2004 and 2005, respectively. About 800 Canadian companies explore outside

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4 Ibid.
5 Ibid., 2006 Facts and Figures.
6 As of the end of 2005, there were 1,192 mining companies listed in Toronto, 484 in Australia, 133 in London, 55 on the American Stock Exchange and 50 in Japan. Mining Association of Canada, 2006 Facts and Figures, p. 18.
7 Prospectors and Developers Association of Canada, Federal investment tax credit.
Canada, in more than 100 countries, and they occupy the largest share—40 per cent—of global exploration investments.

Canada’s major mining companies do not match the scale of their primary global competitors, mainly transnational diversified companies from Australia, South Africa, the United Kingdom, the U.S. and Brazil, which have grown in recent years, mainly through consolidation. As recently as 1996, there were 28 major diversified mining conglomerates in the world. Today, that number has been almost halved, although the market capitalization of these powerhouses has nearly quadrupled. The evolution of Canadian mining corporations has favoured a wider array of more moderately sized firms that have grown mostly from among the juniors. Recently, two of Canada’s major mining companies, Inco and Falconbridge, were snapped up by the international “super majors.”

OPPORTUNITIES AND CHALLENGES

DEPLETED MINERAL INVENTORIES

The persistently low commodity prices over the last decade resulted in curtailed mineral exploration activity. It is therefore not surprising that the national inventory of mineral deposits has been depleted. For example, at 6 per cent in 2000, Canada ranked fifth in world mine production of gold, behind South Africa, the U.S., Australia and China. In 2004, Canada’s share of production had fallen to 5.3 per cent, dropping the country to seventh place in the world.8 Chart 8 illustrates the persistent decline in proven and probable base metal reserves over the past 25 years. As mines closed, no new mine capacity was created to replace their ore deposits. At the same time, new mines were being developed in other countries, some by Canadian companies, because the overall cost structure in those countries was lower. Today, Canada must stimulate mineral exploration to replenish its reserves; this is critical to sustaining the country’s mining sector and meeting increased global demand.

The odds of finding a prospect that will eventually become a mine are low, and more than a decade of work may be required to take a mineral discovery to the status of a producing mine. Moreover, the investment required to support the complete mine life cycle—exploration, infrastructure development, mine construction, production, mine closure and site reclamation—is considerable.

Exploration is equivalent to scientific R&D in other businesses, and through the years, Canada has become a global leader in mineral exploration. The sector’s strengths are its entrepreneurial culture, its system for raising risk capital, its technology, its expertise and its best practices.

A resurgence in commodity prices that started around 2002 (see Table 10) triggered a dramatic rise in mineral exploration around the world. Significant investment in this activity ensued, with Canada benefiting as a major target for exploration. Recent worldwide exploration has focused on late-stage prospects (those already discovered) because they are the best means to accelerated mine development. (See Chart 9.) Mine-site (close to an operating mine) and late-stage forms of exploration offer a higher probability of finding new ore.

Grassroots exploration—preliminary activity that is conducted to determine the existence, quality, location and extent of a resource—carries the largest degree of risk, but it is critical to the long-term sustainability of the sector. World-class deposits have been discovered within the last decade: diamonds in the Northwest Territories and nickel in Labrador. Once a potentially mineral-rich region has been identified, more intensive exploration uncovers multiple economic deposits. The set-up of mines and their associated infrastructure then follows.

8 Goldsheet Mining Directory, “World Gold Production.”
The major companies (those with operating mines) have historically dominated exploration. But since 2002, exploration—and especially grassroots exploration—has been led mainly by small junior companies. This trend can be attributed to many factors, including a paring back of exploration budgets by the majors during lean commodity-price cycles and an increased tendency toward company consolidation. The rationalization and budgetary shrinkage that typically follow a merger free up talented exploration geologists trained by the major companies. Those unemployed geologists then often open or move to work for small, technically experienced junior companies. This transfer of expertise is unlikely to be sustainable in future, given the declining number of major Canadian companies. But because the juniors play such a key role in the sector, development of exploration by these small companies deserves particular stimulation.

DECLINING INVESTMENT IN GEOSCIENCE

A central part of the exploration process is a clear understanding of a region’s geological potential. This understanding traditionally flows from the efforts of government scientists dedicated to gathering basic geological data, interpreting them and creating maps in support of private sector exploration efforts. The deficit pressures on government budgets of the 1990s led to reductions in the funding of basic geology, with a resultant loss of expertise and data important to grassroots exploration companies in Canada.

<table>
<thead>
<tr>
<th>Table 10</th>
<th>Metal Prices</th>
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</thead>
<tbody>
<tr>
<td>Metal</td>
<td>Unit</td>
</tr>
<tr>
<td>Copper, electrolytic COMEX</td>
<td>$/lb.</td>
</tr>
<tr>
<td>Gold, London final</td>
<td>$/troy oz.</td>
</tr>
<tr>
<td>Lead, London Metal Exchange, cash</td>
<td>$/lb.</td>
</tr>
<tr>
<td>Nickel, New York dealer, cathode</td>
<td>$/lb.</td>
</tr>
<tr>
<td>Silver, Handy &amp; Harman</td>
<td>$/troy oz.</td>
</tr>
<tr>
<td>Zinc, London Metal Exchange, special high-grade</td>
<td>$/lb.</td>
</tr>
</tbody>
</table>

Source: Mining Association of Canada.
CONSOLIDATION: RISKS OR OPPORTUNITIES?

With the recent boom in commodity prices driving a revitalization of the mining sector worldwide, consolidation in the sector (also assisted in part by persistently low interest rates) has once again become prevalent. In several high-profile cases, major historic Canadian firms have been purchased by foreign mining companies—leading to questions about whether the Canadian mining sector can survive in its current form and about its ability to compete globally.

With the recent boom in commodity prices driving a revitalization of the mining sector worldwide, consolidation in the sector has once again become prevalent.

Canada’s largest mining companies—Inco and Falconbridge—have been swept up in the consolidation wave, and companies based in Europe, the U.S. and South America continue to show interest in purchasing high-quality Canadian companies. The latter will either be bought or buy others in this wave. Canada risks losing head offices in this process, but the probability of retaining major regional offices that take advantage of local expertise is high. In addition, displaced executives from those offices would fit the bill as the high-quality talent required to augment existing small companies or to start up new ones.

The current consolidation trend is partly the result of demand for commodity exposure from large, diversified, generalist investment funds. Managers of these funds choose to be able to allocate a percentage of their portfolio to commodities. They want exposure to a diversified basket of commodities in the form of liquid assets—that is, large-market capitalization—that permit easy access and divestiture. The managers are not particularly interested in spending a great deal of time and effort allocating portions of their assets to specific companies that specialize in a single metal. Consequently, large diversified mining companies tend to be more attractive to large institutional investors than single-product mining companies.

The global mining arena is dominated by four diversified world mining companies, collectively known as the “super majors”: BHP Billiton, Rio Tinto, Anglo American and CVRD. Each has a market capitalization exceeding US$50 billion. Just a few years ago, the top three had a market capitalization of greater than US$20 billion, and CVRD had a market capitalization greater than US$10 billion. If the remaining eight largest firms from 2003 (WMC, Inco, Xstrata, Phelps Dodge, Noranda, Falconbridge, Teck Cominco and MIM) had merged, the combined entity would still have been smaller than Anglo American.9 The actual consolidation activity of the past two years has transformed those “remaining eight” into five.

The world’s largest companies are traded chiefly in New York and London, where the market capitalization (and hence liquidity) is greater than that of the Incos, the Norandas and the Falconbridges of Canada. Although these three mining firms were considered large by Canadian standards, they were quite small in the international arena. It might be argued that these companies, being the premier Canadian mining companies, grew complacent about their financial liquidity with respect to the international investment community. After all, they were the biggest in Canada and well known around the world in their specific commodity. And so other large players, quick to realize the demands of the investment community, struck first and launched hostile bids to acquire these Canadian firms with the goal of significantly increasing their own diversity, size and liquidity. In essence, these international firms picked up on and acted on the demands of their investor or shareholder base. (See box “What Drives the Consolidation Trend in Mining?”)

The TSX and TSX Venture Exchange are still among the best places in the world to raise mining capital; however, the major mining houses prefer listing with

9 Keevil, Mining in the Next 20 Years.
the New York Stock Exchange (NYSE) and the London Stock Exchange (LSE), where all the largest investment funds go to shop. Long term, the NYSE and LSE are the “big boards”—the places where billions of dollars in funding originate. The Canadian marketplace is far too small to support the capital requirements of the super majors. To diversify their risk exposure and increase their shareholder base on an international scale, most large Canadian companies will also seek to raise a portion of their capital in overseas markets. 

Sound Financial Underpinnings
At the beginning of 2006, four Canadian companies could be found among the world’s top 15 mining corporations, by market capitalization. Each had a market capitalization exceeding US$12 billion. Interestingly, the combined market capitalization of the top five mining companies in Canada at that time was greater than the market capitalization of the top 27 participants just 20 years ago. These top five Canadian firms include the world’s largest producers of gold, uranium, zinc and nickel, and the world’s second-largest producer of aluminum.

What Drives the Consolidation Trend in Mining?

1. The lead time to put a mine into production from discovery is now between seven and nine years. The lack of exploration over the past 10 years has limited the opening of new mines. It is thus quicker and less expensive to acquire existing production to meet customer demand than it is to explore, obtain permits and build new mines.

2. Mergers and acquisitions activities do not typically generate growth in the form of new production; rather, they consolidate production into fewer hands. Mergers and acquisitions merely reshuffle the asset mix or portfolios of companies to allow them to buy better assets and discard older and less profitable mines. This enhances the quality of their portfolios and hence their ability to survive the next downturn in commodity prices.

3. Most generalist investment funds require market capitalization in excess of US$10 billion before they can invest in a firm. This requirement is driven primarily by the need for stock liquidity and additional value for shareholders. In 2005, the market capitalization of the entire mining sector was estimated to be less than US$450 billion.

4. Increased size typically reduces the perception of risk attached to major companies. Larger companies are better positioned to absorb the rising social and environmental costs of mining, and to provide assurances to governments that they will be able to honour the commitments and obligations that they entered into during the permitting phase. Increasingly, many environmental costs (environmental impact statement costs, bonding, etc.) and social costs have to be met upfront before a project can begin operating and generating revenue. Permitting and social interaction are as much games of patience and perseverance as they are of cost. Large, diversified players can afford to wait while they navigate the social, environmental and technological hurdles to bring a project into production.

5. The larger, diversified mines tend to have more geographically diverse operations across numerous commodities. This diversification of risk provides earnings stability and hence reduced credit risk and cost of capital, thereby enhancing project returns.

6. Increased control of mineral production by fewer players is generally believed to result in supply behaviour that is more rational, giving rise to better long-term prices and profitability. Base metals (typically owned by larger, more diversified companies) have historically provided returns superior to those of gold investments. Although base metal deposits have been larger and longer lived than gold deposits, the top 10 base metal producers control between 65 and 75 per cent of the market. Despite a number of large mergers over the last three years, the top 15 international producers in the gold industry (before the Barrick takeover of Placer Dome) were generating about 40 per cent of the new mine supply each year.

7. An inevitability in mining is that most of the near-surface and highest grade deposits have already been discovered or exploited. New technologies are allowing what were once historically marginal deposits to be mined economically. As time progresses, grades decline and unit costs rise. To combat the latter, companies need to buy larger equipment and improve their economies of scale.

Since the beginning of 2006, two of the major Canadian producers have been taken over by members of the super majors, creating considerable uncertainty about the prospects for the remaining large companies and for firms that service the sector. Whether the remaining Canadian mining giants are sufficiently aggressive and their financial backers sufficiently risk tolerant to permit them to escape other international takeovers remains to be seen. Takeover avoidance will require that these firms grow by making their own acquisitions of major assets in competition with other heavyweight companies around the globe.

Canadian companies may no longer dominate the mining arena in terms of size, but several, including the Canadian divisions of the global super majors, retain the dominant producer position in their own commodity grouping. Should the opportunity arise, they have the ability to develop and build a multi-billion-dollar project. And despite the recent rationalization, entrepreneurial spirit and an excellent capital base continually bring new players to the market.

Canadian companies may no longer dominate the mining arena in terms of size, but several retain the dominant producer position in their own commodity grouping.

Canada now hosts approximately 40 mining companies with a market capitalization in excess of US$1 billion. Many of these companies did not exist 10 years ago, a fact that testifies to the resilience and depth of the Canadian capital markets. Consolidation within this mid-size group, as well as within Canada’s majors, appears to be a logical development that will enhance the sector’s ability to assure its financial security.

A Sensible Division of Expertise

Although major companies discover a significant number of ore deposits, their exploration cost structures cannot compete with those of the lone prospector or individual entrepreneur. The combination of significant exploration expertise in Canada and low barriers to entry into the exploration game has led to some of the world’s greatest mineral deposits being found by junior exploration companies, entrepreneurs and lone prospectors.

The majors, with their greater operating expertise and access to capital markets, then buy into the project and put the mine into production.

Loss of a head office may actually spawn several new ventures in a continuing cycle of regeneration.

Although mergers and acquisitions result in larger, better capitalized companies with more extensive resources to build and expand operations on an international scale, consolidation has its pros and cons:

- **Natural industry regeneration:** The average premium in an unsolicited takeover is typically on the order of 25 to 30 per cent. The acquiring company must then generate extensive savings to illustrate to its shareholders that real synergies between the firms justify the transaction, with resultant accretions in earnings or cash flow, or both. The demise of head offices and management teams typically triggers the formation of new exploration companies centred on the discharged personnel, who then advance long-forgotten or otherwise mothballed projects from within the merged companies’ asset portfolio. Thus, loss of a head office may actually spawn several new ventures in a continuing cycle of regeneration.

- **Synergies:** A global mining company typically comprises a head office, a series of regional offices managing a portfolio of assets, and dispersed operations. The major mining companies all use similar equipment and infrastructure, and so opportunities to generate additional savings at the operating level may be significant. One example is the synergy between the operations of Inco and Falconbridge, which are in close proximity in Sudbury, Ontario.

- **Protecting a stake in R&D:** Consolidation and closure of head and regional offices can generate significant overhead savings for a new entity; however, these savings are typically achieved at the expense of research, technology and exploration budgets. The global economies of scale and market access open to large mining companies make those companies more likely to engage in in-house R&D. In 2004, Canadian mining companies invested US$204 million in R&D. Post-merger spending at a combined Inco, Noranda
and Falconbridge would have been interesting to observe, considering that their individual expenditures in 2004 were US$37.8 million, US$25.2 million and US$18.3 million, respectively, for a total of US$81.3 million. Similarly, the R&D efforts of these companies under their new owners will serve as a useful indicator of management intentions.

The outcome of future industry consolidation with the greatest potentially negative consequences for Canada is the disappearance of the super majors’ exploration dollars. Those firms may opt to spend their exploration and capital dollars in countries with lower costs, lesser environmental regimes and better opportunities. Canada therefore needs to provide incentives that will encourage increased spending by the juniors and intermediates.

The expertise of the Canadian juniors in the discovery and extraction of almost all commodities has spanned the globe.

A greater risk may be the long-term erosion of Canada’s capital market base should other countries and exchanges (perhaps Australia’s, or London’s Alternative Investment Market) be able to replicate Canada’s financial strength with duplicate products or favourable tax treatment of exploration funding. Canada has become the world leader in mining finance and infrastructure because the tax structure provided by flow-through share financing favours the exploration sector.

The expertise of the Canadian juniors in the discovery and extraction of almost all commodities has spanned the globe. The largest mining companies still rely heavily on juniors to discover new deposits. Canadian mining and exploration firms not only handle the largest share of global exploration in Canada, but also dominate exploration in the U.S., South America, Central America, Europe and, most recently, Africa. So long as the capital base continues to help entrepreneurs raise funds for their exploration and discoveries, the mining sector should remain vibrant. (See box “Mining on the TSX.”)

Today, the super majors are beginning to concentrate their exploration efforts elsewhere. As a result, the production base may also start to shift elsewhere; however, expertise should remain in Canada as long as discovery of deposits and extraction of metals continue. For example, in a span of less than six years, Canada’s nascent diamond industry rose to the rank of third in world production and is currently supplying 15 per cent of the worldwide value in rough diamonds. Although the two operating mines are owned by foreign entities (which acquired the deposits from Canadian prospectors), those mines still provide significant opportunities for Canadians to strengthen their position in global mining. Canadian mining companies should retain financial leadership as long as they maintain their traditional expertise, key positions in the mining capital markets, and sufficient size and the financial capability to bid for and build major mines. If this happens, Canadian capital markets will continue to be an incubator of world-class mining companies.

### Mining on the TSX

The TSX is the seventh-largest stock exchange in the world and the third largest in North America, with a market capitalization of about US$1.600 billion in 2005. Mining companies represent 10 per cent of that value, and the listed companies constitute the largest peer group of mining firms in the world.

Mining issues on the TSX Venture Exchange were valued at CDN$17.5 billion, making up 53 per cent of the total exchange, at the end of 2005.

The decision by Australia’s Normandy Mining (now part of Newmont) to list in Canada was in part driven by the enhanced liquidity provided by the Canadian capital markets. The average time needed to trade Normandy’s market capitalization in Australia was one-and-a-half years, compared with 120 business days for comparable North American companies. Canada outranks all major exchanges in the world for mining equity, raising 41 per cent of all mining equity capital in the world in 2005. The closest competition came from Hong Kong, with 32 per cent of global equity financings. The TSX Venture Exchange completed more equity financings for mining interests than all the other exchanges in the world combined.

ENVIRONMENTAL IMPACTS

The very nature of mining poses potentially significant risks to the environment. In particular, large quantities of fine rock particles from ore processing (tailings) and coarse waste rock are deposited on the landscape near the mine. The mine excavations and waste deposits and their potential chemical contaminants can have adverse effects on wildlife and their habitat, on human use of land and water, and on vegetation, terrain and air quality.

From majors to juniors, not all companies have the same capacity to provide excellent environmental stewardship.

Two adverse impacts of mining have drawn widespread attention in the last two decades: the legacy of old mines, abandoned when environmental awareness and acceptance of responsibility were lacking; and a series of tailings impoundment failures and spills through the 1990s that caused significant environmental damage and attracted worldwide media attention.

The reputation of the Canadian mining sector still suffers from the legacy of these past detrimental environmental impacts. Mining’s interaction with the environment attracts critical attention from environmental groups and media even as evidence mounts regarding successful precautionary planning, mitigation of environmental risks, and reclamation and monitoring. Industry and governments share a strong interest in demonstrating the successes of responsible stewardship and taking responsibility for failures to protect the environment.

Environmental excellence has been prominently recognized by the majors as both an ethical and a business priority in mining development. However, from majors to juniors, not all companies have the same capacity to provide excellent environmental stewardship. Industry and governments share a responsibility to ensure that all companies, regardless of size, are motivated and equipped to strive for environmental excellence. One misdemeanor on the part of a truant explorer or mine operator has significant potential impact on hard-won credibility with the public and investors. Policy, regulation and voluntary initiatives will continue to play a vital role in ensuring that Canadian companies excel at meeting both environmental and social responsibilities at home and abroad.

The sector’s intentions will be challenged further by the fact that new mining development in Canada will be predominantly located in remote and sensitive frontier regions. Companies will have to undergo increasingly close scrutiny, so their standards of environmental performance will need to be consistently high, regardless of where projects are located. And of course, new mining development elsewhere in the world will involve Canadian companies in sensitive environmental and social situations abroad.

Protection of the Canadian environment is understood to be a shared objective of governments, the mining sector and society.

ENVIRONMENTAL ASSESSMENT

Environmental assessment is defined as “a planning tool that requires early identification and evaluation of all potential environmental consequences of a proposed undertaking and its alternatives, combined with a decision-making process that attempts to reconcile any approval of the proposed development with environmental protection.”

Protection of the Canadian environment is understood to be a shared objective of governments, the mining sector and society. The environmental assessment process designed to meet this objective subjects proponents to significant costs. Industry has heavily criticized the complexity, differentiation, stability and intergovernmental conflict involved in environmental regulation by the provinces and territories. Confusion about and overlap in regulations between the federal and provincial jurisdictions seem to exist, and costly litigation

10 Castrilli, Environmental Regulation.
11 McMahon and Cust, The Fraser Institute Annual Survey.
has occurred, reflecting the potential inadequacy of regulations and regimes to manage the balance between environmental preservation and sustainable mining. Also, technological limitations restrict the ability to accurately predict, assess and mitigate the possible impacts of mining projects. Continually incorporating new and better technology into the process will help to ensure that the sector meets its objectives and continues leadership for Canada in environmental stewardship.

**British Columbia is the most highly regulated province in Canada. It has 38 acts and regulations that fall under the jurisdiction of the Ministry of Energy and Mines.**

The Canadian Environmental Assessment Agency maintains that “environmental sustainability is emerging as a basis for competitiveness, and consumers, producers and investors are responding to this change. The efficiency and effectiveness of an environmental assessment process can contribute to a positive view of the country.” In light of the criticisms mentioned earlier that relate to the burdens of time, cost and accuracy, the Agency recommends a “timely and predictable environmental assessment process” to promote Canada’s international competitiveness.

The Fraser Institute’s Policy Potential Index (PPI) attempts to determine the most investment-friendly regulatory environment for mining companies. In the 2005–06 PPI survey of 322 international mining companies that had invested more than $2 billion in new projects in 2005, Nevada achieved the top spot for mineral policies for the sixth straight year. Alberta, Manitoba, Quebec and Saskatchewan all placed in the top 10. Of 64 jurisdictions, British Columbia ranked 23rd, an improvement over 44th place in 2004–05.

British Columbia is the most highly regulated province in Canada. It has 38 acts and regulations that fall under the jurisdiction of the Ministry of Energy and Mines.

The province appears to suffer uncertainty on many fronts: Aboriginal land claims, proposed parks and park boundaries, and environmental regulations. Regulatory duplication and inconsistency are not uncommon.

Recent political stability and government support for revitalizing the B.C. mining sector, as expressed in the 2005 BC Mining Plan, appear to have been significant factors in a resuscitation of the province’s mining sector. Exploration success in B.C. has generated a string of new mining projects that now await environmental assessment and permitting. The efficiency and effectiveness of the B.C. environmental assessment process will determine the speed with which new mines can be activated in response to market opportunities.

**Recent political stability and government support for revitalizing the B.C. mining sector appear to have been significant factors in a resuscitation of the province’s mining sector.**

**Cumulative Effects**

Concerns are often raised about the long-term effects on the environment that may occur as a result of not only a single action but also the combined effects of each successive past, present and foreseeable future action. The impacts from a single development may not be significant on their own but could become significant when combined with other impacts.

As mining development continues in more remote regions, environmental assessments will have to consider these cumulative effects. A Cumulative Effects Assessment (CEA) is now required in federal legislation when an action is subject to a federal environmental assessment under the Canadian Environmental Assessment Act. The Alberta Environmental Protection and Enhancement Act and the British Columbia Environment Assessment Act also include provisions for the assessment of cumulative effects. CEAs will likely continue to gain in importance, particularly in Canada’s North.

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13 McMahon and Cust, The Fraser Institute.

AN EMERGING CRISIS IN THE WORKFORCE

In *Prospecting the Future*, a study funded by the federal government’s Sector Council Program, a looming human resource crisis in the Canadian mining sector is identified. A critical shortage of physical scientists, engineers, technologists, technicians and skilled tradespeople is attributed to three factors:

- **Retirement** will remove a large segment of the mining sector workforce in the next decade. The age of that workforce already exceeds the age of the Canadian workforce in general, making the loss of these workers even more threatening.

- **Competition for workers** exists within and outside the mining sector during strong economic times like the present. Workers with transferable skills are presented with attractive options in many domains.

- **The mining sector’s stereotypic image and cyclical nature** have historically impeded recruitment.

All occupations in Canada are poised for critical future shortfalls, but skilled tradespeople, semi-skilled workers and miners (where only 7.5 per cent of employees are under 30) will be particularly scarce.

Currently, half of the mining workforce is between the ages of 40 and 54, compared with only 39 per cent of the overall Canadian workforce. The sector therefore faces a significant reduction in available workers and expertise when this group retires. And, even more disturbing, 40 per cent of mining employees state that they plan to do so some time during the next 10 years. All occupations in Canada are poised for critical future shortfalls, but skilled tradespeople, semi-skilled workers and miners (where only 7.5 per cent of employees are younger than 30) will be particularly scarce. (See Chart 10.) Attracting highly skilled, job-ready, adaptable workers to replace anticipated losses is already proving difficult.

**Engaging Aboriginal People**

Engaging Aboriginal people in the mining sector is a priority. In 1,300 communities across Canada, Aboriginal people make up more than 20 per cent of the population, and about 1,100 of those communities are located within 200 km of an operating mine or advanced resource operation. The total estimated Aboriginal workforce across Canada is approximately 700,000—a number that is expected to grow to almost 800,000 by 2011.

Mining companies are trying to increase the number of Aboriginal employees on staff, but this group may be underrepresented in the more highly skilled positions. Aboriginal workers are often hired for entry-level jobs that do not require certification. But this practice is becoming more difficult as even entry-level jobs now require a level of technological sophistication that can be obtained only through post-secondary technical training.

As the Aboriginal presence in the workforce grows, larger numbers of these workers may begin to seek career advancement and to pursue education and training opportunities with a view to moving into managerial and skilled-labour positions. In recent years, some mining companies have been recruiting and retaining significant numbers of Aboriginal workers. Examples include uranium and diamond mining operations in Canada’s North.

**Mining companies are trying to increase the number of Aboriginal employees on staff, but this group may be underrepresented in the more highly skilled positions.**

Although only 5.3 per cent of the mining workforce is Aboriginal, this share compares favourably with that in the Canadian workforce overall, at just 2.6 per cent. This relatively higher participation in this sector is likely the result of the proximity of Aboriginal populations to mining operations, but is also due to a relatively new trend in Impact and Benefit Agreements between Aboriginal groups and mining companies. These agreements represent a useful way to increase Aboriginal engagement in new mining projects.

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16 Ibid.

17 Ibid.
However, Aboriginal success in mining can be further enhanced by improved education levels. Despite their “low-tech” image, mining operations and the exploration ventures that precede them require high levels of technological sophistication, and management and scientific understanding. But high school completion rates on reserves close to potential new mines are below the national average, a fact that is causing these Aboriginal populations to miss out on prime opportunities.

In 2001, 48 per cent of all Aboriginal students in Canada failed to complete secondary schooling.\textsuperscript{18} Furthermore, in that year, only 41.4 per cent of Aboriginal people 15 years of age or older living on reserves had completed high school, compared with 68.7 per cent of the general Canadian population.\textsuperscript{19} Federal, provincial and Aboriginal representatives have been collaborating to find solutions, but despite some progress, serious issues remain.\textsuperscript{20} Until these education issues are resolved, Canada’s Aboriginal people cannot fully participate in the skilled labour force.

To improve the situation in Aboriginal education, the federal and Aboriginal governments need to develop creative solutions, perhaps in cooperation with provincial education departments.

This relative lack of labour force participation is partly a consequence of an education system that is failing reserve communities. Numerous organizations and commentators have condemned the appalling lack of educational achievement among Canada’s Aboriginal populations and have called upon the federal government, which provides the funding, to take decisive and urgent action to improve the quality and accountability of the education systems that serve these populations. Education at all levels, from elementary to post-secondary, has been criticized.\textsuperscript{21}

The mining sector can help with recruitment programs and on-the-job training, but the basic need for students to complete their courses is in the hands of the reserve education system, now predominantly led by band organizations and the federal government. The latter is responsible for funding education on reserves, and the bands typically deliver the service in accordance with provincial core curricula.

To improve the situation, the federal and Aboriginal governments need to develop creative solutions, perhaps in cooperation with provincial education departments, which have significant expertise in education delivery. A model involving the private sector is currently operating in Alberta and could form one of a suite of

\begin{itemize}
\item \textsuperscript{18} Mendelson, Aboriginal Peoples and Postsecondary Education, pp. 10–12.
\item \textsuperscript{19} Auditor General of Canada, 2004 Report, pp. 7, 10.
\item \textsuperscript{20} Ibid., pp. 10–17; Indian and Northern Affairs Canada, Education Action Plan, pp. 1–4, 17, 18; Assembly of First Nations, First Nations Action Plan, pp. 1–9; Ibbitson, “Aboriginal Debate.”
\end{itemize}
solutions to enhance governance and transparency in the system, while delivering improved results. In the case of the Sunchild Learning Community, the private sector’s interest in competent and successful workers is helping focus the attention of its government partners on achieving improved outcomes. The project is still relatively new, but results to date suggest that it is a promising model that warrants further examination.22

Women accounted for only 13 per cent of all employees in mining in 2003, substantially below the national average.

Engaging Other Populations
Less than 3 per cent of workers in the mining sector are members of visible minorities. This proportion is well below the national average of 12.6 per cent. Furthermore, Statistics Canada census data from 2001 indicated that the proportion of recent immigrants working in the mining sector was 0.5 per cent, markedly lower than the 1.9 per cent of recent immigrants employed in the Canadian economy as a whole.

Women accounted for 13 per cent of all employees in mining in 2003, substantially below the national average (46.9 per cent). Only 14.6 per cent of mining employers surveyed for a study sponsored by the Mining Industry Training and Adjustment Council23 said that they had recruitment policies that targeted women.

Improving Participation in Education Programs
The enrolment of students in mining education programs (engineering, geology, metallurgy and technology) fell dramatically during the last decade,24 reflecting the sector’s down cycle, its poor safety image and its image as a sunset industry. From 1998 to 2002, 40 per cent fewer undergraduates enrolled in mining-related programs than in previous years. Geological, materials, metallurgical and environmental engineering programs showed similar reductions—at the same time that overall engineering enrolments at Canadian universities rose by 19 per cent. (See Chart 11.) In spite of falling enrolments during the last decade—and in contrast to the situation in the U.S., Australia and Europe—Canada has been fortunate not to experience the loss of any of its nine university-based mining schools.

Chart 11
Change in Engineering Undergraduate Enrolments, 1998 to 2002
(per cent)

Source: Mining Industry Training and Adjustment Council.

22 Greenall, Formative Evaluation.
23 Mining Industry Training and Adjustment Council, Prospecting the Future.
24 Scoble, “The Crisis.”
MEETING SOCIAL RESPONSIBILITIES
Several factors, particularly progress in civil society and community empowerment, have recently underlined the mining sector’s need to meet its social responsibilities in and around mines and their communities, at home and abroad. The sector is moving toward new, deeper relationships between mines and society, with an increased focus on local impacts and benefits to mine communities. And so two key questions arise: What are the sector’s social responsibilities? And how does the sector relate to other stakeholders?

One interpretation of sustainable development as applied to mining considers environmental and social responsibilities to be integrated with economic development and accountable decision-making. The challenge is to adapt the corporate culture to achieve new levels in economic, environmental and social performance. Priority actions to meet this challenge should include monitoring and reporting on performance, learning through case studies, and using voluntary initiatives to evolve best practices.

Several factors have recently underlined the mining sector’s need to meet its social responsibilities in and around mines and their communities, at home and abroad.

Sustainable development finally became a major issue for the mining community in 1998, when nine major transnational mining companies began to collaborate on the Global Mining Initiative. That project produced a blueprint for transition to sustainable development in mining, and its learnings and recommendations were highly valuable. Unfortunately, the follow-up from the project has been disappointing. Nevertheless, the Mining Association of Canada continues to use its Towards Sustainable Mining initiative with some effect to drive change within the sector.

Companies have varying capacities to respond to the many drivers of sustainable development. For example, peer pressure exerted through the Mining Association of Canada and the Prospectors and Developers Association of Canada can drive mining to minimize negative impacts while enhancing positive benefits to corporate stakeholders. Capacity building is important for junior companies—particularly with regard to engagement with local communities. Juniors are usually the first into an area, and their performance significantly affects relationships and expectations throughout the mining cycle.

Having a damaged reputation is hazardous at a time when obtaining a “social licence to operate,” or community buy-in to a project, is becoming mandatory.

Reputation damage stands out among other risks for mining companies and investors. It poses a significant concern because it can affect access to land, community relations and investor confidence. Having a damaged reputation is hazardous at a time when obtaining a “social licence to operate,” or community buy-in to a project, is becoming mandatory.

Recently, external benchmarking initiatives that attempt to rate company performance have emerged. Investors and fund managers are using them to screen investment targets on their environmental and social policies and performance. The Dow Jones Sustainability Index and the United Kingdom’s FTSE4Good Index are among the most advanced of these benchmarking tools. A more recent scheme is the Citigroup Sustainability Mining Index. It aims to “take a broad view of sustainable development that encapsulates not only sustainability governance and human rights, health, safety and environment . . . but also commodity issues, country risk aspects, mine development prospects, and companies’ ability to access capital.” This novel and extended view of sustainability is strongly oriented to valuation on behalf of the investor.

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27 Citigroup Research, Towards Sustainable Mining.
Mining companies have responded to this pressure from investors. Led by such majors as Teck Cominco and Falconbridge, the companies have moved beyond simply defining their environmental policies to including voluntary best practices. This culture of environmental commitment needs to be spread to the smaller companies, aided by Mining Association of Canada and Prospectors and Developers Association of Canada initiatives.

Corporate social responsibility initiatives in the mining sector vary from international agreements and programs to national policy, legislation and regulation. They also include financial lending sector and investment requirements (e.g., Equator Principles). The resulting benefits are shared by industry (increased flexibility and certainty, plus improvements in public image) and governments (cooperative efforts to meet environmental goals).

Exploreation and mineral development will gain momentum only if industry can improve its trust partnership with communities throughout the mine life cycle.

Reaction to these efforts has been mixed. Some members of the mining sector have criticized the initiatives because of a perceived threat of government regulatory follow-up. Others view voluntary initiatives as a cost-effective approach to compensate for weak, reactive regulatory systems. Fostering these measures and drawing the commitment of a diverse range of companies in the mining sector are worthy pursuits.

Communities and Aboriginal Peoples

Recognition is growing for the notion that mineral development must be built on a foundation of trust between the company and the affected communities—in Canada, this particularly means Aboriginal communities. Exploration and mineral development will gain momentum only if industry can improve its trust partnership with communities throughout the mine life cycle. Such improvements require that awareness of social and political issues be spread through the corporate culture. One route to integration runs through the environmental assessment process, coupled with effective socio-economic assessment.

The current trend of building communication and partnerships in the form of Memoranda of Understanding and/or Participation (Impact and Benefit) Agreements with Aboriginal peoples is likely to accelerate. Governments appear to be encouraging engagement and agreement of this sort, independent of the environmental assessment process.

For the moment, these agreements (often confidential between the company and a particular Aboriginal group) have been confined to the mine development phase; however, they could be extended to the cycle of exploration activity. These agreements are not an alternative to government resolution of outstanding issues of rights and of use of lands and resources. Rather, they affect only the Aboriginal peoples associated with a particular project. A fundamental feature is typically the company’s recognition of traditional rights, title and interests in the project area. In return, Aboriginal peoples recognize the company’s right to explore and develop mineral resources in the area.

Agreements enhance partnerships in environmental stewardship by integrating Aboriginal values, concerns and priorities into the environmental management context. They make good business sense: Aboriginal traditional knowledge provides a wealth of information, from the acquisition of baseline data to the determination of valued components. And these agreements contribute significantly to the sustainability of Aboriginal communities.

Acquiring the social licence to operate from local communities means demonstrating corporate accountability, credibility and capacity while promoting a fair distribution.
of benefits to the community from the mining operation. A social licence to operate represents the community’s unwritten consent to responsible exploration, development and extraction of local mineral resources.

Exploration is the first point of contact; how the company exploration staff first engages with the community is critical. Project planning must ensure an early, integrated and comprehensive analysis of the relevant political, economic, social and technological factors. Finally, the management team has to adopt and support a holistic approach to exploration and mine planning that is dedicated to integrating community values and practices.

Workforce Health and Safety

Taking responsibility for the health and safety of the mine workforce and their associated communities is basic to the sector. In the last couple of years there has been a series of tragic mine accidents, notably in the U.S. and China. These accidents have been associated with underground coal mining, a particularly challenging operational environment.

The quality of life in mining camps requires closer assessment, particularly as “fly-in, fly-out” operations become more commonplace.

Canada is not without its tragic experiences of underground mining disasters, in both hard rock and coal mines. As recently as January 2006, 72 miners were rescued from an underground potash mine in Esterhazy, Saskatchewan. Overall, though, Canadian mining companies have good safety standards, and they exercise continuous improvement by emphasizing the need to be always vigilant.

The quality of life in mining camps requires closer assessment, particularly as “fly-in, fly-out” operations—where the workers are brought to the remote area for a specified period and then returned to their homes—become more commonplace. With this method of workforce management, small isolated resource towns (that are eventually abandoned at the end of the mine’s life) need not be built. New studies into the subject should address the basic physical and mental health of this commuter workforce, as well as the resilience of their home families and communities under potential stress from separation, particularly in remote Aboriginal communities. Mining development has a significant opportunity to bring health benefits to communities and alleviate poverty, especially in northern Canadian and developing world locations. However, it is important to understand the implications of these developments on communities.

GOVERNMENT AND INDUSTRY ACTIONS TO STRENGTHEN THE MINING SECTOR

ENVIRONMENTAL BEST PRACTICES

Canada’s mining sector is active in implementing environmental best practices. This has included implementing the provisions of the Metal Mining Effluent Regulations created under the federal Fisheries Act in 2002. These regulations impose effluent discharge limits and apply to about 100 metal mines operating in Canada. They also require environmental effects monitoring to determine whether mine effluent is affecting fish, fish habitat or the use of fisheries resources. The “no net loss” principle established by the Department of Fisheries and Oceans, while not necessarily favoured by industry, tries to achieve sustainability. The principle recognizes that loss of fish habitat stemming from mining operations can be compensated by future fish habitat gain.

Direct costs for each mine tailings impoundment failure in recent years have ranged between $70 million and $150 million.

Tailings management—a business risk inseparable from mining—is another area of concern. Direct costs for each mine tailings impoundment failure in recent years have ranged between $70 million and $150 million. The Mining Association of Canada formed a Tailings Working Group that was tasked with developing guidelines for the safe and environmentally responsible management of tailings and with promoting awareness of effective facility management. The resulting statement of best practices has

30 Gardiner and Gladwin, “Managing Tailings.”
been recognized internationally for the high standards it has set for the sector. The goal is for Mining Association of Canada members to self-audit against these and other performance indicators, and for some form of third-party verification to eventually follow.\textsuperscript{31} (See Table 11.)

A joint government–industry project is tackling the problem of metal leaching and acid rock drainage that can occur at abandoned mines because of sulphide minerals and their products in mine waters. This environmental liability is the largest facing the mining sector—and, to a lesser extent, the public—from abandoned mines. The Mine Environment Neutral Drainage Program implemented by Natural Resources Canada has reduced the liability by at least $400 million through a research investment of $17.5 million.\textsuperscript{32} However, the work is not complete; essential research to resolve significant issues is still ongoing.

The Britannia Project in British Columbia is another initiative that has significant potential to create an improved social image for mining. The project aims to transform an historic mine site on the Sea to Sky Highway—a site with a significant legacy of adverse environmental impacts—into one of Canada’s preeminent sustainability-focused research, education and entertainment destinations.

The Voisey’s Bay nickel mine and mill in Newfoundland and Labrador is a recent example of the sector’s growing commitment to incorporating Aboriginal traditional ecological knowledge into its operations. Inuit traditional knowledge is integrated into the continuing “monitoring and management of environmental performance at Voisey’s Bay.”\textsuperscript{33} The Canadian Environmental Assessment Agency cites Voisey’s Bay as an example of how a combination of expertise—government, traditional and other—contributes to a comprehensive environmental review.\textsuperscript{34} Industry and governments have also created the large-scale National Orphaned/Abandoned Mines Initiative to identify and remediate older orphaned and abandoned mines.\textsuperscript{35} These and similar efforts could be intensified.

The Voisey’s Bay nickel mine and mill is an example of the sector’s growing commitment to incorporating Aboriginal traditional knowledge into its operations.

The participation of Aboriginal peoples in the environmental assessment process is critical to its effectiveness, but the first order of business is to enhance the ability of these communities to participate. To that end, Indian and Northern Affairs Canada helped develop the Environment Capacity Development Initiative to support First Nations, Innu and Inuit groups in their efforts to promote environmental stewardship consistent with the principles of sustainable development. The goals of the initiative are straightforward: to improve public health and safety, to protect the natural environment, and to support the development, management and use of Aboriginal traditional knowledge.\textsuperscript{36}

**STRENGTHENING EDUCATION AND SKILLS**

Companies such as Syncrude, Cameco, Diavik and BHP Billiton have successfully implemented human resource initiatives related to school programs, essential skills workplace training, and company leadership programs. At the Ekati diamond mine in the Northwest Territories, for example, BHP Billiton established a Workplace Learning Program to bring workplace learning, Aboriginal content, and personal and community interest together in a program that can be customized for individuals. It teaches the essential skills (reading, writing, math and oral communication) that workers need to pass trade entrance exams or take correspondence courses.\textsuperscript{37}

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32. Natural Resources Canada, “Mine Environment.”
36. Indian and Northern Affairs Canada, “Environment Capacity.”
Governments and industry have also responded to the 2005 study by the Mining Industry Training and Adjustment Council that identified the concerns around the recruitment of Aboriginal people, youth, women and minorities. To address these issues, the Council was transformed: its board of directors has evolved to include not just industry associations, but also representatives of the Aboriginal community, post-secondary educational institutions, organizations promoting women in non-traditional roles, and organized labour. The new entity, the Mining Industry Human Resources Council, has been tasked with a new mission: to provide comprehensive solutions to national human resource challenges facing the mining sector.38

Partnerships aim to develop comprehensive Aboriginal human resources training plans that cover basic skills, literacy and academic upgrading through job-specific training and apprenticeships.

A pilot program by Human Resources and Social Development Canada at the Voisey’s Bay mine in Newfoundland and Labrador is helping Aboriginal people develop skills to work in the mine. The five-year, $85-million Aboriginal Skills and Employment Partnership has brought together the Voisey’s Bay Nickel Company, the Innu Nation, the Labrador Inuit Association, the Labrador Métis Nation, and the Province of Newfoundland and Labrador. Partnerships such as these aim to develop comprehensive Aboriginal human resources training plans that cover basic skills, literacy and academic upgrading through job-specific training and apprenticeships.

Another series of partnerships across Canada has recently been driving other new mining education initiatives. In British Columbia, for example, the provincial government, industry and educational organizations at all levels are working toward forming the B.C. Mining Education Network, which uses existing resources to coordinate mining education, training and employment opportunities, and to build on past accomplishments.

Table 11
Vision of a Mining Sector With a Maximized Contribution to Sustainable Development

<table>
<thead>
<tr>
<th>The Worst of the Past</th>
<th>A Vision of the Future</th>
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<tbody>
<tr>
<td>Mineral revenues that are spent outside the public view for the benefit of a few</td>
<td>Mineral wealth spent transparently to support social and economic goals</td>
</tr>
<tr>
<td>Long-running disputes with landowners about compensation</td>
<td>Disputes resolved efficiently and fairly</td>
</tr>
<tr>
<td>Tariff and non-tariff barriers that deter developing countries from establishing downstream industries</td>
<td>A level playing field where free trade works more equitably</td>
</tr>
<tr>
<td>Mining development as a threat to protected areas and biological diversity</td>
<td>Mining development in appropriate places and as a source of revenue to ensure the protection of areas critical to biodiversity</td>
</tr>
<tr>
<td>Companies that set their own rules in protected enclaves</td>
<td>A shared system of laws and practices that applies to everyone</td>
</tr>
<tr>
<td>Government decisions taken privately, without accountability and based on poor information</td>
<td>Decisions taken publicly, after consultation with affected parties, based on clear criteria</td>
</tr>
<tr>
<td>Mining and recycling industries seeing each other as competitors</td>
<td>An integrated, complementary approach to management of materials in use</td>
</tr>
<tr>
<td>Consumers who have no idea of the source of the minerals they use</td>
<td>Consumers who know the source of the products they use and increasingly act on that knowledge</td>
</tr>
<tr>
<td>Mining development seen as a threat to Indigenous peoples’ cultures and societies</td>
<td>A mining sector that works in partnership with Indigenous peoples and communities</td>
</tr>
<tr>
<td>Frequent disputes and armed conflicts</td>
<td>Fair, equitable, and accepted ways of preventing and resolving disputes</td>
</tr>
<tr>
<td>Mining sector operations endangering worker and public health, and causing deaths</td>
<td>A sector that promotes improvements in public health</td>
</tr>
<tr>
<td>A legacy of ghost towns, poverty and pollution</td>
<td>Integrated planning for sustained post-closure environmental, social and economic benefits</td>
</tr>
<tr>
<td>Infrequent exchanges among a few stakeholders</td>
<td>Ongoing and inclusive dialogue among all stakeholder groups</td>
</tr>
</tbody>
</table>

Source: Adapted from the Mining, Minerals and Sustainable Development Project.
TAXATION AND REGULATION PROGRAMS

Various financial programs operated by both industry and governments have fostered an environment in which opportunities and technological advances have led to mineral discoveries and exploration success. The B.C. Mining Flow-Through Share Tax Credit program, for example, was recently extended to 2008. Federally, the Investment Tax Credit for Exploration (also known as “super flow-through”) has also been extended. These programs have had major beneficial impacts on the ability of companies to raise exploration funds. They have increased Canada’s share of exploration investment worldwide, and have helped to keep exploration investment and new discoveries within Canada. These instruments are the envy of companies in mining countries such as Australia, South Africa, Brazil, Chile and Peru.

IMPROVING GEOSCIENCE KNOWLEDGE

Under the significant budgetary pressures of the 1990s, governments across Canada reduced many of their routine data-gathering programs, including those that gather geoscience data. Given the importance of basic information to exploration activities, reinstatement of geoscience data gathering is critical to the redevelopment of Canada’s mining sector. In 2005, the B.C. provincial government fostered the expansion of geoscience data by providing a $25-million grant to establish Geoscience BC. This non-governmental organization is charged with facilitating the generation of geoscience data for the benefit of the mining and energy sectors.

SUMMARY

The recent rise in commodity prices signals a rebound for Canada’s mining sector. Domestic mineral exploration has already increased significantly, but a depleted domestic mine inventory can and must be restored beyond historical levels if the sector is to exploit the long-term growth in demand for metal and mineral commodities. Restoring the inventory will require greater exploration efforts than ever before.

GOING FORWARD

STIMULATE MINERAL EXPLORATION

Major companies finance their exploration activity mainly from income generated by their operating mines. Financing for junior companies comes from the financial markets or from joint ventures with major companies. Governments can play a significant role in supporting both groups of companies through tax policy, land use decision-making and access, and the permitting process.
Governments at all levels need to work with the financial markets to ensure that reporting protocols and regulations are coherent and transferable across Canada. Some regulatory agencies would need to cede control of certain functions to other regulatory agencies; this sort of coordination will minimize the time and money spent on compliance. For example, geoscientists are currently required to be registered in each province or territory in which they work in order to prepare documents for submission to the securities and financial institutions. Many geoscientists therefore choose to maintain registrations in multiple provinces. A single, nationwide registration for qualified geoscientists would simplify the regulatory process, ease their time and financial burdens, and ensure that a common set of standards are maintained across Canada.

Governments should simplify the process of securing permits while simultaneously ensuring full compliance and adherence to best practices. Industry should work closely with government agencies at all levels to develop a uniform permitting process that meets a rigorous set of guidelines agreed to by all stakeholders.

Canadian industry associations and governments should continue their efforts to lead in establishing safe and environmentally and socially responsible best practices for exploration. Canadian exploration guidelines, such as the Environmental Excellence in Exploration (E3) Best Practice Guidelines, should be promoted to all companies from the juniors to the majors, and to developed and emerging nations where Canadian firms are engaged.

A single, nationwide registration for qualified geoscientists would simplify the regulatory process, and ease their time and financial burdens.

Exploration and mine development in the coming years will depend on reinvigorating government funding of basic geoscience within government research departments and in academia. The resulting data and information will help determine the choice of exploration targets.

RENEW HUMAN CAPITAL

Recruitment of new workers must be a high priority. Government and industry initiatives targeted to Aboriginal people, youth, women and immigrants—and partnerships involving governments, industry and educational institutions—need to be fostered to increase enrolments in training programs. Fortunately, Canada retains a critical mass of academic support that can be rejuvenated and coordinated through prompt investment. Governments and industry should cooperate in that investment, possibly involving clusters for research and education networking.

Recruitment of new workers must be a high priority. Government and industry initiatives targeted to Aboriginal people, youth, women and immigrants need to be fostered to increase enrolments in training programs.

Mining companies must adapt their human resource policies so that older workers can continue to add value—perhaps through mentoring and flexible work arrangements. The sector’s large number of workers nearing retirement represents a significant wealth of knowledge, expertise and experience. Those attributes could be tapped for meaningful continuing contributions to the sector’s future. By exploring options to ensure the continued involvement of this group, useful ways to transfer skills and knowledge to new entrants could be found, and gaps in the workforce could be filled until new entrants are ready to lead.

With government support, industry must continue to develop improved employment and education opportunities for Aboriginal people to increase their participation in mining. Mechanisms such as Impact and Benefit Agreements with local Aboriginal bands and job-training programs at the facilities must be actively pursued. But a large part of the long-term sustainable solution involves preparing the Aboriginal population for the challenging roles that will be available. This would entail federal and Aboriginal governments working together to improve the on-reserve education system so that high school completion rates begin to approach

39 Prospectors and Developers Association of Canada, A Brief.
the national average. Both should also cooperate with the provincial education departments and the private sector to find creative solutions.

**Particular attention needs to be devoted to nurturing small and intermediate companies so that they can evolve into the next generation of Canadian majors.**

The fly-in, fly-out approach to work will become increasingly common in the mining sector because new mine development will likely occur in remote locations. The impact on the values, traditions and customs of Aboriginal communities that provide mining employees needs to be taken into account to ensure productive workforce development. And the quality of life in commuter mining camps will remain important recruitment and retention factors.

**SECURE FINANCIAL LEADERSHIP**

Particular attention needs to be devoted to nurturing small and medium-size companies so that they can evolve into the next generation of Canadian majors. To sustain competitiveness, the Canadian mining sector must foster its entrepreneurial spirit and capital base so that new players are continually added to the market. Companies must maintain key positions in the mining capital markets, and they must maintain sufficient size and financial capability to find and build major mines.

**CREATE AN R&D POWERHOUSE**

In cooperation with governments and academia, industry should establish a global centre of excellence in R&D on topics of critical interest to the Canadian mining sector. Such a centre would conduct world-class research and thereby support the development of a cadre of professionals who can sell their services anywhere in the world. Government support of academic research into mining and geoscience will attract more professors to these disciplines and will draw students interested in a vibrant and progressive mining sector.

**IMPROVE THE ASSESSMENT PROCESS FOR NEW PROJECTS**

The anticipated new stream of mining projects will need to be screened by environmental and socio-economic assessment processes that are considerably more efficient and integrated than those that currently exist. Full participation by affected communities should be encouraged and appropriate respect paid to traditional Aboriginal values concerning land so that projects obtain a social licence to operate. Ongoing issues related to Aboriginal title and rights should be proactively resolved.

Careful and effective assessment of environmental effects must be integrated into mine life cycle planning, and into the assessment and permitting process, from the outset. The environmental assessment process should account for cumulative effects, but without impeding proposed developments to which mitigating measures can provide adequate protections.

**MEASURE UP TO SOCIAL RESPONSIBILITIES**

Industry must promote voluntary initiatives while it negotiates the difficult transition to increased environmental and social responsibility. Achievement of truly sustainable mining—in which operations adequately reconcile mining’s adopted way of doing business with the principles of sustainable development—should be an objective for the longer term.

Both industry and governments need to devote adequate attention and resources to maintaining the health and well-being of the workforce. Assessments of the quality of life in mining camps will become especially important as fly-in, fly-out operations become more commonplace.
RECOMMENDATIONS TO BOOST MINERAL EXPLORATION TO OPEN NEW MINES

The Conference Board of Canada recommends that:

10. Governments support mineral exploration by providing tax incentives and establishing one set of rules and regulations that is coherent and transferable across provinces and territories.

11. Governments provide adequate funding to public laboratories and universities for the development of the geoscience information that is critical to exploration.

12. Governments and industry assess the cumulative environmental effects of new mining activities and take appropriate measures to minimize environmental impacts.

13. Industry engage with Aboriginal communities as economic and environmental stewardship partners. 🍀
• Canada has ample energy resources to help meet growing North American and global demands. But the energy sector will need to make significant investments and must address major challenges, including environmental issues and skills shortages.

• Oil sands will become the predominant source of oil but, to develop this resource, the industry will need to address water use and greenhouse gas (GHG) emissions.

• Expansion of natural gas supply will need to come from unconventional sources, such as offshore and northern frontier gas, coal-bed methane, and imports of liquefied natural gas.

• Canada has vast coal resources, and electricity generation is the largest single use of that resource in the country. But if coal is to be a major future source of energy, the coal industry will need to address major environmental problems, such as air pollution and GHG emissions.

• Electricity demand is expected to continue to grow, and additional electricity generation and transmission will be required either to meet domestic demand or to service the U.S. export market. While Canada’s electricity generation will come from a variety of sources, renewable energy will become more important as demand for “clean power” escalates due to pressures to reduce GHG emissions.

• There are currently some electricity transmission bottlenecks that will need to be addressed.

• Canada has the opportunity to become a clean energy superpower that would integrate the two policy goals of taking advantage of the country’s rich energy resources and addressing its environmental challenges. This vision can be achieved only through technological innovation.
The energy sector is a major driver of Canada’s economy and society. In addition to being essential to a high quality of life and a critical enabler of industrial activity, Canada’s energy sector makes substantial direct contributions to the national economy. The oil and gas industry alone is a $100-billion-a-year industry that operates across the country. It involves more than 150 direct and 130 support companies representing about a half million jobs. In 2005, the oil and gas industry contributed $27 billion in government revenues and invested $41 billion in capital. In 2006, oil and gas companies are expected to invest about another $40 billion.¹

In 2005, Canada produced crude oil at a rate of 400,000 cubic metres per day (m³/d) and produced approximately 490 million m³/d of natural gas. Coal production in Canada in 2005 was 34.4 million oil-equivalent tonnes. Coal use and demand in foreign countries, especially China and the U.S., has increased to the point where demand for coal is growing faster than that of any fuel, with global consumption in 2005 increasing 5 per cent over 2004 levels.

With an installed capacity of more than 118,000 megawatts (MW), Canada plays an important role in North American electricity markets. In 2004, Canada exported more than 33 million megawatt-hours (MWh) to the U.S., and imported nearly 22.5 million MWh from American utilities. Table 12 provides the most recent comprehensive figures available for Canada’s aggregated energy sector.

As a result of production well above domestic energy demand, Canada maintains a vibrant international trade in energy, mainly with the United States. Energy sales to the American market in 2005 totalled nearly $70 billion, with the oil and gas industry amassing $66.7 billion in sales and the electricity industry contributing $3.1 billion.

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¹ Canadian Association of Petroleum Producers, Canada’s Oil, p. 1; Ibid., CAPP releases, p. 1; Mang, “Energized,” p. 1; Maynard, CAPP Presentation, p. 2.

² The energy sector is defined by Statistics Canada as a “special aggregate” of a number of industries, some of which are also included in other sectors. In this report, data on the coal industry are included in both the mining sector and the energy sector.
Global demand for energy is expected to double by 2030, to 16.3 billion oil-equivalent tonnes annually. More than two-thirds of that demand will come from expanding economies in the developing world. In particular, China and India are heavily dependent on energy imports. If they reach expected growth rates, they will remain substantial energy consumers and help to keep energy prices high for the foreseeable future. Fossil fuels are expected to supply 60 per cent of the increased demand, and by 2030, oil, gas and coal will provide 81 per cent of global energy supply.³

Global demand for energy is expected to double by 2030, and more than two-thirds of that demand will come from the developing world.

The energy sector in Canada as a whole will likely prosper in the coming decades, but it faces three main challenges. First, major energy investment projects are being delayed and have higher than expected costs because of skills shortages. Also, the sector’s aging workforce will create a significant human resource challenge that must be addressed within the next decade.

Second, the complex nature of regulatory approval processes renders them time-consuming, which has an impact on major energy projects, whether they are oil or gas plants, pipelines, electricity generation or electricity transmission. These unwieldy processes are delaying projects that are needed to meet growing energy demands. Public resistance exhibited during the proposal and approval stages also acts as a hindrance to such new energy projects.

Third, the energy sector has serious environmental issues that it must address. The expansion of oil sands projects requires significant industrial water use that could tax watersheds and affect Aboriginal communities. The projected growth in fossil fuel production and consumption will lead to a rise in air pollution and greenhouse gas emissions.

This chapter offers an overview of trends in the sector, analyzes the key opportunities and challenges, and proposes ways that Canada can benefit from exploiting its rich energy resources while improving environmental performance.

**SECTOR OVERVIEW**

Canada has ample energy resources to help meet North American and global demands, but, to do so, the energy sector will need to invest significantly to boost production and transport the energy to markets. The following overview describes the trends in oil and gas production, oil and gas pipeline transportation, coal supply, electricity supply, and electricity transmission.

**OIL AND GAS PRODUCTION**

Oil sands are expected to become Canada’s predominant source of oil, and production from the sands will increase significantly in the coming years. The four oil sands deposits in Alberta (Athabasca, Peace River, Wabasca and Cold Lake) are estimated to hold a combined bitumen content of 270 billion cubic metres (m³).⁴ These deposits give Canada the second-largest pool of resources in the world, behind Saudi Arabia.

Oil sands are expected to become Canada’s predominant source of oil, and production from the sands will increase significantly in the coming years.

Production from Canadian oil sands is anticipated to increase to 472,000 m³/d by 2015—more than double current production—and could provide US$40 billion in revenue annually.⁵ These bullish projections are predicated on world oil prices maintaining a level that permits oil sands developments to proceed. Capital and operating costs for these types of operations are higher than those for conventional oil developments. At today’s prices, oil sands extraction presents an attractive option, and some reduction in global prices will likely not materially reduce extraction activity.

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⁴ Brugger, *Canada’s Oil and Gas Industry*, p. ii.

⁵ Hoover et al., “Pursuing Sustainability,” p. 104.
A return to 1990s prices would definitely endanger these projects, but most observers of global energy prices do not foresee such an occurrence.

To supply growing North American energy demand while satisfying air-quality standards, clean-burning natural gas has been the energy source of choice.

The heat used to process oil sands bitumen currently comes from natural gas, so the projected squeeze on natural gas supplies will increase operating costs. Furthermore, it is questionable whether natural gas, a clean-burning fuel, should be used for such purposes. The sector will need to consider other sources, such as bitumen, coke and nuclear. Natural gas by-products also serve to dilute bitumen during processing, but alternative diluents—such as synthetic crude itself—will have to be found.

To supply growing North American energy demand while satisfying air-quality standards, clean-burning natural gas has been the energy source of choice. Natural gas production in Canada has been increasing steadily since the 1950s, and today, Canada is the third-largest producer in the world.

Demand growth for natural gas has been outpacing supply growth since 2001. The resulting crunch has elevated prices to levels that peaked in 2005 with the impact on the sector of hurricanes Katrina and Rita. Natural gas prices have been receding in 2006, but the long-term outlook suggests that they will remain higher than historical levels for the foreseeable future.

North America’s supply of natural gas from conventional sources is declining. To keep gas flowing at current or greater levels, investments will need to be made in offshore and northern frontier resources, coal-bed methane, hydrates (natural gas trapped in frozen form) and tight sands (unconventional natural gas trapped in low-permeability rocks), and imports of liquefied natural gas (LNG). Development of these unconventional sources is currently in its infancy, and some uncertainty exists about potential production. The full extent of Canadian unconventional natural gas resources is not yet known. Moreover, each source has unique challenges that must be met before commercial production can commence.

Confirmed reserves of natural gas sit at 283 million m$^3$, with undiscovered quantities harboured in Newfoundland and Labrador’s offshore oilfields estimated at up to 1.4 trillion m$^3$. Unfortunately, delays abound. Major technological problems have to be overcome before production plans can be implemented. And with the long lead time required to develop these resources and to build infrastructure, consumers will not have access to these new resources until at least 2010. Furthermore, northern frontier gas development depends on successful settlement of an array of regulatory and political issues. (See box “The Mackenzie Valley Pipeline Project: Delayed Again?”)

Canada is not yet a major international player in LNG, but it could become a noteworthy North American player.

On a more optimistic note, Canada’s burgeoning LNG facilities could boost supply if adequate offshore natural gas imports can be secured. Some firms have shown interest in importing LNG for regasification and shipment to the North American market. Over the next seven years, the LNG industry will likely experience more growth than it has in the past 40 years.

From 2003 to 2004, LNG imports to North America increased by 30 per cent. During that time, the approximately 51 million m$^3$ supplied daily represented about 2 per cent of North American gas demand. For 2006, import capacity is projected to triple that amount, increasing to 164 million m$^3$ daily.

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6 Ibid., p. 106.


8 National Energy Board, Short-Term Outlook, pp. viii–x, 8, 15, 16; “LNG Projects,” Nickel’s Energy Analects.
The Mackenzie Valley Pipeline Project: Delayed Again?

The Mackenzie Valley Pipeline (MVPL), if built, would transport natural gas from the Mackenzie Delta in the northern Northwest Territories more than 1,200 km south to an inter-tie at Alberta’s northern border.

In the 1970s, a federal government inquiry by Mr. Justice Thomas R. Berger into the proposed development resulted in a recommendation to place a 10-year moratorium on the project while First Nations land claims were being settled. Berger felt that development was “inevitable,” but that the timing was not right. A pause was required to ensure that the social, cultural and environmental impacts of development would not adversely affect the peoples who lived there. Berger urged energy sector representatives and the federal government alike to create the proper conditions for development in the North before commencement of the MVPL project. A critical factor from Berger’s viewpoint was a need for the federal government to first establish a comprehensive land claims agreement with the Aboriginal groups in the North.

Three decades after the Berger Report, the former Justice claims that his suggestions were heeded by industry and that promoters appreciate the importance of better engaging local groups and securing sustainable benefits that will continue to have positive effects after the initial construction phase is complete. The extent of Aboriginal involvement is evidenced by the partnership role played by the Aboriginal Pipeline Group. In addition, the federal government has negotiated land claims settlements with key stakeholders including the Arctic Inuvialuit, Gwich’in and Sahtu groups. However, it has not concluded an arrangement with the critical Deh Cho First Nation, which controls 40 per cent of the territory affected by the MVPL. And other issues remain outstanding: for example, discussions are ongoing concerning benefit packages and access rights to lands. The federal government also continues to have a critical role in arranging royalty payments and effectively devolving powers and responsibilities away from the Department of Indian and Northern Affairs to the government and local boards of the Northwest Territories.

Although MVPL proponents in the 1970s may not have welcomed Justice Berger’s development moratorium, current project developers would surely agree with his assessment that, once conditions are right for development, a unified regulatory system will be essential. Unfortunately, while negotiations and regulatory delays continue, project construction costs increase and could ultimately threaten the pipeline’s feasibility. Were that to happen for a second time, Canada could lose, for another generation, the chance to develop an important and lucrative energy project in the North.


Canada is not yet a major international player in LNG, but it could become a noteworthy North American player. To fully capitalize on energy market conditions, Canada will have to make significant investments in new transportation and storage infrastructure on its coasts. Currently, eight LNG regasification plants are either already being constructed or planned: three in Nova Scotia, two in British Columbia, two in Quebec and one in New Brunswick. (See Table 13.) LNG proposals in Eastern Canada face stiff competition from similar LNG proposals in the United States. But Canada has an advantage in that public opposition to development projects is not as strong here as that demonstrated by our southern neighbours.

**OIL AND GAS PIPELINE TRANSPORTATION**

Oil and gas supply reaches markets through pipelines. Canada has enough oil and gas pipeline capacity to meet current demand, with approximately 48,000 m^3/d spare capacity in place. Previous planning led to the expansion of pipeline capacity in Western Canada by about 88,000 m^3/d between 1990 and 2005. Projections indicate that an additional 95,000 m^3/d of pipeline capacity will be required in the next 10 years. Today, there are 100,000 km of oil and gas pipeline, worth more than $20 billion, located in 10 provinces and territories. Pipelines are predominantly privately owned and tend to run for thousands of kilometres with enormous capacities.

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**Today, there are 100,000 km of oil and gas pipeline, worth more than $20 billion, located in 10 provinces and territories.**

Current pipeline capacity has to be tempered with concerns for the future. Unless advance planning and project initiation begin soon, capacity bottlenecks could begin to develop as early as 2007. Increased production from Alberta’s oil sands represents wonderful export opportunities, but those opportunities can be exploited only if the pipeline infrastructure necessary to move product to the marketplace is available. With the considerable addition of pipeline capacity needed before
2015 (discussed above) to move the output of new crude developments to market, the construction challenge is daunting. Adding to the overall capital requirement, Canadian natural gas pipeline companies plan to spend $20 billion over the next two decades to expand capacity.

Canada’s oil and gas industry is actively engaged in meeting the infrastructure capacity challenges before bottlenecks can develop. At an estimated cost of more than $5 billion, the oil industry has preliminary and some advanced plans in place for the construction of more than 163,000 m$^3$/d capacity within Canada. The new pipelines will service the needs of the domestic and international energy markets for conventional crude.\textsuperscript{10} In addition, proposed pipeline expansions to handle oil sands output are valued at $236 million and will provide an aggregated capacity in excess of 117,000 m$^3$/d.\textsuperscript{11}

It is important to realize that some of the aggregated numbers mentioned above represent competing proposals and that not all projects will necessarily proceed. The oil and gas industry often encounters public opposition to its initiatives and has to contend with the regulatory challenges that are described later.

\textsuperscript{10} Ibid., pp. 13–16.


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### Table 13
Proposed LNG Projects in Canada

<table>
<thead>
<tr>
<th>Location</th>
<th>Terminal</th>
<th>Company</th>
<th>Capacity (Bcf/d)*</th>
<th>On-Stream Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Point Tupper, Nova Scotia</td>
<td>Bear Head</td>
<td>Anadarko Petroleum Corporation / U.S. Venture Energy</td>
<td>0.75 to 1.00</td>
<td>Uncertain</td>
</tr>
<tr>
<td>2. Point Tupper, Nova Scotia</td>
<td>Statia</td>
<td>Statia Terminals Canada Partnership</td>
<td>0.50</td>
<td>Information not available</td>
</tr>
<tr>
<td>3. Goldboro, Nova Scotia</td>
<td>Keltic, Goldboro</td>
<td>Irving Oil Limited and Repsol YPF</td>
<td>1.00</td>
<td>Late 2009</td>
</tr>
<tr>
<td>4. Saint John, New Brunswick</td>
<td>Canaport</td>
<td>TransCanada Pipelines Limited and Petro-Canada</td>
<td>0.50</td>
<td>Late 2009</td>
</tr>
<tr>
<td>5. Gros Cacouna, Quebec</td>
<td>Cacouna Energy</td>
<td>Irving Oil Limited and Petro-Canada</td>
<td>0.50</td>
<td>Late 2009</td>
</tr>
<tr>
<td>6. Québec City, Quebec</td>
<td>Rabaska</td>
<td>Gaz Metro Limited Partnership, Gaz de France, and Enbridge Inc.</td>
<td>0.50</td>
<td>Late 2009</td>
</tr>
<tr>
<td>7. Ridley Island, British Columbia</td>
<td>WestPac Prince Rupert</td>
<td>WestPac Terminals Inc.</td>
<td>0.30</td>
<td>2009</td>
</tr>
<tr>
<td>8. Emsley Cove, British Columbia</td>
<td>Kitimat</td>
<td>Galveston Energy</td>
<td>0.61</td>
<td>2009</td>
</tr>
</tbody>
</table>

*Bcf/d = billion cubic feet per day.

Source: National Energy Board.
COAL SUPPLY
Among the major sources of fossil fuels, coal is hard to ignore. Canada has a vast coal resource within its borders: recoverable reserves of coal are estimated at approximately 6.6 billion tonnes, or about a 100-year supply at current rates. And up to 125 billion tonnes may be recoverable in future.\textsuperscript{12}

The mining, handling and transportation of coal also represent significant economic activity. The industry estimates that it contributes $5 billion annually to the domestic economy, and it employs 56,000 people directly and indirectly.\textsuperscript{13} As a fuel, Canadian coal is used primarily for electricity generation and steelmaking. Approximately 19 per cent of electricity is generated from coal,\textsuperscript{14} making electricity generation the largest single use of coal in Canada.\textsuperscript{15} This massive potential—economic activity, energy creation and existing facilities that already use the fuel—suggests that coal will figure prominently in the quest to power Canada’s future. But first, the coal industry must address important environmental issues, described later in this chapter.

By 2020, electricity generation in Canada will need to be increased to 814 terawatt-hours (TWh) from the 2005 level of 594 TWh to satisfy increasing demand.

ELECTRICITY SUPPLY
The Canadian Electricity Association has said that it expects electricity demand to continue to grow at an annual rate of 1.5 to 2 per cent.\textsuperscript{16} In coming years, population growth, economic expansion and increased use of electrical equipment will trigger the need for new electricity generation capacity in Canada. For example, Ontario will soon require an additional 2,500 to 3,000 MW of electricity capacity to meet escalating energy demand. This demand will be serviced by increases in generation capacity, improvements in efficiency of transmission and use, and in some cases, purchases of electricity from other jurisdictions. It has been estimated that, by 2020, electricity generation in Canada will need to be increased to 814 terawatt-hours (TWh) from the 2005 level of 594 TWh to satisfy increasing demand.\textsuperscript{17} And predictions suggest that energy efficiency measures will have only a minimal impact, reducing demand in 2020 by just 35 TWh. (See Chart 12.)

Canada’s increase in electricity generation will be supplied by a variety of sources, likely a mix of hydro, fossil fuel, nuclear, wind, solar and biomass.

Recent announcements from Quebec have indicated a willingness to develop more electricity sources to service the U.S. export market and to strengthen interconnections with Ontario. By 2008–09, Quebec will invest $3.5 to $4 billion annually to support new hydro-electric development projects.\textsuperscript{18} In general, Canada’s increase in electricity generation will be supplied by a variety of sources, likely a mix of hydro, fossil fuel,

\begin{table}
\centering
\begin{tabular}{|c|c|c|c|}
\hline
 & 2000 & 2010 & 2020 \\
\hline
Energy efficiency measures & & & \\
New supply to meet plant retirements & & & \\
Generation legacy & & & \\
New supply to meet demand growth & & & \\
\hline
\end{tabular}
\caption{Electricity Supply Projection to 2020 (terawatt-hours)}
\end{table}

\textsuperscript{12} Natural Resources Canada, \textit{Energy in Canada 2000}, p. 86.
\textsuperscript{13} Coal Association of Canada, Coal in Canada.
\textsuperscript{14} Canadian Electricity Association, \textit{Power Generation}, p. 3.
\textsuperscript{15} Coal Association of Canada, Coal in Canada.
\textsuperscript{16} Canadian Electricity Association, \textit{Electricity 2006}, p. 5.
\textsuperscript{17} Ibid., \textit{Making the Right Choices}, p. 3.
\textsuperscript{18} “Charest Pitches,” \textit{The Evening News} [New Glasgow, N.S.].
nuclear, wind, solar and biomass. In the next 15 years, renewable sources, including hydro, will come to the fore as demand for these types of power sources escalates and pressure to reduce greenhouse gas (GHG) emissions ramps up.

In 2004, fuel-type generators, including coal and nuclear, were producing approximately 573 TWh of electricity. Hydro dominates electricity production in Canada, constituting approximately 60 per cent of all generation. (See Chart 13.) Hydro generation is concentrated in British Columbia, Manitoba, Quebec, and Newfoundland and Labrador; it also provides one-quarter of Ontario’s electricity. Hydro’s dominance is expected to decline over the next couple of decades, but a technical potential exists to develop an additional 118,000 MW of hydroelectric energy in Canada.19

As Canada strives to reduce GHG emissions, strong interest in developing and implementing climate-friendly technologies for electricity generation is growing.

As Table 14 shows, the remaining 40 per cent of overall generation uses a wide variety of fuels. For example, in 2005, approximately half of Ontario’s generation came from nuclear facilities. Generators in the Maritime provinces rely primarily on coal and oil. In Alberta and Saskatchewan, coal predominates.

As Canada strives to reduce GHG emissions, strong interest in developing and implementing climate-friendly technologies for electricity generation is growing. Some renewable sources (such as windmills, solar and biomass) are already being deployed, but they are not yet sufficiently developed to have much impact on GHG emissions.

New hydro projects in provinces with the necessary potential can address the GHG challenge. In other provinces, nuclear could be a viable alternative, given that Canada has access to the necessary technology and is the largest supplier of uranium to the world.

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19 Centre for Energy, Electricity Transmission; Energy Information Administration, “Table 6.3”; Fortin, “Hydropower.”

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**ELECTRICITY TRANSMISSION**

Electricity generation is just one step, though. Without adequate electricity transmission infrastructure, meeting future demand for electricity will be impossible. Canada has approximately 163,000 km of bulk transmission lines of 230 kilovolts (kV) or higher.20 Given that the Cumulative Effects Assessment forecast

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indicates that annual energy demands are expected to increase to approximately 814 TWh by 2020, sufficient transmission capacity must be built in advance.

Transmission capacity for the approximately 522 TWh of generation needed in Canada in 2005 was ample, but serious planning is required to ensure adequacy into the future. Moreover, if reliable transmission systems are to be optimally sited, it will be crucial to anticipate the regions that will undergo load growth because of population and economic expansion.

Reliable domestic and international electricity transmission grids are critical to meeting the needs of Canadian and export customers. Grids also provide links to power producers and therefore facilitate a competitive energy marketplace. But when restructured and more competitive markets lead to a surge in electricity trade, strains are placed on transmission systems and concerns about reliability rise to the fore.

Because of the number of regulators involved, the addition of environmental assessment and extensive stakeholder involvement, the approval process for energy projects is complex and lengthy.

The August 2003 blackout that left about 50 million customers in Canada and the U.S. without power for several days illuminated the vital importance of reliability. The event was caused in part by a shift in the industry from cooperation between utilities to competition among private sellers of electricity, and in part by cost-cutting measures implemented by those sellers. Jurisdictions that have restructured their energy markets to allow for greater competition have come to the conclusion that the state has a direct, strong and definitive role to play in the governance and operation of the transmission grid.

Perspectives on the importance of electricity transmission regulation in Canada’s most advanced private sector-driven electricity marketplace, Alberta, have evolved over time. During the initial restructuring stage in that province, the belief was that market forces and mechanisms were “omni-competent.” But electricity transmission is a special case in which natural monopoly theory still holds. Transmission lines, like highways, are public goods that support the operation of a free market. In 2004, the Alberta provincial government brought in new legislation that promoted greater use of market forces in the generation of electricity, but allowed the government to retain full control over transmission infrastructure. That move was meant to ensure stability, reliability and effective operation of other aspects of the electricity marketplace. (See box “The Rebirth of an Old Idea: A National Power Grid.”)

OPPORTUNITIES AND CHALLENGES

REGULATORY APPROVALS

Proposed energy infrastructure projects in Canada are required to undergo rigorous regulatory approval processes. Federal authorities are responsible for regulating interprovincial energy development and exports, while provincial and territorial governments oversee the development and exploration of non-renewable natural resources. Because of the number of regulators involved, the addition of environmental assessment and extensive stakeholder involvement, the approval process for energy projects is complex and lengthy. Substantial delays can occur even for much-needed projects. However, the approval process is critical to protecting the environment and the public interest. The challenge is to improve the efficiency of this process without compromising protection of the environment and the public.

Oil and Gas Pipeline Regulatory Processes

A proposed oil or gas pipeline constructed entirely within a provincial boundary is subject to the province’s approval policy. Provincial utility boards and commissions are responsible for regulating energy infrastructure, and they grant project approval based on a regulatory process. Provincial legislation may also trigger a requirement for

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Canada has three main power grids: Western, Central and Quebec (which includes Atlantic Canada). However, the major transmission lines in Canada run north–south and not east–west between provinces.

The Ontario government is interested in establishing a robust east–west power grid to increase domestic flows of electricity. Such a grid would help Ontario secure energy supplies and reduce GHG emissions and air pollutants through imports of clean hydro power from other provinces. Such a plan could also help the federal government’s efforts to reduce GHG emissions. The idea of an east–west grid is not as novel as it was in 1962, when Prime Minister John G. Diefenbaker advocated establishing a national power grid.

Diefenbaker’s idea was to set up a national electricity transmission system capable of moving energy from areas of abundant supply to areas with perpetually abundant demands for electricity, such as the industrial heartland of Southern Ontario. He presented his idea as analogous to the construction of the Canadian Pacific Railway—a great national endeavour to unify the country and lay the foundations for strong future growth. He established a Committee on Long Distance Transmission to discuss the project’s feasibility.

The linchpin in any national plan was then (and still is) Quebec because of its vast hydroelectric resources and geographic position. Without the province’s participation, only regional interconnections can be established. However, in the 1960s, the Government of Quebec opposed the project on grounds of provincial jurisdiction over natural resources. And without the province’s cooperation, the benefits of a national grid were considered by Diefenbaker’s Committee to be marginal.

Since then, despite a lack of national initiative from the federal government, an unofficial pan-Canadian skeletal transmission framework has evolved, simply because each Canadian province has an electricity transmission inter-tie with its adjacent provinces. In addition, Quebec’s previous opposition to transmitting electricity from other provinces across its territory has moderated.

Political questions aside, economic and pragmatic issues concerning the desirability of a national grid need to be addressed. For example, it may be more economically feasible for Canadian electricity demand to be supplied from adjacent American sources than from more remote Canadian sources. In Ontario, Hydro One is investing $116 million in upgrading transmission lines to facilitate imports from New York State. Similarly, Newfoundland and Labrador could decide to sell electricity from any new hydroelectric developments to the New England states rather than to other Canadian provinces.

There is also a need to decide if new transmission capacities would solve problems, or if extra transmission would be moot because of other issues. For example, Hydro Quebec and the Government of Ontario obtained regulatory approval for a new 1,250 MW interconnection transmission line in the 1990s, but it took until June 2006 for conditions to be sufficiently advantageous for the project to finally proceed. It can now proceed thanks to supply problems in Ontario and the availability of sufficient surplus capacity in Quebec.

A national power grid could facilitate wind energy development. In Canada, however, one of the limiting factors in wind energy is that many of the best locales are too remote to make transmission costs viable. The possibility of constructing shorter lines to a grid could lower the costs of moving wind energy to market, provided that the additional supply from wind is small compared with the base capacity of the lines. Large additional supply from wind power would require extra capacity on any grid. Nonetheless, the facilitation of wind energy projects could increase the economic feasibility of a national power grid.

approvals from provincial ministries of environment and natural resources. And, depending on the project’s scope and location, federal legislation may also be applied by a number of federal departments. For example, a provincially regulated pipeline development may cross federally regulated navigable waters or potentially have an effect on fish habitat, necessitating a federal environmental assessment. (See Table 15.)

Transboundary pipelines—those crossing federal and provincial jurisdictions—must seek approval from the National Energy Board (NEB), an independent federal regulatory agency. Under the National Energy Board Act, a proposed oil or gas pipeline of more than 40 km requires an extensive regulatory review process consisting of a public consultation, public hearings and an environmental assessment. Transboundary pipeline development often crosses federal and provincial jurisdiction and would fall under both categories of approval. Transboundary pipelines require additional federal approval from the National Energy Board (NEB).

Before submitting an application for NEB approval, energy project proponents are required to undertake a public consultation. During the initial planning phase, the proponent discusses the project with affected communities and landowners to address the environmental and socio-economic effects potentially associated with construction and operation. The proponent then integrates these expressions of public interest, and the resolutions, into the application to the NEB.

Our research indicates that the extensive approval process for interprovincial pipelines can typically take two to three years to complete.

During the next stage of project approval, federal legislation may trigger an environmental assessment. Environmental assessments for project proposals are administered by the Canadian Environmental Assessment Agency; the NEB acts as the lead federal authority. The NEB is expected to consult with other federal agencies that have a regulatory role in pipeline construction and operation and to ensure that the public are involved.

Table 15
Federal Approval Regulations for Oil and Gas Infrastructure

<table>
<thead>
<tr>
<th>Agency</th>
<th>Act and Regulation</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Energy Board (NEB)</td>
<td>National Energy Board Act</td>
</tr>
<tr>
<td></td>
<td>Section 52: Interprovincial or international pipelines greater than 40 km in length require a Certificate of Public Convenience and Necessity</td>
</tr>
<tr>
<td>Canadian Environmental Assessment Agency</td>
<td>Canadian Environmental Assessment Act (CEAA)</td>
</tr>
<tr>
<td></td>
<td>The CEAA Comprehensive Study List Regulations indicate that a pipeline or liquefied natural gas (LNG) facility proposal requires a Comprehensive Study or environmental assessment by a review panel</td>
</tr>
<tr>
<td>Department of Fisheries and Oceans</td>
<td>Fisheries Act</td>
</tr>
<tr>
<td></td>
<td>Section 35(2): A proposed pipeline or LNG facility should not result in the harmful alteration, disruption or destruction (HADD) of fish habitat, unless approved by the Minister</td>
</tr>
<tr>
<td></td>
<td>Energy infrastructure construction may cause the HADD, triggering Ministry approval</td>
</tr>
<tr>
<td>Transport Canada</td>
<td>Navigable Waters Protection Act</td>
</tr>
<tr>
<td></td>
<td>Section 5(1): The Canadian Coast Guard is responsible for ensuring that no pipeline shall be built or placed in, on, over, under, through or across any navigable water unless otherwise approved</td>
</tr>
<tr>
<td></td>
<td>An approval is issued by the Regional Superintendent of Navigable Waters Protection</td>
</tr>
<tr>
<td>Natural Resources Canada</td>
<td>The Minister recommends approval of the NEB’s Certificate of Public Convenience and Necessity prior to Governor in Council approval</td>
</tr>
<tr>
<td>Environment Canada</td>
<td>Canadian Environmental Protection Act</td>
</tr>
<tr>
<td></td>
<td>Migratory Birds Convention Act</td>
</tr>
<tr>
<td></td>
<td>Canada Wildlife Act</td>
</tr>
</tbody>
</table>

Source: The Conference Board of Canada.
Exhibit 1
Nova Scotia Offshore Transboundary Pipeline Approvals, January 2004

1. Community consultation by applicant
2. Application for Certificate of Public Convenience and Necessity submitted to the NEB or Preliminary Submission
3. Is application complete?
   - Yes
   - Environmental assessment track determined
4. Applicant can file additional information
5. Proponent can resubmit
6. GIC denies approval
7. GIC approval
8. (Joint) panel review and report
9. Gov’t. prepares response to panel’s recommendations
10. GIC approval of response to recommendations

PANEL REVIEW PROCESS

- Order issued under s. 58 for pipelines < 40 km
- Certificate of Public Convenience and Necessity
- Applicant files PPBoR
- Applicant places public notice
- Is detailed route hearing required?
  - No
  - Detailed route hearing conducted
  - Approved
- NEB decision on PPBoR
- The NEB issues leave to open
- Application for leave to open
- Construction and testing proceeds
- Final detailed route approved

Source: Erlandson Consulting Inc. and Petroleum Research Atlantic Canada.
during and after the assessment. Our research indicates that the extensive approval process for interprovincial pipelines can typically take two to three years to complete.

Duplication and jurisdictional overlap are apparent in the regulatory approval process. For example, the environmental assessment and the NEB regulatory hearings may be presented with duplicate issues, and jurisdictional overlap occurs for offshore and northern oil and gas development proposals.

Long approval schedules and uncertain outcomes create a poor regulatory environment for project proponents, add cost and act as a disincentive to invest in the sector. The NEB and the Canadian Environmental Assessment Agency alike have recognized certain redundancies in the process and have made some progress toward streamlining approvals for interprovincial oil and gas infrastructure proposals.

In recent years, the NEB has moved toward implementing a “smart regulation” strategy that aims to make the regulatory process clear and predictable.

Public consultations are a critical component of the regulatory review. To avoid consultative duplication, a Joint Review Panel can be formed to conduct both the NEB and the environmental assessment hearings. This was done for the Sable Gas Project, and by all accounts it successfully streamlined the regulatory process. (See box “Sable Gas Project.”)

Overlap between jurisdictions with regulatory authority also poses a barrier to an efficient approval process. For example, energy infrastructure projects proposed in northern Canada are subject to numerous regulatory approvals by federal agencies, territorial governments and Aboriginal boards. In the Northwest Territories, 14 organizations have responsibility for pipeline development. To avoid jurisdictional overlap during the environmental assessment and regulatory review for the Mackenzie Valley Pipeline gas pipelines through the Northwest Territories, the NEB and various northern regulatory agencies completed a cooperation plan. That plan is expected to condense the duration of the regulatory process from 44 months to between 24 and 36 months.26

In recent years, the NEB has moved toward implementing a “smart regulation” strategy that aims to make the regulatory process clear and predictable.27 This involved the NEB revising the Guidelines for Filing Requirements

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Sable Gas Project

An infrastructure proposal that spans provincial and federal jurisdictions may be subject to an environmental assessment under the federal Canadian Environmental Assessment Act and provincial environmental assessment legislation. To streamline the regulatory process and to avoid duplication, overlap and delay, a joint review process can be initiated.

The Maritimes and Northeast Pipeline Project and Sable Gas Project illustrate a cooperative environmental assessment process among federal, provincial and offshore agencies. The Maritimes and Northeast Pipeline extends offshore from the Sable Gas Project through Nova Scotia to the New Brunswick border. Project proponents submitted applications to the Canada–Nova Scotia Offshore Petroleum Board (CNSOPB), the NEB, and Nova Scotia Energy and Minerals Resource Conservation Board for project approval. Because each agency possesses regulatory approval and decision-making authority, a joint collaborative environmental assessment process was organized, involving the Canadian Environmental Assessment Agency, Nova Scotia Department of the Environment, NEB, Natural Resources Canada, Nova Scotia Department of Natural Resources and CNSOPB.

A public hearing was conducted by an independent Joint Review Panel to collect evidence on potential environmental impacts and to allow for public input. The panel concluded that the pipeline was unlikely to cause significant adverse environmental impacts, provided that appropriate mitigation measures were put into place. As a result, the bodies with jurisdiction over the project issued individual approvals.

Overall, the Sable Island Joint Review Agreement allowed for a single environmental assessment process that avoided regulatory duplication and overlap, lowered related costs and shortened the time to assessment completion.

Source: Caron, Infrastructure and Markets.

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27 Vollman, Path to Smart Regulation.
to provide project proponents with a clear set of criteria, which should reduce the cycle time for processing applications. And through joint environmental assessments, cooperative agreements and harmonization agreements, other agencies have cooperated to streamline the environmental assessment reviews and regulatory procedures.

Harmonization agreements have also been negotiated between a number of provinces and the Canadian Environmental Assessment Agency. These agreements reduce overlap between jurisdictions and put an end to the need for both federal and provincial environmental assessments. For example, the Canada–Ontario Agreement on Environmental Assessment Co-operation guides federal–provincial cooperation when an environmental assessment is triggered by the Canadian Environmental Assessment Act and the Ontario Environmental Assessment Act. Provincial and federal approvals are then based on one environmental assessment review, and decision-making authority is retained by each jurisdiction.

Harmonization agreements reduce overlap between jurisdictions, and they put an end to the need for both federal and provincial environmental assessments.

Overall, some progress has been made to reduce the complexity of and amount of time required for regulatory approvals of new oil and gas projects. But given the need to add capacity soon to meet growing demand, further enhancements in these regulatory processes will be required to improve timeliness without compromising the protection of the environment and public.

Electricity Regulatory Processes

The regulatory approval process for electricity generation and electricity transmission facilities is also a complex multi-step procedure that requires considerable time, effort and stakeholder involvement. The goal of the approval process is to ensure that both the environment and the public interest are protected.

In each province, electricity generation and transmission proposals are reviewed and approved (or not) by a provincial utility board. If an environmental assessment is required, that process—albeit lengthy and costly—becomes a vital element of the overall development schedule. So if new electricity generation and transmission projects are to become operational within a reasonable time frame, the regulatory approval process must become more efficient. The consequences of prolonged regulatory approvals for electricity transmission are revealed in the next subsection on transmission hot spots.

Regulatory approval processes for electricity transmission in Ontario, Alberta and British Columbia have both positive and negative aspects, and regulators have implemented a number of policy changes to improve the efficiency of these processes. The Ontario Energy Board has set key objectives for improving the regulatory process (in areas such as timelines and stakeholder involvement) and has developed performance measures to evaluate progress. To streamline the environmental assessment process, the Ontario Ministry of the Environment has created Class Environmental Assessments for routine, minor transmission facilities with predictable environmental effects. But for large electricity generation and transmission facilities, the environmental assessment and regulatory processes are seen as a major hurdle for proponents. (See box “Ontario Electricity Transmission Approval Process.”)

If new generation and transmission projects are to become operational within a reasonable time frame, regulatory approval processes must become more efficient.

Alberta has been delivering conflicting regulatory messages. To ensure that its regulatory process is efficient, the Alberta Energy and Utilities Board developed guidelines for filing applications and a transmission development policy that enforces specific process timelines. However, the environmental assessment process of Alberta Environment is characterized by open-ended timelines, which create uncertainty for large projects. Furthermore, duplication results from public hearings that are held by both regulatory bodies for large electricity projects. Alberta Environment has recognized this
Ontario Electricity Transmission Approval Process

Several factors are affecting the demand for new electricity transmission facilities in Ontario, including the aging of existing generating units, weather-related impacts and the proposed replacement of coal-fired electricity generating stations. It has been estimated that more than 10 large infrastructure projects will have to be built across the province to provide the additional 2,500 to 3,000 MW of electricity capacity that Ontario will require to maintain system reliability. The need is especially acute in Greater Toronto, which is expected to require 250 MW of generation capacity by 2008.

To meet Ontario’s growing energy needs, increases in both electricity generation and transmission capacity are required. The provincial government has committed to augmenting electricity transmission capacity and has accepted the supply-mix recommendations set out in the Ontario Power Authority’s 20-year Integrated Power System Plan. As a result, the transmission capacity from Bruce County will be expanded to deliver electricity to Ontario residents from several new wind farms and the Bruce Nuclear Complex.

The current regulatory approval process for electricity transmission is complex, resulting in additional costs and time in the decision-making process. According to the Association of Power Producers of Ontario, this approval process is the greatest barrier to transmission development. The Ontario Ministry of Energy says that federal, provincial and local governments, local interest groups and First Nations are requesting a larger role in the decision-making process. The Ministry anticipates that participation by these groups will increase the complexity of the planning process, making it even more difficult to construct new transmission facilities. To accommodate public and government interest while ensuring timely development of new transmission lines, the Ministry has recommended that a more efficient and fully coordinated approval process be created.

In response, the Independent Electricity System Operator has been working with the Ontario Energy Board, the Ontario Power Authority and Hydro One (the provincially owned transmission utility) to improve the process.

The Ontario Energy Board has committed to using such instruments as generic policy proceedings, benchmarking, incentive rate-making, delegation and streamlined application forms to improve the regulatory processes and ensure that they are effective, fair and transparent. Specific performance measures have been developed to ensure that key objectives are met over the 2006–08 period, including a strengthening of stakeholder input.

The Ontario Environmental Assessment Act identifies three classes of projects for public and private electricity transmission proposals. Category A projects are expected to have minimal environmental effects and do not require an environmental assessment. Category B and C proposals are subject to an environmental screening or an individual environmental assessment with varying degrees of study and consultation. (See exhibit “Ontario’s Electricity Transmission Approval Process Flow Chart.”)

The Environmental Assessment Act also regulates timelines in the assessment process, including public comment periods, so that participants can plan their projects. However, proponents have raised concerns about open-ended timelines for decision-making and the potential for embarking on a continuous stream of studies and elevation requests. The public plays a significant role in determining whether a proponent has sufficiently addressed the environmental impacts and can request a more extensive elevated review. To avoid an elevated request and to reduce approval time, evident problems should be identified and resolved early in the process. In June 2006, the Ontario Ministry of the Environment amended the environmental assessment process. The changes reduce the opportunity for appeals by delegating decisions on elevation requests and introduce improved approval timelines.

The Ontario Minister’s Environmental Assessment Advisory Panel has suggested a “one project, one process” regulatory review approach. According to the panel, the one process approach will be achieved by integrating the administrative functions of various approval authorities, clarifying criteria and accountability for decision-making, and eliminating redundant steps in the overall process. To create efficiency in the regulatory review, the panel has recommended the appointment of a coordinator to administer an integrated and coordinated process. It has also been suggested that environmental assessment hearings be combined with Ontario Energy Board proceedings. As a result of the panel’s recommendations, regulatory obligations could be addressed and executed in one process.

Ontario’s Electricity Transmission Approval Process Flow Chart

### Project Classification

- **Category A**: No Environmental Assessment Act requirements
- **Category B**: Environmental screening process
- **Category C**: Individual environmental assessment

### Screening Stage

- Proponent prepares and publishes Notice of Commencement of a Screening.
- Prepare project description.
- Apply screening criteria to identify potential negative environmental effects.
- Consult with public and agencies to identify any issues or concerns.
- Assess potential negative effects. Develop mitigation and impact management. Consult and address issues and concerns.
- Prepare Screening Report. Includes results of screening and consultation, impact management commitments.
- Publish Notice of Completion of Screening Report and begin 30-day public and agency review.

### Environmental Review Stage

- Proponent identifies and describes the potential environmental effects, concerns and issues to be addressed in the Environmental Review.
- Prepare Environmental Review Report includes results of review and consultation, impact management commitments.
- Publish Notice of Completion of Environmental Review Report and begin 30-day public and agency review.

### Elevation of Project Status

- Director of the EAAB receives request(s) for elevation of the project. Within 30 days the Director will decide to do one of the following:
  - Deny the request for elevation. Project may proceed.
  - Deny the request for elevation with conditions. Project may proceed.
  - Refer the matter to mediation before making a decision.
  - Require proponent to conduct further study before making a decision.
  - Require proponent to conduct an Environmental Review.
  - Recommend to the Minister that the project be elevated to an individual environmental assessment.
  - Refer to section B.4.1.1 and Figure 3 in Part B of this Guide for details on elevation requests.
- Proponent submits Statement of Completion to Ontario Ministry of the Environment, and project may proceed subject to any other required approvals.

### Key Steps in the Process

- Proponent initiated
- Agency or public initiated
- Environmental Assessment and Approvals Board (EEAB) Director initiated
- Key steps in the process
- Mandatory public notice
- Director’s decision

Source: Ontario Ministry of the Environment.
inefficiency and has offered suggestions to streamline the process, including assigning responsibility for the full life cycle of each project to just one regulator.

Canada has several “hot spots”—areas with a critical need for reliable infrastructure, but where community concerns delay transmission proposals.

Public hearings and consultations with stakeholders, including First Nations, are an integral part of the regulatory process in British Columbia. Regulatory complexity and public opposition to transmission facilities have created uncertainty for transmission development, particularly for needed transmission upgrades on Vancouver Island. These renewal projects are still in the regulatory approval stage and will not be constructed until at least 2008. However, the Environmental Assessment Office made a commitment to ongoing improvement in the environmental assessment approval process and began by introducing—and then meeting or exceeding—time limits and performance targets for application reviews.

Electricity generation facilities may require approvals from provincial and federal regulators. Hydro projects face regulatory hurdles under the Canadian Environmental Assessment Act and the Canadian Fisheries Act. The current assessment process places more emphasis on local environmental impacts (e.g., aquatic habitat) and less on long-term effects (e.g., climate change). For example, regulatory reviews for thermal power plants can take six months, while the process for hydro facilities can last for up to four years. As a result, thermal power may be favoured over hydro to generate electricity for future needs because of these differences in regulatory reviews.

ELECTRICITY TRANSMISSION “HOT SPOTS”
Electricity projects can have lasting effects on communities. Although an economical and reliable source of power is important to local residents and the economy, opposition to projects can arise from landowners who fear the possibility of expropriation or lowered property values, and from members of the public who have environmental concerns.

Canada has several “hot spots”—areas with a critical need for reliable infrastructure, but where community concerns delay transmission proposals. The three hot spots discussed here highlight the critical transmission issues affecting electricity planners:

- The Vancouver Island case study examines efforts to replace a critical piece of aging transmission infrastructure before the existing lines reach their end-of-service dates.
- The Calgary–Edmonton corridor case study illustrates siting controversies and the potential strength of public opposition to proposed routes.
- The Toronto case study details the economic importance of having secure and reliable transmission infrastructure.

One of the most acute hot spots is Vancouver Island, which depends on transmission lines from mainland British Columbia for most of its electricity.

Vancouver Island
One of the most acute hot spots is Vancouver Island, which depends on transmission lines from mainland British Columbia for most of its electricity. By mid-2007, the main transmission line will have a reliability rating of zero, and it will have reached the end of its projected life cycle. In the early 1990s, BC Hydro developed plans to replace the aging infrastructure. However, numerous attempts to build a cogeneration plant on the island or to purchase electricity from a private operator were thwarted by public opposition, competitor challenges and rising natural gas prices. Alternative plans to replace the decrepit lines by using the same routes for new transmission have encountered

29 Fortin, Submission.
30 Ibid.
similar difficulties. Substantial opposition has emerged from competing companies and some members of the general public who are concerned with the use of overland transmission towers. Meanwhile, opponents to the initiatives proposed so far argue for alternative energy such as wind power and want major industrial users on the island to curb their electricity consumption during cold weather.

In Alberta, a lack of transmission capacity is a key factor limiting growth in the province’s electricity industry and hindering the province’s goal to become North America’s prime energy source.

A final decision on the environmental assessment for the construction of a new transmission line is expected in early 2007. BC Hydro has conceded that new capacity will not be in place in time to meet the 2007 deadline. As a result, the utility is attempting to extend the life of the aged lines and is working on curtailing the amount of energy used by industry on the island. Without timely construction of a replacement transmission system, the people of Vancouver Island risk serious economic and social disruptions.

Calgary–Edmonton Corridor

In Alberta, a lack of transmission capacity is a key factor limiting growth in the province’s electricity industry and hindering the province’s goal to become North America’s prime energy source. The transmission system within the province will reach its limit by 2010. The electricity transmission corridor linking Calgary and Edmonton is especially in need of upgrades. No new generation facilities can be built along the corridor to supply cities and their environs until new transmission lines are in place.

Of three possible transmission routes between the two cities, a western route received approval, but it is being held up by the legal efforts of a group of approximately 2,500 landowners who fear that the development would cut their property values in half and impose restrictions on land use. This group proposes using an eastern corridor that has a smaller population and lower levels of agricultural activity. However, that route would be approximately 100 km longer and would cost an additional $100 million to build.

While both sides battle over questions of routing and cost, the strains on the existing electricity transmission infrastructure continue to build. Without timely construction of new transmission lines, the citizens of Calgary and Edmonton could begin to experience problems with their electricity supply and may lose out on opportunities for expanded generation and export of electricity.

Toronto

In Toronto, a lack of transmission capacity will have serious economic consequences. Securing adequate transmission capacity in the midst of a densely populated city is proving a daunting task because the public frequently opposes the proposed solutions.

In Toronto, a lack of transmission capacity will have serious economic consequences. If immediate action is not taken, the city faces the prospect of rolling blackouts as early as 2008.

Canada’s largest city is served by two main transmission lines. During peak periods, those lines are running at or near their maximum capacity. If immediate action is not taken, the city faces the prospect of rolling blackouts as early as 2008. The provincial government has proposed to build a 550 MW gas-fired generation station on the site of an older mothballed generating station, because the new facility could be connected to a distribution hub

33 British Columbia Transmission Corporation, Final Submission, pp. 6, 8–70; Simpson, “Projects Vie.”
34 British Columbia Transmission Corporation, Final Submission, pp. 6, 8–70; Simpson, “Hydro ‘Ambushed’ ‘Rival’”; Ibid., “Projects Vie.”
36 Scotton, “Province to Cut Red Tape.”
37 Alberta Department of Energy, Alberta’s Electricity, p. 34.
without the need to construct additional transmission lines. Few viable alternatives are available. Even if sufficient public support could be secured for additional transmission lines running through the city, at least five years would be required to work through the current permitting and regulatory system.

The city’s energy problems are reputedly making businesses wary of moving to the city. Rising electricity rates could cost the city (and the entire province) 100,000 jobs by 2025—a loss of up to $16 billion in gross domestic product. In Toronto, as in the Calgary–Edmonton corridor and on Vancouver Island, urgent action is required to ensure that reliable electricity transmission capacity is in place to meet emerging demand.

ENVIRONMENTAL OPPORTUNITIES AND CHALLENGES
An adequate energy supply and the timely development of vast energy resources for domestic and international use are of critical economic and social importance for the entire country. However, Canadians expect their energy resources to be developed in as sustainable a manner as possible, and the regulatory system is a critical tool in assuring them of this outcome.

Canada is one of the world’s pre-eminent energy storehouses, second only to Saudi Arabia in proven oil reserves.

Canada is one of the world’s pre-eminent energy storehouses, but in 2003, its electricity and oil and gas industries directly produced about 274 million CO₂-equivalent tonnes of greenhouse gas (GHG) emissions, representing 36 per cent of Canada’s total GHG emissions (758 million CO₂-equivalent tonnes). Table 16 shows a breakdown of this 274 million CO₂-equivalent tonnes. Canada’s oil and gas industry presents policy-makers with a conundrum. Proven reserves of nearly 28 billion m³ of oil, including approximately 27 billion m³ in Alberta’s oil sands, make Canada second only to Saudi Arabia in proven oil reserves. At the same time, the environmental costs of developing fossil fuels are staggering. Oil sands production alone requires between 2 and 4.5 m³ of water per cubic metre of mined synthetic crude produced, and the industry has an allocation of just 518 million m³ of water at its disposal. Tailings management is another major water-related environmental concern.

Measures will have to be taken to reduce the emissions or to offset them through technology or purchases of emissions credits.

Moving beyond those issues, the oil and gas industry was responsible for approximately 18 per cent of Canada’s GHG emissions in 2003. Oil sands production in particular is one of the largest sources of Canadian GHG emissions, representing 3 per cent of the total in 2000. This burgeoning industry is a major factor in Canada’s difficulties in achieving its international obligations under the Kyoto Protocol.

The oil and gas industry must meet three key emissions challenges. With regard to the first challenge, it already is striving to make more progress on its self-chosen path of reducing emissions per unit of output. Second, in regions such as the oil sands, where production is expected to grow rapidly, particular attention will be required to address the effects of total emissions on the receiving environment—reducing per-unit waste discharges will not be sufficient. Third, oil sands are poised to become an increasingly significant portion of total oil production in Canada in the coming decades. Because oil sands production is more GHG-intensive than conventional

41 Spears, “Business Fears.”
42 Association of Major Power Consumers of Ontario, “New research finds Ontario.”
44 Griffiths et al., Troubled Waters, pp. 16, 32, 33, 53.
45 Canadian Association of Petroleum Producers, 2005 Stewardship.
production, total GHG emissions from the industry will grow considerably unless action is taken. Measures will have to be taken to reduce the emissions or to offset them through technology or purchases of emissions credits.

Canada has the opportunity to become a “clean energy superpower.” Acting on this vision would integrate the two policy goals of taking advantage of the country’s rich energy resources and addressing its environmental challenges, including curtailment of GHG emissions. The key to achieving the vision is technological advancement through robust commitments to research and development (R&D) and effective implementation of discoveries. Developing and implementing green technologies would not only further Canada’s efforts to become a clean energy superpower, but might also shape an energy sector that could sell its environmental expertise and technologies worldwide.

In the oil and gas industry specifically, technological advances could help oil and gas companies conduct activities in a more environmentally responsible fashion. For example, the development of carbon sequestration technologies would help to prevent the release of GHGs and could be used to enhance oil recovery from depleting hydrocarbon wells and to release coal-bed methane. This latter technology is of special interest to Alberta and Saskatchewan, whose massive oil and coal resources are accessible to the requisite pipelines; however, significant technical and financial problems remain to be resolved. Among the most immediate concerns are the high costs and technical feasibility involved in retrofitting generation plants for carbon capture and the costs of large-scale carbon capture, transportation and sequestration.47 Major pilot projects and initiatives are currently taking place in southern Alberta and in Saskatchewan.48

Coal has a number of environmental problems that it must overcome. Coal combustion discharges particulates, sulphur dioxide and other contaminants into the atmosphere surrounding the coal plants. These emissions contribute to smog and acid rain, and their aesthetic effects have become the focus of much public and government concern over the past few decades. Although contaminants can be removed from plant discharges, the necessary technologies are expensive, and they have not been widely implemented in Canada. If coal-fired electricity generating stations are to have a future in Canada, they will need to adopt these technologies.

### Table 16
Sources of GHG Emissions From the Electricity and Oil and Gas Industries (millions of CO₂-equivalent tonnes)

<table>
<thead>
<tr>
<th>Source Category</th>
<th>1990(^3)</th>
<th>2000</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity and heat generation(^1)</td>
<td>95</td>
<td>132</td>
<td>130</td>
</tr>
<tr>
<td>Petroleum refining and upgrading(^2)</td>
<td>23</td>
<td>24</td>
<td>29</td>
</tr>
<tr>
<td>Fossil fuel production</td>
<td>30</td>
<td>45</td>
<td>49</td>
</tr>
<tr>
<td>Fugitive sources from oil and natural gas fuels</td>
<td>41</td>
<td>64</td>
<td>66</td>
</tr>
<tr>
<td>Total</td>
<td>190</td>
<td>265</td>
<td>274</td>
</tr>
</tbody>
</table>

1. Includes both utility and industrial general and commercial steam generation.
2. Includes combustion and process emissions associated with the refining of crude oil.
3. The numbers in this column do not add to the total due to rounding.

Source: Environment Canada.

A more vexing feature of coal is the huge quantity of CO₂ emitted during its combustion. Although nearly 75 per cent of Canada’s electricity is generated from non-emitting sources, the segment of the electricity industry that uses coal for generation is a major contributor to GHG emissions. At 124 million tonnes, fossil-fuel-based electricity generation accounts for almost 45 per cent of all energy sector GHG emissions and 16 per cent of Canada’s total GHG emissions.49

As shown in Table 17, burning coal to produce electricity is the single greatest GHG challenge facing the electricity industry.

49 Environment Canada, Canada’s Greenhouse Gas Inventory, pp. 27, 37; Canadian Electricity Association, “Electricity Generation.”
The environmental difficulties associated with burning coal are sufficient that the Ontario government has committed to permanently shutting down the four coal-fired generating stations it currently operates. This shutdown is anticipated to considerably improve air quality and reduce GHG emissions.\(^{50}\)

To reduce the climate change effects of coal, advanced new technologies—collectively called “clean coal” technologies—are being actively researched and developed. Integrated Gasification Combined-Cycle (IGCC) systems are currently the most attractive approaches to clean coal. This technology promises to improve the thermal efficiency of coal-fired electricity generation by producing a synthetic gas that burns more cleanly than pulverized coal does. The process also includes a cogeneration phase to use more of the heat generated by the combustion.

The most advanced method uses CO\(_2\) flue gas to enhance the production of oil from older underground reservoirs. The CO\(_2\) is pumped deep into the ground to displace the oil; it then remains there, effectively removing it from the atmosphere. Pipelines move the captured CO\(_2\) from the source to the oilfield, and considerable opportunity therefore exists for use of this technology in Alberta, where conventional oil production is found in relative proximity to coal-fired generating stations. This process is already being used in Saskatchewan, near Weyburn. In West Texas, approximately 3,000 km of pipeline are dedicated to this process.\(^{51}\) However, provinces such as Ontario have to discover other methods of safely and economically storing captured CO\(_2\) emissions.

The environmental challenges of electricity generation are being met in part by an increase in the mix of renewable energy sources.

Given vast coal resources worldwide, research into clean coal use is likely to continue to grow. In fact, research is moving quite quickly in the U.S., which has even greater coal reserves and more infrastructure invested in coal than does Canada. The United States Department of Energy intends to build FutureGen, a $1.11 billion emissions-free coal-fired generating station, by 2012.\(^{52}\) Once completed and in operation, FutureGen will produce 450 MW of electricity. Another zero-emissions plant, worth $1.42 billion, is expected to be up and running in Germany and producing 275 MW by 2014.\(^{53}\) Provided that FutureGen is successful and that other demonstrations confirm its success, it is safe to say that clean coal technology will be highly desirable because of coal’s abundance and broad dispersal.

Table 17
Sources of GHG Emissions From Electricity Generation (millions of CO\(_2\)-equivalent tonnes)

<table>
<thead>
<tr>
<th>Source Category</th>
<th>1990</th>
<th>2000</th>
<th>2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal</td>
<td>79</td>
<td>105</td>
<td>96</td>
</tr>
<tr>
<td>Refined petroleum products</td>
<td>11</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>Natural gas</td>
<td>4</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Total</td>
<td>94</td>
<td>130</td>
<td>124</td>
</tr>
</tbody>
</table>

Source: Environment Canada.

Coal has a large environmental footprint that includes air pollution and GHG emissions. The future acceptable use of Canada’s immense coal resource hinges on our ability to reduce the environmental effects of coal combustion with new technologies. Canada therefore needs

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\(^{50}\) Ontario Power Authority, *Ontario’s Integrated*, pp. 17–18.

\(^{51}\) Uranium Information Centre Ltd., “Clean Coal.”

\(^{52}\) FutureGen Alliance, Timeline.

\(^{53}\) “RWE in €1 Clean Coal Project,” International Coaltrans;
Smith, “EU Regulations”; Real Plan, [slide show]; FutureGen Program, [slide show].
to remain current with these developments and to position itself to exploit its coal resources by adopting these new technologies.

The environmental challenges of electricity generation are being met in part by an increase in the mix of renewable energy sources. Wind and solar energy projects, and small hydro projects that require small dams or no significant dams, are making inroads even though their total production of electricity is currently modest. In Canadian cities, an opportunity exists to augment the electricity supply by burning garbage in “energy from waste” facilities rather than dumping it in landfills—a double benefit. This practice is common in Europe and present in the U.S. in modern, non-polluting facilities. In Toronto, which is facing both a landfill and an electricity shortage, energy from waste could provide some relief. But past public opposition to the concept has made local authorities reluctant to propose this solution for fear of the political repercussions. It remains to be seen what effect Toronto’s recent purchase of a large landfill facility will have on the overall waste management picture in the region.

Volume III of this Canada Project report, Mission Possible: Successful Canadian Cities, considers the adoption of industrial ecology principles in the planning and design of Canada’s cities. Successfully implementing these principles as our cities develop would reduce the volume of waste to be disposed of. Clean and modern energy from waste facilities could form an integral part of the industrial ecology measures.

Public and private sector efforts to reduce electricity consumption through conservation and efficiency are aimed at helping the environment and also at easing the need to increase electricity generation and transmission infrastructure. For example, the Quebec government is committed to improving energy efficiency in the province by 8 TWh by 2015. The current federal government is interested in curbing levels of wasted energy in Canada through the promotion of energy efficiency and strong demand-side management strategies.

Ontario is also focusing on conservation, but just how much capacity can be saved is unclear. For example, the Pembina Institute argues that, in Ontario, an aggressive demand-side management strategy could reduce the baseload electricity generation capacity by 4,500 MW by 2012. In contrast, Navigant Consulting’s report for Ontario’s Independent Electricity System Operator argued that maximum demand response would be approximately 1,450 MW. Without making any judgments on the predictions of potential demand reductions, energy savings will evidently not be sufficient to delay or forego the construction of additional transmission and production infrastructure in Canada.

**The labour shortage threatens to stifle economic activity in Western Canada, delay construction of liquefied natural gas facilities, and potentially hurt electricity reliability nationwide.**

**HUMAN RESOURCE CHALLENGES**

A lack of qualified workers is causing concern across Canada’s energy sector. The labour shortage threatens to stifle economic activity in Western Canada, delay construction of liquefied natural gas (LNG) facilities, and potentially hurt electricity reliability nationwide. Oil and gas producers in Alberta are facing debilitating labour shortages affecting investment projects. Construction of LNG facilities is challenged by the short supply of qualified engineers, experienced personnel and even labourers. The electricity industry is facing chronic shortages of engineers and lineworkers to develop and maintain facilities. The causes of the shortages in each

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55 Peters et al., *A Quick-Start*, pp. 5, 16.
industry differ, but the problems are the same: a severe lack of qualified recruits, and difficulties in attracting and retaining available workers.

In 2005, labour accounted for 17.1 per cent of costs in the oil and gas industry within the energy sector, and wages and benefit packages increased by 8 per cent that year. Labour and other costs are expected to continue to increase, on average, by 4.2 per cent annually over the next several years.\(^\text{57}\)

The current shortfall of workers in the oil and gas industry is projected to become even more severe, despite the substantial influx into Canada’s “oil patch” of workers from other parts of Canada and abroad. And current low levels of unemployment are putting inflationary pressures on wages and the cost of living in the province. Labour force growth will be further complicated by an aging population. By 2025, Alberta alone could face an annual labour shortage of 332,000 individuals, with potentially devastating effects on operations.\(^\text{58}\)

Strategic government planning will be essential to prevent Alberta’s labour crisis from constraining growth in the oil and gas industry in the future. Strict reliance on market forces will guarantee sharp increases in already high wage levels, with spillover inflationary pressures.\(^\text{59}\)

Similar concerns for the future plague the electricity industry. A generation of retiring professionals and difficulties in recruiting younger replacements are threatening the industry’s future stability and productivity. A current wealth of career options driving intense competition for skilled technicians and professionals is making it difficult for utilities to attract and retain adequate numbers of workers. The problem can only worsen as the baby boomers retire over the coming decade. In 2004, the average age of workers in the electricity industry was 44.2, with 65 per cent of workers aged 40 to 54. By 2009, 17.3 per cent of the workforce will be eligible for retirement, and by 2014, that share will rise to 37.3 per cent. Simply maintaining activities at 2004 levels will require approximately 9,000 new technical people by 2009 and more than 17,000 by 2014.\(^\text{59}\)

A current wealth of career options driving intense competition for skilled technicians and professionals is making it difficult for utilities to attract and retain adequate numbers of workers.

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**GOVERNMENT AND INDUSTRY ACTIONS TO STRENGTHEN THE ENERGY SECTOR**

Governments have already made headway in ensuring the effective operation of Canada’s energy sector. The federal and provincial governments alike have been active in promoting “smart regulations” and in simplifying approval processes to assist in the timely construction of energy infrastructure.\(^\text{60}\) The Canadian Environmental Assessment Agency has recently taken a creative approach to streamlining the approval process for transboundary pipeline approvals. For the first time, the agency has applied substitute provisions of the *Canadian Environmental Assessment Act* to allow the NEB to conduct environmental assessment hearings concurrently with the NEB’s own regulatory approval hearings for the Brunswick Pipeline Project development. This change will result in shorter approval times and an overall improvement in the efficiency of the process. If the outcome is successful, the substitute provisions should be applied to similar energy projects in the future.

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\(^{57}\) Brugger, *Canada’s Oil and Gas Industry*, pp. 1, 13, 14.

\(^{58}\) Coughlin, *Alberta’s Labour Shortage*, pp. 1–5.


\(^{60}\) Privy Council Office, *Smart Regulation*, pp. 3–21; Canadian Environmental Assessment Agency, *Federal Environmental Assessment; Ibid., Environmental; Ibid., Canada and Ontario; Caron, Infrastructure and Markets in Canada.*
Also, governments across the country are investing heavily in R&D projects whose outcomes are potential boons for the energy sector. For example, the federal government has established a Program of Energy Research and Development that supports 26 federal and provincial R&D projects in the energy sector. Meanwhile, at the provincial level, many governments have established dedicated energy research organizations or have provided dedicated research funding for energy activities. In August 2000, for example, the Alberta Energy Research Institute was established. Since that time, it has helped to develop an energy research strategy for the province.

Alberta has developed an advanced royalty regime specifically designed to promote research on and utilization of carbon sequestration technologies and other innovative energy technologies.

On yet another front, governments are investigating the most effective means of using public policy to spur further energy investments in exploration and the use of new technologies. Alberta has developed an advanced royalty regime specifically designed to promote research on and utilization of carbon sequestration technologies and other innovative energy technologies. Ontario, British Columbia and Quebec are promoting the greater use of private sector actors in the generation of new sources of electricity while the traditional utilities retain responsibility for baseload generation.

The oil and gas industry is actively engaged in lessening the environmental impact of its activities. As a start, the intensity of emissions has been reduced, but unfortunately, net emissions have risen because of rapid expansion in that industry. For example, emissions intensity from oil sands production dropped by 26 per cent over a decade, but increased activity is producing more emissions than ever. Similarly, net oil and gas exports to the U.S. climbed 180 per cent from 1990 to 2003, with a corresponding surge in related GHG emissions of approximately 115 per cent.

Loming labour crises have led to the creation of the Petroleum Human Resources Council of Canada and the Electricity Sector Council. These councils are collaborative efforts uniting the energy sector, government, educators and workers to ensure that adequate numbers of qualified individuals are available to work in the energy sector over the coming years. The councils work to develop human resource strategies that incorporate training, credential recognition, occupational standards and methods of attracting new workers.

The oil and gas industry is actively engaged in lessening the environmental impact of its activities.

**SUMMARY**

Canada is on the cusp of an exciting and potentially lucrative energy future. The country has a vast natural endowment of energy resources and is currently investing in leading-edge research. Emerging renewable energy technologies, carbon sequestration and new facilities for energy supply such as LNG re-gasification terminals illustrate the vibrancy of the country’s energy sector. Major challenges, however, must be addressed.

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65 Woynillowicz et al., *Oil Sands Fever*, p. 19.


Meeting future demand for energy will require an array of massive new investments. The energy sector will continue to be constrained by shortages of skilled labour, which are already affecting key projects such as the oil sands developments. The energy sector also faces environmental challenges caused by GHG emissions and water use. If Canada is to achieve sustainable prosperity, it will need to find an appropriate mix of energy resources, optimize its vast hydroelectric potential, develop emerging renewable energy sources, encourage energy conservation and efficiency, and develop and implement new fossil fuel technologies to resolve environmental issues. As for managing water use, governments will need to work with industry and affected Aboriginal communities to find appropriate solutions.

The federal government, in cooperation with the provinces/territories and industry, must develop coherent energy policy principles to guide the regulatory process.

Effective and efficient regulations that enable timely construction of energy infrastructure projects are vital to the Canadian energy sector and the national economy. Streamlined regulations can protect the environment and the public, and ensure long-term sustainability. For Canada to maximize the economic opportunities in global energy markets, regulatory reform will have to continue into the future. Cooperation between federal and provincial government departments and their regulatory agencies will ensure that Canada can live up to its potential to be a major player in global energy markets while producing sufficient energy for domestic needs.

GOING FORWARD

ESTABLISH A NATIONAL ENERGY FRAMEWORK

The federal government, in cooperation with the provinces/territories and industry, must develop a coherent statement of energy policy principles to guide the regulatory process and provide a distinct sense of direction for Canada’s energy sector in order to take advantage of energy resources and improve environmental performance. Such a statement need not infringe on areas of provincial jurisdiction. A strong statement of the national interest would send clear signals to the energy sector, potential investors and the research community regarding the future of energy policy in Canada. These signals would be amplified if the statement of federal energy principles also supplied a provisional road map stating how and when policy goals are to be met.

INCREASE REGULATORY EFFICIENCY FOR PROJECT APPROVALS

Governments must streamline the regulatory process so that energy infrastructure projects are approved more efficiently without compromising the protection of the environment and the public. Several jurisdictions have already moved in this direction. For example, British Columbia has introduced rigid decision-making timelines that allow proponents to manage the process and that provide certainty.

The following components characterize an efficient and effective regulatory system:

- enforced timelines for regulatory and environmental approval processes;
- annual performance targets for regulatory bodies;
- standardized independent review of the approval process; and
- continued development of cooperation agreements between the federal and provincial/territorial governments.

Governments must streamline the regulatory process without compromising the protection of the environment and the public.

To complement efforts by the NEB to increase regulatory efficiency, an independent body could review completed regulatory procedures in a mechanism of continual improvement. Recommendations could then be made for increasing the efficiency of the regulatory process and reducing approval timelines. Provincial electricity regulators should also streamline and accelerate approval
processes. It has been suggested that, in Ontario, the process be coordinated among the various agencies so that proponents can obtain regulatory responses within predictable time frames.\textsuperscript{68}

**DEVELOP POLICY ON CLIMATE CHANGE**

One of the greatest long-term challenges is climate change. As the Report of the Commissioner of the Environment and Sustainable Development notes: “As we are an energy-producing and dependent country, climate change goes to the heart of our economy and touches many aspects of our lives, threatening economic costs. It also presents opportunities . . . . [E]xperts suggest long-term solutions involve changing to low carbon economy and energy systems.”\textsuperscript{69}

While the problem of climate change is of global scale, Canada cannot wait until a global consensus on strategies is reached before taking action. Indeed, the country’s GHG emissions continue to increase partly because of our economic expansion but also because of insufficient actions taken by our businesses, governments and individuals. From 1990 to 2004, Canada’s growth rate in CO\textsubscript{2} emissions was higher than that of all the other Group of Eight (G8) countries, including the U.S.

\begin{quote}
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\end{quote}

As the 2006 Report of the Commissioner of the Environment and Sustainable Development makes crystal clear, Canada is not on track to meet its obligations to reduce emissions nor is it adequately prepared to adapt to the effects of climate change. The report outlines reasons for this assessment. Among them, it says the federal government is not organized to manage its climate change initiatives effectively. Mechanisms are missing to coordinate activities across departments and to track spending and results that should be reported to Canadians. It notes, too, that few federal efforts are underway to deal with the booming growth in the oil and gas industry.\textsuperscript{70}

That said, the federal government has accepted all of the recommendations made in the report. In addition, it has proposed the *Canada’s Clean Air Act*, which includes a plan to address climate change.

In a June 2006 report, The National Round Table on Environment and Economy noted that the ambitious goal of 60 per cent emissions reduction by 2050 is achievable, but only if energy is used more efficiently and if energy is produced while less CO\textsubscript{2} is emitted. *Canada’s Clean Air Act* does propose long-term targets for reducing GHG emissions but does not identify specific short-term targets to initiate actions that will lead to these long-term reductions. Response to the Act has been tepid, but more refinement is anticipated in early 2007.

Technologies will play a critical role. Technologies exist to increase energy efficiency but how to effectively deploy them remains an important policy issue. On the energy production front, carbon capture and sequestration technologies must be perfected in the oil and gas industry, and clean coal technology must be developed to reduce GHG emissions in electricity generation.

Governments must play a major role in ensuring the development and implementation of these technologies by:

- introducing new regulations (such as stricter energy efficiency standards) and fiscal measures (such as investment tax credits);
- implementing a tradable emissions permit system similar to the one found in the European Union; and
- increasing public investments in R&D and possibly funding environmental technology infrastructure.

\begin{quote}
Technologies will play a critical role, and governments must ensure the development and implementation of these technologies.
\end{quote}

Developing an effective program to reduce the quantity of GHG emissions is critical, but developing a program of adaptation to ensure that the Canadian economy can cope with the effects of climate change is equally
important. In the decades ahead, Canada could experience a level of climate change that would place undue stress on all of Canada’s ecosystems and physical infrastructure. To secure a sustainable future, adaptation to climate change effects will need to become an integral part of the public and private decision-making processes and climate change strategies.

MAKE CANADA A CLEAN ENERGY SUPERPOWER

Canada is already a world leader in low-emissions electricity generation, thanks to its nuclear technology and renewable resources such as hydro and wind. Still, the country continues to face a conundrum. It is set to become a global energy superpower based largely on hydrocarbon sources, and yet it aspires to reduce GHG emissions and to improve air quality and water use. The solution is to make Canada a clean energy superpower. Turning this vision into a reality will require major actions on the part of governments and industry.

Effective regulations will reduce the impacts of energy production and consumption on the overall environment. Governments should provide fiscal incentives for industry to develop and implement new technologies and processes that address their environmental challenges, such as air quality, GHG emissions and water use. Emissions trading systems should be implemented to allow flexibility in how air quality and greenhouse gas emissions goals are achieved. Governments should also supply funding to universities and others for R&D to find technological solutions to reducing emissions and water use.

Governments, researchers and industry must work together to make Canada a world leader in energy innovation.

RECOMMENDATIONS TO MAKE CANADA A CLEAN ENERGY SUPERPOWER

The Conference Board of Canada recommends that:

14. Industry invest in new energy supply, pipelines, electricity transmission infrastructure, and technologies and processes that minimize environmental impacts on watersheds, air and climate.

15. The federal government work with the provinces/territories and industry to develop a national energy framework of coherent policy principles that integrate energy security, increased trade, improvements in air quality and reductions in greenhouse gas emissions.
16. Governments develop and implement comprehensive climate change strategies that will significantly reduce greenhouse gas emissions and help Canada adapt to the effects of climate change.

17. Governments encourage investments in environmental technologies through effective regulations and implementation of emissions trading systems and fiscal incentives.

18. Industry and governments devote more funding to research and development to find technological solutions that will reduce emissions from the production and consumption of fossil fuels, including the capture and safe disposal of greenhouse gas emissions.
HIGHLIGHTS

- The current expansion of the world economy and rise of middle classes in China and India are driving up the demand for natural resources. For Canada to benefit, major investments will be required over the next decade and major challenges will need to be addressed. Investments made will have consequences far beyond the investment period, and every decision must be weighed for not only the gains that can be achieved immediately but also the long-term consequences for Canada's sustainable prosperity.

- Opportunities and challenges are unique to each major Canadian resource sector, but there are two themes that are common to all resource sectors—the need to address labour shortages and improve regulatory approval processes.

- Overall, Canada's resource sectors have a workforce that is older than the national average. Shortages will occur not only in operations but also in construction and development of new infrastructure. Major actions by business and governments will be required to address such shortages, including creating incentives to attract skilled workers to resource communities, improving Aboriginal education and training, and increasing apprenticeship and internship programs.

- Complex and lengthy regulatory approval processes are delaying investments in new projects, commercialization of new products, and adoption of new technologies and production processes. Streamlining of the regulatory approval processes is urgently needed beyond the current progress made. Sufficient allocation of resources to public laboratories and regulatory agencies can allow regulatory decisions to be made in a timely way while also protecting the environment and the public.
Conclusion

The current expansion of the world economy and rise of the middle classes in China and India are driving up the demand for forest products, food, mineral products and energy. This boom in commodities could last for the next 15 years and is presenting significant opportunities for Canada, given its wealth in natural resources; however, the country must address some major challenges to be able to fully benefit from the upturn.

Business and governments will need to cooperate in meeting the challenges. Furthermore, strategic private and public investments will be required if Canadian industries are to capture larger shares of the global commodity markets while also taking measures to protect the environment and the Canadian public.

This boom in commodities could last for the next 15 years and is presenting significant opportunities for Canada, given its wealth in natural resources.

Investments made over the next decade will have consequences that flow far beyond that period. Therefore, every decision must be weighed for not only the gains that can be achieved immediately, but also the long-term effects on Canada’s sustainability.

Today’s emerging market trends and challenges are unique to each major Canadian resource sector. Each must therefore be analyzed separately for possibilities and how those possibilities can be achieved. Each sector must individually explore how it can contribute to the country’s long-term prosperity. At the same time, all of these resource sectors face some common problems that must be addressed. This chapter first summarizes the unique nature of each of Canada’s four principal resource sectors; it then turns to common issues.

FOREST PRODUCTS: TIME TO RENEW

Global wood and paper consumption is likely to increase by $4 billion to $7 billion annually, at least over the next 10 to 15 years. This should be a welcome boon for Canada’s forest products sector, but to truly benefit from increasing global demand, the sector must take steps now to renew itself.

The lumber industry has struggled under the weight of tariffs imposed by the United States. Many lumber production facilities have closed or curtailed operations. The recent resolution to the softwood lumber dispute should help, but the projected cooling of the U.S. housing market will likely offset the benefits of the agreement—at least in the short term.

In the past few years, many pulp and paper mills have closed because of three factors: increasing costs (their operating costs are higher than those of newer mills in competing countries); aging facilities (Canada’s pulp and newsprint mills are relatively old and small); and excess global capacity for their products (the growing
numbers of international temperate-zone competitors, including emerging producers in the southern hemisphere, which are seizing a growing share of the global market.

The forest products sector is one in which economies of scale matter. Canadian pulp and paper mills will have to “bulk up” to compete successfully with newer, technologically advanced “super mills.”

**The sector must revitalize its operations. Further mill closures will be required, but investments in new, upgraded and larger mills will also be important.**

If the Canadian sector wants to be competitive and to capture new market opportunities, it cannot hesitate. It must take steps now to revitalize its operations. Further mill closures will be required, but investments in new, upgraded and larger mills will also be important. At the same time, some existing mills will need to be modified to produce non-traditional products.

The huge new mills in other competing countries approach 1 million tonnes in annual capacity. In theory, 10 pulp and 7 newsprint “super mills” could replace the entire current Canadian production. No one is suggesting that all mills should reach that size, but at least some Canadian super mills will be needed if the sector is to continue to compete in world markets.

New and enlarged facilities will require a ready supply of wood. Decisions on where these mills are sited will need to take into account sources of that supply. And depending upon location, mill operators may have to obtain their wood from neighbouring provinces. Current timber tenure systems in many of the provinces have the effect of trade barriers: they prevent interprovincial shipment of logs. These policies reduce the supply of roundwood that could be used by large mills and likely increase the price of chips that could be drawn from neighbouring provinces. Forest tenure legislation will need to be amended to accommodate the establishment of larger mills.

To convince investors to support new super mills, provincial governments will have to begin to accept the inevitability of mill closures. They will have to direct their efforts toward helping affected communities make the transition rather than toward subsidizing mill jobs. Policy-makers will also have to acknowledge that larger mills are necessary and adapt their competition policies accordingly. Finally, they will need to change tax regimes that discourage investment—notably capital taxes.

Encouraging investment in mill upgrades, larger mills or bioproducts mills will be no small feat considering that this is a difficult time for the sector. Investors are disinclined to put money into a sector with a recent spotty profit record. Although the fundamentals of the markets for existing and novel products will ultimately win out, policy matters such as tax regimes and approval processes can have a material bearing on the investment climate. Accordingly, the federal and provincial governments should modify tax rates and ensure that environmental assessment and permitting processes can lead to timely approvals without compromising protections. Removing the encumbrances that discourage investment can help stimulate the necessary renewal.

**Encouraging investment in mill upgrades, larger mills or bioproducts mills will be no small feat considering that this is a difficult time for the sector.**

In addition to conventional wood and paper products, Canada’s forest resource can be used to produce a variety of non-traditional products. Traditional pulp mills can be modified to produce products such as bioenergy, biochemicals and biodiesel. Energy, fuels and chemicals generated from renewable forest biomass would not only renew a struggling forest products sector, but also help to reduce greenhouse gas (GHG) emissions.

Here again, support from the federal and provincial governments in the form of policies and standards to stimulate the development of biofuel production facilities will be an important factor. Government support for research and new product development will also be
essential. Providing flexibility in forest allocations and timber tenure systems to permit uses for logs outside the traditional lumber and pulp and paper products is another way in which governments can contribute. This latter effort will need to be supported by a more detailed inventory of the Canadian forest, with a focus on the uses for various types of wood fibre.

A good start would be policies that make it easy to develop and market biomass energy. The relevant technologies are well known to the industry and they lower GHG emissions, while reducing local pollution through low particulate and other emissions. To stimulate production of this cleaner energy source, governments should offer financial incentives similar to those offered for wind power. Canada’s energy policy should also be reformed to facilitate the sale, at competitive prices, of excess electricity generated from biomass.

**Mill closures were rare in previous generations; now, they are a fact of life.**

Governments and industry should complete the work they have initiated to improve air quality in mill towns while permitting the sector to renew itself. The cooperative multi-stakeholder approach can effectively achieve real improvements at costs that are reasonable and in time frames that meet community concerns and industry’s financial needs.

Since 2001, 108 mills have partially or fully closed, and provincial governments have, in general, taken a reactive approach to mill closures. The result has been hardship for communities and their laid-off workers. Provincial governments have responded by using subsidies and ownership to extend the lives of uneconomic facilities and by implementing employment and economic diversification strategies in ailing rural communities when closure has finally occurred.

But a reactive approach is less than effective. Mill closures were rare in previous generations; now, they are a fact of life. Affected communities need to find ways to address the consequences. If a mill closure is foreseen, measures can be taken to lessen the impact on displaced workers. In forest-dependent communities, economic diversification strategies need to be initiated before mills close. This kind of planning requires that the sector work closely with the community and with governments, advising them well in advance of closures and helping communities make effective transitions.

**AGRI-FOOD: TIME TO MAKE THE SECTOR MORE INNOVATIVE AND COMPETITIVE**

Given population and income growth in developing countries, the global agri-food sector can expect increasing demand for the next several decades. The need for traditional agricultural products will continue, but highest growth is expected to come from added-value products and product varieties based on differentiation. Canada’s agri-food sector will be able to benefit from these global market trends if certain barriers are eliminated or reduced.

The agri-food sector will require a workforce that is creative and risk tolerant. The sector has made some steps in this direction, but will need to do more to improve its image so that highly qualified individuals will be attracted to careers in agri-business. Steps that will assist in this transformation include making investments in training and development, and publicizing the changing nature of careers in the sector.

**Given population and income growth in developing countries, the global agri-food sector can expect increasing demand for the next several decades.**

Many of the opportunities identified in this report for the agri-food sector involve improved product development for segmented consumers in the domestic and export markets alike. Taking advantage of these opportunities means leaving the comfort zone of “this is the way we’ve always done it.” It means gaining a better understanding of today’s consumers and developing products, practices and delivery processes that reflect that understanding.
At the moment, producers are constrained by the lack of consumer information flowing to them along the value chain. Supply-managed sectors are particularly vulnerable. If the sector is to produce more variety and the higher-value products that consumers want, it will need to integrate vertically or to form collaborative alliances among farmers and downstream processors, distributors and retailers whose specific aim is to create consumer value.

The sector also needs to improve its productivity by investing in new equipment and by creating and selling new products. Governments can stimulate investment by reducing capital and other taxes that act as a drag on investor enthusiasm. Productivity-driven investments are then likely to follow. Governments must also ensure the timely approval and introduction of new products, rationalize provincial and federal food inspection regulations, and support research and development (R&D) as well as commercialization of new products.

In the area of food safety and quality, governments and regulatory agencies must be vigilant. An efficient and effective regulatory system is essential to protecting our exports and the Canadian public. However, Canada’s regulatory approval processes of new food products, crop protection products and animal health products are slow, thereby reducing the agri-food sector’s competitiveness and preventing the use of inputs and processes—and the creation of new products—that could be beneficial to Canadians and the environment.

The agri-food business also faces environmental challenges that must be met by effective regulation and farm-based best management practices. These practices are being adopted but could be made even more attractive by supporting farmers who make environmental improvements and protect natural capital, such as wetlands. Developing a market that trades in ecological goods and services may help, but the agricultural community and governments must be open to both new ideas and flexible approaches. Concern about GHG emissions provides a clear opportunity for developing a biofuels economy based on fermented farm products or co-products. Government support for such initiatives is critical, and results are already apparent in one ethanol plant announcement. Further opportunities will emerge as the demand for ethanol for motor fuel grows.

Canada is a net exporter of food because it has a large arable land mass in relation to its population. But to increase opportunities for exports, the federal government must actively pursue further trade liberalization for agricultural goods. For example, the Canada–U.S. Free Trade Agreement (FTA) removed tariffs from several higher-value food categories. As a result, Canada now has more access to U.S. markets for processed and higher-value agri-food products, and exports of those products to the U.S. have indeed risen, whereas exports of Canadian bulk raw-product have stayed level.

The federal government must actively pursue further trade liberalization for agricultural goods.

More can be done, especially at the international level. Tariffs are currently at extremely high levels—some in excess of 300 per cent. And tariffs in most countries are higher on value-added food products than on raw commodities. Practices such as these prevent trade in higher-value products, thereby limiting market opportunities for countries like Canada.

Another major issue for the Canadian agri-food sector is the subsidization that U.S. and European farmers receive for products that are traded internationally. These subsidies lead to excess production, which in turn lowers prices for the relevant products. Canadian farmers do not receive equivalent subsidies, and they therefore suffer the consequences of weak farm income.

Canada’s supply-managed commodities (dairy and poultry products) occupy a position very different from that of other Canadian farm products. Supply-managed commodities are protected by relatively high tariffs.
(roughly 150 per cent for poultry products and 250 per cent for dairy products). The protection from foreign competition and the control exercised over production have kept net incomes for farm families producing those commodities relatively high and stable.

The suspended Doha Round of World Trade Organization negotiations attempted to deal with agricultural tariff and subsidy issues. If Doha is revived and successfully reduces trade barriers, Canadian exporters of food products and Canadian farmers and food manufacturers will greatly benefit. But Canada will have to wait until at least 2009 for full trade negotiations to resume.

Successful trade liberalization could prove detrimental for Canada’s domestically focused supply-managed products. A real dichotomy would occur at the trade negotiating table as Canada argues for improved market access for its internationally traded products, while at the same time trying to protect its supply-managed industries. Overall, though, it is in Canada’s interest to pursue an agenda of further trade liberalization.

If multilateral trade agreements such as the Doha Round are ultimately unsuccessful, Canada will be forced to negotiate bilateral and regional agreements, although with Canada’s relatively small market, such piecemeal agreements are not an optimum solution. However, with a carefully thought-out strategy jointly developed by industry and the federal government, and forcefully implemented in negotiations, Canada’s agri-food sector could continue to enjoy further export opportunities.

To rebuild an inventory of deposits, Canadian exploration will have to expand into frontier areas.

Governments can play a significant role in boosting exploration activity. Tools for this purpose include attractive tax policy, improved geoscience, better decision-making concerning land use and access, and an improved permitting process. Tax programs such as the B.C. Mining Flow-Through Share Tax Credit and the federal Investment Tax Credit for exploration have been able to raise funds for exploration. Continuation of such tax programs should provide financial incentives for much-needed new exploration projects.

Governments and financial markets need to work together to ensure that the reporting protocols and jurisdictional regulations are coherent and transferable across Canada. Streamlined procedures will minimize the time and costs for meeting the legal and financial requirements. Governments also need to simplify the process of securing permits, while ensuring full compliance and adherence to best practices. To develop a uniform permitting process, industry should work closely with government agencies at all levels and adhere to a rigorous set of guidelines agreed to by all stakeholders.

MINING: TIME TO EXPAND DOMESTIC MINERAL EXPLORATION

The past decade saw a downturn in Canadian mining exploration activity in response to a persistent reduction in commodity prices. As a result, Canada’s inventory of mineral deposits has been depleted. To replenish reserves, mineral exploration must be stimulated. New mine developments that can meet increased global demand will sustain the Canadian mining sector into the future.

The demand for minerals and metals that began about 2002 is expected to continue to grow at least over the next 15 years, especially with the rise of the emerging economies and their middle classes. This resurgence in commodity prices saw mineral exploration rise dramatically around the world, but the focus has been on deposits already discovered and those relatively close to current mining operations. To rebuild an inventory of deposits that will eventually develop into new mines and to expand exports of mineral products, Canadian exploration will have to expand into frontier areas. Examples from the last decade include the discovery of diamonds in the Northwest Territories and of nickel at Voisey’s Bay in Newfoundland and Labrador. More deposits remain to be discovered in our large country.
The impending human resource shortage in the sector can be ameliorated by actively engaging the Aboriginal community. More and more, industry is initiating discussions that lead to the implementation of Impact and Benefit Agreements to increase Aboriginal participation. At this time, raising the education level on reserves should be a priority. Advancement on this front will help Aboriginal workers reach beyond entry-level jobs while remaining close to their homes. To this end, the federal government must work with Aboriginal governments to improve the rate of high school completion on reserves to at least the national average. Partnering with provincial educational authorities and industry groups could lead to focused and creative new approaches.

**New mining development in Canada will predominantly be located in remote and environmentally sensitive frontier regions, close to Aboriginal communities.**

The very nature of mining leads to potentially significant environmental risks. Mine excavations, waste deposits and potential chemical contaminants can create adverse environmental effects. This situation could prove doubly challenging, given that new mining development in Canada will predominantly be located in remote and environmentally sensitive frontier regions, close to Aboriginal communities. Similarly, new global mining development will involve Canadian companies in sensitive environmental and social situations abroad. The organizations involved must ensure that they adhere to the high standards of environmental performance, regulatory compliance and oversight, regardless of project location.

To address outstanding issues related to the mining sector’s environmental performance, Canadian governments should improve environmental impact assessments to take into account cumulative effects and advances in environmental science and technologies. Dealing with cumulative environmental impacts by using best practice mitigation measures will become increasingly important, particularly in Canada’s North, where most new mineral deposits will be found.

**ENERGY: TIME TO BECOME A CLEAN ENERGY SUPERPOWER**

The outlook is promising for energy producers, at least over the next 15 years. Canada’s energy sector is poised to tap into the projected tight energy markets, but to do so, companies will have to make significant investments in production, pipelines and electricity transmission while reducing environmental impacts on air quality, water resources and climate. At the same time, governments will need to have the policies, fiscal measures and regulations that bring about these environmental impact reductions as well as continuous improvements in energy efficiency.

The long-term view for Canada’s oil and gas production is excellent: strong growth in world demand is expected to continue, and the U.S. will undoubtedly want to rely on secure, politically stable sources such as Canada. This optimistic forecast is encouraging massive investments in oil sands. In fact, oil sands production will increase significantly and will offset the decline in conventional crude oil production. By 2015, supply from oil sands could reach 472,000 cubic metres per day (m$^3$/d)—up from 175,000 m$^3$/d in 2005. The value of Canada’s net crude oil exports is expected to more than double by 2020.

**Canadian energy companies will have to make significant investments in production, pipelines and electricity transmission while reducing environmental impacts.**

Although this outlook sounds promising, the sector must address certain critical issues. First, it must find new sources for the large quantities of energy required to produce oil from the oil sands. The current squeeze on natural gas—the heat source currently used to process oil sands bitumen—is driving up operating costs, so an alternative will have to be found. Furthermore, it is questionable whether natural gas, a clean-burning fuel, should be used for such purposes. Alternative sources such as bitumen, coke and nuclear will need to be considered.
A second major issue is the use of water in oil sands operations. Massive expansion of these operations will put significant pressure on water resources, even though its use per unit of production is decreasing. Resolving this issue may prove difficult, but good management of water resources will be critical to the future development of the oil sands and the other users of that water supply.

Given the projected increase in oil sands production, ways to curtail the resulting emissions will have to be found if overall GHG emissions are to be reduced.

A third major issue for the energy sector is the GHG emissions produced per unit of oil derived from oil sands. They are more than double the emissions from conventional oil production. Given the projected increase in oil sands production, ways to curtail such emissions will have to be found if overall GHG emissions are to be reduced in the future. New technologies, such as carbon sequestration, may prove to be highly beneficial. But further research and development is needed to make these new technologies economically feasible.

Natural gas markets in North America will require new supply. This will come from Canada’s less-developed natural gas resources—including offshore and northern deposits, and coal-bed methane—and imports of liquefied natural gas. All require regulatory approvals: pipeline approval processes to ship northern frontier gas to southern markets, environmental assessments for the production of coal-bed methane, and site approvals for liquefied natural gas plants. To increase supply of this clean-burning fuel, all of these issues must be addressed by governments and industry.

Provincial electricity industries differ significantly with regard to sources of supply and the markets they serve. In Ontario, for example, growing domestic demand for electricity requires new power generation, while Quebec is seeking to expand its hydroelectric capacity mainly to increase its exports of electricity to the New England states.

Finding the right mix of electricity generation technologies will be important. Choices as to the supply mix must take into account each province’s potential energy sources and the need to meet environmental objectives using renewable energy sources such as hydro, wind and solar. But for provinces with limited hydro capacity, wind and solar power are not yet sufficiently reliable. Other options include coal and nuclear, imports of electricity from neighbouring regions and greater energy efficiency.

Coal-fired generating stations are economically appealing but problematic from an environmental viewpoint. Abundant coal reserves are available in North America, making coal an attractive fuel source. But new technologies and processes will have to be developed to cut air pollutants and GHG emissions if coal is to have a promising future. Some improvements have already been made in technologies to reduce pollutants, and pilot projects to cut emissions significantly are underway. The success of piloted zero-emissions coal plants in the U.S. and Germany could make the long-term outlook for coal quite bright. If coal-fired generating stations are to have a future in Canada, they will need to adopt these technologies.

Increases in oil, gas and electricity production are not all that is required to meet future consumer demand. New pipeline and electricity transmission capacity is also necessary. Timely investments in infrastructure must be supported by efficient regulatory approval processes and, while progress has been made in streamlining these processes, much remains to be done. Overlapping, duplicate and lengthy regulatory approval processes are currently delaying construction of new pipelines and electricity transmission lines.

Gains in energy efficiency will contribute to a reduction in the rate of growth in energy demand and will improve the environment. Current high energy prices
are prompting consumers to conserve to a certain extent, but governments will need to play a major role by providing incentives and public education that encourage reduced energy use, and by increasing energy-efficiency standards such as those found in building codes and that apply to motor vehicle fleets.

One of the country’s most critical long-term challenges will be to deal with climate change. Effectively meeting this challenge will require global cooperation and strategizing. But Canadians would be ill advised to wait for the emergence of global consensus and strategies before taking action, because Canada’s growth rate in GHG emissions surpasses that of all other Group of Eight (G8) countries. The European Union, Japan and the U.S. are already investing in the development of expertise and technologies to address GHG emissions. Canadian inaction risks the country being left behind, missing out on market opportunities and being unprepared when other countries start to push the climate change agenda at the international negotiation table.

The European Union, Japan and the U.S. are already investing in the development of expertise and technologies to address GHG emissions.

Canadian governments will need to develop and implement a strategy to cut emissions significantly by 2050. The lead time to this long-term target would be ample for the development and implementation of new technologies and the replacement of aging physical assets with energy-efficient, low-emissions plants. However, action, and not rhetoric, is required to achieve long-term targets. Governments must act now by implementing emissions reduction regulations and an emissions trading system. Fiscal measures should be used to entice companies to capture their CO₂ emissions or to invest in new plants and equipment that use the most energy-efficient and economically feasible technologies available.

The fossil fuel industry also has an opportunity to develop and implement technologies that can reduce the release of GHG emissions. For example, carbon sequestration technologies could provide a solution to the projected growth of oil sands production, enhance oil recovery from aging oil reservoirs and produce natural gas from coal.

Governments can support low-emissions sources of electricity and low-environmental-impact sources such as hydro, nuclear, ethanol, biofuels and biomass. In particular, governments should reduce the regulatory hurdles to these developments, especially within the assessment and approval systems.

The fossil fuel industry also has an opportunity to develop and implement technologies that can reduce the release of GHG emissions.

Business and governments also need to invest in R&D if new methods to curtail emissions and new carbon-free sources of energy are to be found. Canada has an opportunity to build world-class expertise and technologies in this area, and then to sell that expertise and those technologies worldwide.

Finally, Canada must develop and implement a strategy to adapt to a changing climate. The major benefits of curtailing emissions will accrue to future generations. In the meantime, climate change is occurring, so the country must find ways to adapt.

Canada has the potential to become a clean energy superpower across the spectrum of energy activity, but strong action by business and governments is required to fulfill this vision. As part of this vision, the federal government must take the initiative—with the cooperation of the provinces and industry—to develop a national energy framework that sets out energy policy principles and provides a sense of direction for the future.
DEALING WITH COMMON ISSUES

Two issues—the shortage of qualified people and improvements to regulatory regimes—are common to all resource sectors. Resolving these problems is essential if Canadians are to benefit from the positive prospects in global commodity markets and to turn the country’s vast natural resources into sustainable prosperity.

ADDRESSING SKILLS SHORTAGES

To assure the future prosperity of the resource sectors, attracting, developing and retaining skilled people will be vital. Overall, Canada’s resource sectors have a workforce that is older than the national average. Any discussion of how the country’s resource sectors can expand production and their global market share must also recognize that they face future skills shortages. These shortages will be found not only in operations but also in construction or development of new infrastructure. In fact, such shortages are already evident in Alberta’s oil and gas sector.

New mining and oil and gas developments will be found close to Aboriginal populations. On average, these populations are younger and are growing faster than the national average. They could therefore represent an important untapped labour pool. Currently, however, skilled Aboriginal workers are few in number, and arranging education and training to develop their skills will not happen without significant effort.

Recommendations to Address Skills Shortages

The Conference Board of Canada recommends that:

19. All resource sectors and the federal and provincial/territorial governments provide incentives for skilled workers, including immigrants, to relocate to resource communities.

20. The federal government work with Aboriginal governments, and in cooperation with industry and provincial educational authorities, to improve on-reserve education outcomes.

21. Industry and governments collaborate with Aboriginal communities to provide better skills training to Aboriginal people.

22. Post-secondary educational institutions collaborate with industry to boost apprenticeship and internship programs for the resource sectors. Governments will need to support the increase in these programs.

23. Industry, educational institutions and governments promote the value of resource-based jobs to youth and women, to increase their participation in the resource sectors.

24. Industry and resource-based communities provide a healthy and enjoyable work and social environment, plus opportunities for learning, in order to retain skilled workers in the resource sectors.
IMPROVING REGULATORY REGIMES
A well-functioning regulatory system is central to the protection of the public interest and the environment, and ensuring public safety. Governments must continuously ensure that regulations and their enforcement are adequate at meeting these goals in the most efficient and effective way. They must allocate sufficient resources to the public laboratories and regulatory agencies to make proper evidence-based regulations that meet policy objectives and to ensure proper enforcement of regulations respectively. Regulatory bodies must provide timely approvals while also protecting the environment and public.

All four of the resource sectors analyzed in this report must have strong regulatory systems. However, they frequently encounter regulatory approval barriers that can inappropriately delay their ability to invest in new developments, the commercialization of new products or the adoption of new technologies and production processes.

In general, the regulatory approval processes for new mills, mines, oil and gas developments, electricity generation, pipelines and electricity transmission are slow and cumbersome. Federal and provincial regulations are often overlapping and duplicative, making approval processes complex and costly.

All four of the resource sectors analyzed in this report must have strong regulatory systems.

To expand the capacity of the resource sectors so that they can benefit from growing world demand for resource-based products, streamlining in regulatory approval processes is urgently required.

Recommendations to Improve Regulatory Regimes for All Resource Sectors While Protecting People and the Environment
The Conference Board of Canada recommends that:

25. Governments eliminate interprovincial regulatory barriers, making resource sectors more competitive in world markets and providing greater access to domestic markets.

26. All government departments and regulatory agencies implement “smart regulations” that protect the environment and the public and that have efficient and timely approval processes for new projects, products and technologies. The federal and provincial governments should harmonize their regulations. When harmonization is not possible, cooperative arrangements should be pursued to eliminate unnecessary overlap and duplication of regulatory processes. Canadian regulations should be harmonized with international standards, wherever feasible.
27. Governments boost the capacity of the regulatory approval processes with adequate technical staff and training so that they can keep pace with developments in science and technology.

28. Governments enforce timelines for regulatory and environmental approval processes, and impose annual performance targets for regulatory bodies.

LIMITED WINDOWS OF OPPORTUNITY TO ACT

Canada has vast natural resources—a supply that well exceeds the needs of its population. A potential therefore exists to benefit from the growing global demand for resource-based products. Within the next decade, Canada must renew and invest in its resource sectors if it is to tap the limited-time opportunities that current global markets offer. These investments must be prudent, in order not to destroy the prosperity of future generations. Similarly, the country’s productive capacity must be expanded without causing irreparable environmental damage. New products must be sought that can generate wealth while they benefit—not harm—humans, animals and ecosystems. Decisions must be geared to helping the resource sectors and their respective communities prosper during the current market gains and stay resilient when downturns occur.

Within the next decade, Canada must renew and invest in its resource sectors if it is to tap the limited-time opportunities that current global markets offer.

The insights and recommendations in this report point to how, over the next 15 years, Canada can maximize its natural resources opportunities to achieve longer-term prosperity and well-being. It is now left to leaders to act.

SUMMARY OF RECOMMENDATIONS FOR A CANadian RESOURCES STRATEGY FOR THE BOOM AND BEYOND

RECOMMENDATIONS TO RENEW THE FOREST PRODUCTS SECTOR
1. Provincial governments allow the sector to close uncompetitive mills, but industry must collaborate with government and affected communities to make the transition.

2. Governments eliminate interprovincial barriers to the movement of logs, reform the timber tenure system, and modify taxation and competition policy to support investments in much larger mills than currently exist in Canada.

3. Governments and industry increase investments in research and development to develop new products, including biomass energy, biofuels and biochemicals.

4. Governments provide financial incentives like those provided for wind power to expand biomass energy in Canada and governments reform energy policies so that excess electricity generated from forest biomass can be sold at competitive prices.

5. Governments and industry continue the work they have initiated to improve air quality in mill towns.

RECOMMENDATIONS TO MAKE THE AGRI-FOOD SECTOR MORE INNOVATIVE AND COMPETITIVE
6. Industry improve value chain management through alliances and collaboration that improve efficiencies and quality control.

7. Governments remain vigilant in ensuring food safety to protect Canada’s food exports and Canadians, but do so without putting undue burden on the sector.

8. Governments facilitate the protection of the environment by not only regulating the sector, but also supporting farmers who protect environmental assets such as wetlands.
9. The federal government take a strong stand in favour of further trade liberalization in food, and that it work with other national governments to pursue such an agenda. The suspension of the Doha Round of negotiations should not deter the government from seeking trade arrangements with other countries.

RECOMMENDATIONS TO BOOST MINERAL EXPLORATION TO OPEN NEW MINES
10. Governments support mineral exploration by providing tax incentives and establishing one set of rules and regulations that is coherent and transferable across provinces and territories.

11. Governments provide adequate funding to public laboratories and universities for the development of the geoscience information that is critical to exploration.

12. Governments and industry assess the cumulative environmental effects of new mining activities and take appropriate measures to minimize environmental impacts.

13. Industry engage with Aboriginal communities as economic and environmental stewardship partners.

RECOMMENDATIONS TO MAKE CANADA A CLEAN ENERGY SUPERPOWER
14. Industry invest in new energy supply, pipelines, electricity transmission infrastructure, and technologies and processes that minimize environmental impacts on watersheds, air and climate.

15. The federal government work with the provinces/territories and industry to develop a national energy framework of coherent policy principles that integrate energy security, increased trade, improvements in air quality and reductions in greenhouse gas emissions.

16. Governments develop and implement comprehensive climate change strategies that will significantly reduce greenhouse gas emissions and help Canada adapt to the effects of climate change.

17. Governments encourage investments in environmental technologies through effective regulations and implementation of emissions trading systems and fiscal incentives.

18. Industry and governments devote more funding to research and development to find technological solutions that will reduce emissions from the production and consumption of fossil fuels, including the capture and safe disposal of greenhouse gas emissions.

RECOMMENDATIONS TO ADDRESS SKILLS SHORTAGES
19. All resource sectors and the federal and provincial/territorial governments provide incentives for skilled workers, including immigrants, to relocate to resource communities.

20. The federal government work with Aboriginal governments, and in cooperation with industry and provincial educational authorities, to improve on-reserve education outcomes.

21. Industry and governments collaborate with Aboriginal communities to provide better skills training to Aboriginal people.

22. Post-secondary educational institutions collaborate with industry to boost apprenticeship and internship programs for the resource sectors. Governments will need to support the increase in these programs.

23. Industry, educational institutions and governments promote the value of resource-based jobs to youth and women, to increase their participation in the resource sectors.

24. Industry and resource-based communities provide a healthy and enjoyable work and social environment, plus opportunities for learning, in order to retain skilled workers in the resource sectors.
RECOMMENDATIONS TO IMPROVE REGULATORY REGIMES FOR ALL RESOURCE SECTORS WHILE PROTECTING PEOPLE AND THE ENVIRONMENT

25. Governments eliminate interprovincial regulatory barriers, making resource sectors more competitive in world markets and providing greater access to domestic markets.

26. All government departments and regulatory agencies implement “smart regulations” that protect the environment and the public and that have efficient and timely approval processes for new projects, products and technologies. The federal and provincial governments should harmonize their regulations. When harmonization is not possible, cooperative arrangements should be pursued to eliminate unnecessary overlap and duplication of regulatory processes. Canadian regulations should be harmonized with international standards, wherever feasible.

27. Governments boost the capacity of the regulatory approval processes with adequate technical staff and training so that they can keep pace with developments in science and technology.

28. Governments enforce timelines for regulatory and environmental approval processes, and impose annual performance targets for regulatory bodies.
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APPENDIX B

The Canada Project Research and Dialogue Activities

RESEARCH ACTIVITIES

- Building Successful Cities: Lessons from the United Kingdom
- Canada’s Hub Cities: A Driving Force of the National Economy
- Clusters of Opportunity, Clusters of Risk
- Course Correction: Advice on Canada’s Future Foreign Policy
- Death by a Thousand Paper Cuts: The Effect of Barriers to Competition on Canadian Productivity
- In Search of a New Equilibrium in the Canada–U.S. Relationship
- Lost Over the Atlantic? The Canada–EU Trade and Investment Relationship
- Open for Business? Canada’s Foreign Direct Investment Challenge
- Opportunity Begins at Home: Enhancing Canadian Commercial Services Exports
- Performance and Potential 2003–04: Defining the Canadian Advantage
  - Chapter 3—Understanding the Impact of Population Ageing: How It Will Affect the Supply of Labour and Health Care Costs
  - Chapter 4—Revitalizing Canadian Foreign Policy: Carving Out a New Role
  - Chapter 5—Assessing Canada’s Fiscal Capacity to 2015: Tough Choices Remain
- Performance and Potential 2004–05: How Can Canada Prosper in Tomorrow’s World?
  - Chapter 2—The Canada–U.S. Productivity Gap: Deepening Our Understanding
  - Chapter 3—Canadian Trade: Scenarios and Policy Options in an Insecure World
  - Chapter 4—Foreign Direct Investment: Ins, Outs and Implications for Canada
  - Chapter 5—Immigration: A New Deal for Newcomers
  - Chapter 6—Canada’s Cities: In Need of a New Fiscal Framework
  - Chapter 2—Making Connections: The New World of Integrative Trade and Canada
  - Chapter 3—Pursuing Sustainability: Global Commodity Trends and Canada
  - Chapter 4—Rethinking the Workforce: Aging Populations and Canada
  - Chapter 5—Facing the Risks: Global Security Trends and Canada
- Sustainability: A Winning Merger of Growth and the Environment
DIALOGUE ACTIVITIES

• Bi-National Leaders Roundtable: The Future of Canada–U.S. Relations
• Canadian Commercial Service Exports Forum
• Capturing the Vision Advisory Panel
• Commodities Research Advisory Panel
• Consultative Forum on Canada’s Role in the World Countries Research Advisory Panel
• Human Resources Management in Multinational Companies: An International Conference on Global Value Chains, Employment Practices and Public Policy
• Panel on Barriers to Competition
• Urban Research Advisory Panel
• Workshop on Enlargement of the European Union

RESEARCH AND DIALOGUE ACTIVITIES FUNDED BY THE SOCIAL SCIENCES AND HUMANITIES RESEARCH COUNCIL OF CANADA

• Employment Practices in Canadian Multinational Enterprises
• The Exchange Rate and Wages: How They Affect Capital Investment
• The Link Between Economic Growth, Openness to Trade and Quality of Life
• The NAFTA Effect: Multinational Enterprises in Canada
• Workshop on International Aviation Policy for Canada

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