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Ministre des Transports,
de l'Infrastructure et des Collectivités
et ministre de l'Agence de développement
économique du Canada pour les régions du Québec



Minister of Transport,
Infrastructure and Communities
and Minister of the Economic Development Agency
of Canada for the Regions of Quebec

Ottawa, Canada K1A 0N5

His Excellency the Right Honourable David Johnston, C.C., C.M.M., C.O.M., C.D.
Governor General and Commander-in-Chief of Canada
Rideau Hall
1 Sussex Drive
Ottawa, Ontario
K1A 01A

Excellency,

It is with great pleasure that I submit for your attention, the Annual Report on the state of transportation in Canada. Please note that this marks the first comprehensive report produced in conformity with the statutory requirements spelled out in Section 52 of the *2007 Canada Transportation Act*.

The report is based on the most current data and information needed to understand the challenges and opportunities facing Canada's transportation system and its stakeholders. The report provides an account of key events, current and future issues and efforts for sustaining an efficient, clean, safe and secure transportation system. It is complemented with an extensive addendum on transportation statistics and figures, as well as an addendum of maps.

In 2011, Canada's transportation system continued on its path of recovery following the economic difficulties since 2008. Activity, whether measured in terms of passengers or freight, was generally up while accident rates were down and significant efficiency gains were realized throughout the system.

Sincerely,

A handwritten signature in black ink, consisting of several loops and a long horizontal stroke.

Denis Lebel, P.C., M.P.

Enclosure

Canada

Canada's transportation system overcomes the limits of the country's topography and geography—linking communities, reducing the impact of distance, and moving people and goods across the country and around the world.

INTRODUCTION

The 2007 *Canada Transportation Act* requires the Minister of Transport to table in Parliament this comprehensive report on the state of the transportation sector every five years.

The bulk of this report focuses on 2011 while offering historical retrospective. It also examines transportation from various perspectives: its impact on the economy; key factors affecting the four modes of transportation (air, marine, rail and road); the movement of dangerous goods; Canada's gateways and trade corridors; and trends and future issues.

TRANSPORTATION AND THE ECONOMY

Demand for freight and passenger transport is driven by overall economic conditions. Canada's economic growth slowed in the second half of 2011, due to lower domestic demand resulting from decelerated consumer spending. Nevertheless, Canada's economic performance was a success compared to that of other industrialized economies; Canada's GDP growth in 2011 ranked third amongst G-8 countries, after Russia and Germany. Gross domestic product rose by 2.5% in 2011, down from 3.2% in 2010. This compares favourably to the 2.8% decline reported in 2009, at the height of the economic downturn.

Canada's economic performance was buoyed in part by higher commodity prices—a double-edged sword for the transportation sector, as higher prices stimulate demand but also drive up costs. The sector's profitability is largely dependent on affordable fossil fuels, since energy is often the largest or second largest expense—after labour—for a transportation company, regardless of mode. Fluctuations in energy prices were noted over the 2006–2011 period, with significant increases in 2011, including a 23.5% increase in the Canadian

average retail price of diesel, a 28.2% rise in price of rail diesel, a 32.1% jump in price for jet fuel, and a 32.6% climb in price for marine bunker fuel.

In addition to grappling with higher fuel costs, Canada's transportation industry must also adapt to changing demographics caused by Canada's ageing population. This key structural issue cuts across all regions and sectors of the economy, and the transportation sector is not immune. Changing demographics will force transportation patterns to shift, and will include heightened demand for accessible transportation.

GOVERNMENT EXPENDITURES AND REVENUES FROM TRANSPORTATION

All three levels of government provide funds and collect revenues from the transportation sector.

Government funding for transportation takes on a number of different forms (see Addendum Tables G1 to G3). At the federal level, it includes funding for VIA Rail Canada, Marine Atlantic and Infrastructure Canada programs. At the provincial and municipal levels, transportation funding covers the cost of building and maintaining roads, ferries and public transit to name but a few areas. Governments also collect revenues from transportation. At the federal level, revenue sources include fuel excise and sales taxes, airport ground leases and the Air Traveller Security Charge. At the provincial level, revenues from transportation come mainly from fuel taxation and licensing. Table G4 provides more details on public revenues from transportation.

AIR TRANSPORTATION

Canada's air transport system encompasses 1,889 aerodromes; 2,220 air carriers; a private not-for-profit corporation owning and operating Canada's civil air

navigation system (NAV CANADA); and the Canadian Air Transport Security Authority (CATSA), a Canadian Crown corporation responsible for security screening at designated Canadian airports. Some of the 26 largest airports in the country form the National Airport System (NAS). These airports handle approximately 90% of all passenger traffic in Canada and have experienced a period of acute expansion and construction aimed at increasing capacity.

In 2011, air transportation carried 78.4 million passengers (up 2.5% from 2010), and 739,000 tonnes of freight (down 9.1% from 2010) (see Addendum Tables A18 to A19C). Air cargo tends to be higher-valued or perishable goods. The air industry transported \$110 billion of Canada's international trade, up nearly 10% from 2010.

Canada's aviation industry's fuel efficiency has improved by 1.9% annually since 1990, surpassing the agreed-upon goal in the voluntary agreement between carriers and the government.

Canada has one of the safest air transportation systems in the world. During the last decade, the rate of air transportation accidents has continuously declined, from nearly eight accidents per 100,000 hours flown in 2000 to fewer than six in 2011. The implementation of Safety Management Systems (SMS) is well underway within the air transportation industry, with SMS policies, processes, procedures and systems covering more than 90% of revenue passenger-kilometres in 2011. Improvements to systems for screening passengers and their belongings have been introduced, including new equipment and lane configurations that improve the flow of passengers and bags through security screening checkpoints at major Canadian airports.

MARINE TRANSPORTATION

In 2011, marine transportation handled more than \$205 billion of Canada's international trade. It is by far the most important mode, both in terms of value and volume, for serving overseas markets. In 2010, marine freight traffic totalled 392 million tonnes—269 of which were handled at the 17 Canada Port Authorities (CPAs). Bulk commodities were the main products transported by ship.

CPAs, which administer federally owned ports at arm's-length and on a commercial basis, are financially self-sufficient. In 2010, they reported combined revenues of \$456.5 million, 18% more than in 2009, with total net income of \$101.7 million (see Tables M8 and M9).

Pilotage services, which provide vessels with local navigational expertise, are grouped around four federal

Crown corporations. In 2011, they handled a combined 50,743 assignments, generating \$180 million of revenue for an overall net income of \$10.8 million.

Alleviating water pollution remains an important focus of government and the marine industry. In 2011, Canada signed the Hazardous and Noxious Substances (HNS) Protocol adopted in 2010 by a Diplomatic Conference convened by the International Maritime Organization (IMO). The Protocol covers approximately 6,500 substances and will bring into force an international regime of liability and compensation for HNS. Transport Canada continued to develop regulations and measures to prevent pollution from vessels operating in Canadian waters and the introduction of invasive species into Canada's waterways, and to enable the implementation of a North American Emission Control Area.

On the security front, the Perimeter Security Action Plan announced in December 2011 proposed several measures aimed at improving, better aligning and coordinating maritime security regulatory measures between Canada and the U.S. while enhancing marine security and fostering economic opportunities.

RAIL TRANSPORTATION

During 2011, the rail transport industry moved 313.5 million tonnes of freight (see Tables RA7 and RA10). In 2010, the latest year for which data is available, the rail industry carried 4.2 million passengers on VIA Rail, 146,500 passengers on other intercity railways and 64.3 million on commuter railways in the Montreal, Toronto and Vancouver metropolitan areas (see Tables RA30 and RA31). The recent economic crisis coupled with cyclical fluctuations in the Canadian economy impacted volumes of rail freight as well as passenger activities, with the railway industry employing 32,006 people in 2010, up 1% from the previous year, and employee average annual compensation at \$76,564, up 2.8% in a year (see Table RA5).

Between 2006 and 2011, the federal government amended the *Canada Transportation Act* to strengthen shipper protection provisions, and the *Railways Safety Act* (RSA) to enhance rail safety oversight and enforcement, and to increase the focus on safety management systems and environmental protection. The government also followed up with a Rail Freight Service Review, releasing the final report in December 2010 and government responses on March 18, 2011.

Canadian National (CN) and Canadian Pacific Railway (CPR) have pursued billion-dollar capital investment programs aimed at improving overall efficiency, reliability and

fluidity of the rail network through targeted investment in track and roadway, buildings, rolling stock and information systems. Locomotive fleet improvement also took priority, as both companies aimed to improve fuel efficiency. Both Class I railways have focused investment in fleet renewal programs, technology and the adoption of best practices to achieve economic and environmental sustainability of their operations. In passenger rail, VIA Rail completed infrastructure upgrades of \$300 million in its Montreal-Ottawa-Toronto corridor, and opened a new \$750,000 station in Smiths Falls, Ontario.

2011 saw significant progress in efforts to reduce air emissions from rail transportation. Both CN and CPR announced plans to improve their locomotive fleet fuel efficiencies and lower emissions by purchasing new locomotives and rebuilding some of their existing fleet, while Transport Canada completed six preliminary consultation sessions on the development of locomotive air pollutant emission regulations.

In keeping with the Rail Safety Strategic Plan 2010–2015, Transport Canada launched the first phase of its national data collection system in 2011 and made significant progress on its implementation of risk-based planning and quality management procedures.

ROAD TRANSPORTATION

With more than one billion (two-lane equivalent) kilometres of roads (see Table RO2), road transportation is Canada's most important mode for passenger and freight transportation. The National Highway System's (NHS) 38,000 kilometres of roads are critical to domestic and North American trade and tourism activities. While the road network falls under the responsibility of provinces, territories and municipalities, the federal government contributed financially to a number of major road-related projects through several programs—such as the Building Canada Fund. The federal government continues to contribute to a significant number of projects, including the construction of a new bridge to replace the existing Champlain Bridge in Montreal, the construction of a new bridge over the St. Lawrence Seaway to connect both ends of Highway 30, and work on the Detroit River International Crossing between Windsor and Detroit, which began in 2011.

In terms of freight on Canada's roads, in 2010, Canadian for-hire trucking carriers moved 225 billion tonne-kilometres of freight (see Table RO17), 139 billion in domestic freight and 87 billion in international freight traffic (see Tables RO13 to RO15). On the passenger side, bus industry revenues in 2010 were \$14.3 billion.

Meanwhile, public transit continued to gain popularity across the country, as did active transportation and shared transportation systems. Major new mass-transit infrastructure projects are being planned in Montreal, Ottawa, Toronto, Edmonton and Vancouver.

Of all transportation modes, the road mode is by far the largest producer of greenhouse gases (GHG), accounting for 82.5% of domestic GHG emissions from transportation, and 19% of total Canadian emissions in 2009. However, more stringent regulations introduced in 2011 for vehicle model years 2012 to 2016, as well as technological advances and alternative fuel and energy types, will help contain the road mode's carbon footprint. As well, the Government of Canada has introduced a number of initiatives in recent years to develop lower carbon-intensive alternative and renewable fuels.

The most recent road casualty data shows a decrease in road casualty collisions from 148,154 in 2005 to 123,524 in 2009 (see Table S6), a decrease in the number of fatalities from 2,898 in 2005 to 2,207 in 2009, and a decrease in the number of injuries from 204,768 to 170,415 (for 2005 and 2009, respectively). Numerous outreach and public initiatives have targeted impaired driving—which may be a factor in up to 37.6% of fatal accidents—winter driving and driver distraction. Canada also supported the United Nations in declaring 2011 to 2020 the Decade of Road Safety.

TRANSPORTATION OF DANGEROUS GOODS

The safety record for the transportation of dangerous goods has improved over the past five years: some 358 transportation accidents involving dangerous goods were reported in 2011, 4.4% below the average for the 2006–2010 period; 70% of them occurred during handling at transportation facilities, and 30% took place while the goods were in transit. The 96 road-related dangerous goods accidents accounted for more than 92% of in-transit dangerous goods accidents (see Tables S22 to S24). Fatalities resulting from the transportation of dangerous goods has remained at zero for the fifth consecutive year.

GATEWAYS AND TRADE CORRIDORS

Canada is working to ensure ongoing trade competitiveness through the implementation of strategic planning and focused investments in the country's transportation system through three initiatives: the Asia-Pacific Gateway and Corridor Initiative (APGCI), the Ontario-Quebec Continental Gateway, and the Atlantic Gateway and Trade Corridor. To support these

initiatives, the federal government created the \$2.1-billion Gateways and Border Crossings Fund and the \$1.0-billion Asia-Pacific Gateway and Corridor Fund within Building Canada, the federal government's overall plan for infrastructure that commits almost \$6 billion to Canada's gateways and trade corridors to support key projects.

Gateway development reaches beyond infrastructure. A broad analytical framework, including a fluidity indicator, has also been developed to evaluate how gateways and strategic trade corridors interact operationally, to examine end-to-end supply chain performance by focusing on the time component, and to identify capacity and demand of the multimodal system by determining issues and bottlenecks that affect the efficient flow of international freight as well as the competitiveness of the system.

TRENDS AND FUTURE ISSUES

Looking forward, an efficient, clean, safe and secure transportation system accessible and integrated across all modes will continue to be vital to Canada's competitiveness. This integrated system will facilitate the movement of people around the world and enable Canadian goods to access new markets, stimulating wider economic activities, direct investments and prosperity in Canada.

While the United States will remain a crucial trading partner for Canada, increased diversification can be expected in the future, with impacts on both freight and passenger transportation. This will present an opportunity to review policies, legislation and regulations under new circumstances.

Canada's transportation system must remain aligned with the country's opportunities in the global marketplace. Pressure from emerging economies on the world's renewable and non-renewable resources represent opportunities for Canada, particularly for its

northern regions where transportation challenges require a tailored approach. However, this will present significant challenges in building a sustainable transportation network that can resupply the North and export its resources while taking into account the needs of the local population and adaptation to climate change.

Canada's transportation sector faces a pending two-pronged infrastructure challenge: first, how to optimize use of current infrastructure to alleviate congestion and adapt to ever-growing traffic volumes; and second, how to address the issue of ageing infrastructure within the current fiscal framework. An additional consideration will be how to address evolving supply chains caused by shifting trade patterns. This may force a rethinking of current service delivery models as well as specific metrics used to measure transportation system performance, and will place a greater emphasis on the transportation system's fluidity, reliability and resiliency.

While high fossil fuel prices provide development and exporting opportunities, they also present a significant challenge to the transportation industry—the challenge of containing costs. All transportation modes are dependent on fossil fuels, and high energy prices have forced industry to explore alternative sources of energy and areas for improved fuel efficiency. This challenge also presents an opportunity for the transportation industry to become more environmentally sustainable and to approach the issue of high fuel prices from a network-wide perspective.

Technology, meanwhile, can play an important role in improving current infrastructure use and capacity, and will remain at the forefront of the transportation system's efficiency, environmental, safety and security improvements.

Transportation links communities and reduces the impact of distance between people, products and services. It supports the country's social and economic fabrics, and adjusts to changes and transformations within Canada's society and economy.

INTRODUCTION

Canada is defined, among other things, by its geography: a 10-million square-kilometre land mass with the longest land border and most extensive coastline in the world, fronting three different oceans; a diversified landscape with a wealth of resources; and challenging topographical and meteorological conditions.

Canada is also home to nearly 34 million inhabitants, and greets more than 16 million foreign visitors every year. It has an annual economic output of \$1.8 trillion—the 14th largest in the world (15th by capita)—as well as one of the most diversified economies.

Transportation in Canada operates against this backdrop by moving people and goods over small and large distances, across towns, regions, provinces, territories and the nation itself as well as to and from other countries around the world. Canada's strategic location between Asia and Europe makes it a gateway to the Americas—a role of particular importance in today's global marketplace.

While the activities of Canada's transportation service industry are highly diversified, several common values prevail among all stakeholders. These include a dedication to efficiency, a commitment to environmental responsibility, adherence to the highest standards of safety, and the determination to provide Canadians with a secure transportation system. These values anchor Canada's strategic transportation objectives and the cornerstone of the country's federal department of transportation, Transport Canada.

ABOUT THIS REPORT

This report on the state of transportation in Canada is tabled by the Minister of Transport, Infrastructure and Communities of Canada in both Houses of Parliament. It is produced in compliance with Section 52 (2) of the 2007 *Canada Transportation Act*, which reads:

Every five years, the report referred to in subsection 52 (1) shall be expanded to a comprehensive review of the state of transportation in Canada which shall include:

- (a) *the financial performance of each mode of transportation and its contribution to the Canadian economy;*
- (b) *the extent to which carriers and modes of transportation were provided resources, facilities and services at public expense;*
- (c) *the extent to which carriers and modes of transportation received compensation, indirectly and directly, for the resources, facilities and services that were required to be provided as an imposed public duty;*
- (c.1) *the long-term outlook and trends in transportation in Canada; and*
- (d) *any other transportation matters that the Minister considers appropriate.*

Transportation in Canada constitutes this mandatory comprehensive review since the *Act's* amendment in 2007. It begins with a description of relevant economic issues and how they impact the Canadian transportation system, and reviews public transportation expenditures

3 EXECUTIVE SUMMARY

and revenues as well as key developments in the four modes of transportation: air, marine, rail and road. These modal chapters present industry overviews, highlights from the previous year, a recap of significant changes that took place since the last comprehensive report in 2006, and descriptions of key issues related to the four values.

The report concludes with chapters on the transportation of dangerous goods; on gateways and corridors and global value chains; and on foreseeable trends and issues likely to affect Canada's transportation system in coming years.

The report, its Statistical Addendum and its Cartography Addendum are based on extensive factual transportation data. Both addenda are heavily referenced in this report. The various data sources are

diverse and encompass a broad range of organizations; proper care and attention was devoted to data quality and reliability. However, the onus for data quality rests with the sources of data reported. To produce this report, the most current data available was used, which was not always from 2011. This results in a slight variation of data periods from one mode to another.

Painting a complete picture of the state of transportation in Canada is a complex task, delimited by access to data. When possible, the scope of the report extended beyond federal transportation responsibilities. Canada's transportation system can be reviewed from local, regional, provincial, national as well as global perspectives. By addressing a mosaic of facts, trends and issues across all modes, this report offers readers a perspective on the state of transportation in Canada.

TRANSPORTATION AND THE ECONOMY

4

After a period of economic crisis and natural disasters, 2011 was a year in which the path to recovery finally revealed itself. Canada weathered the downturn better than most, and is proceeding—with care—through still-tentative times.

4.1 CANADA'S ECONOMIC PERFORMANCE

In 2011, Canada's real gross domestic product (GDP) at market prices rose by 2.5% (compared to the previous year's 3.2%). The country, however, has moved well beyond the -2.8% low of 2009 during the economic crisis (please see Addendum Table EC1).

While the first quarter of the year was strong, several temporary factors (including unanticipated disruptions in the energy sector due to unrest in the Middle East and North Africa, and supply chain interruptions caused by the earthquake/tsunami disasters in Japan) caused second-quarter growth to decline to an annual rate of -0.6%. As the impacts of these shocks abated, net exports rebounded and the economy followed suit, with third-quarter growth of 4.2%. Yet, given weakened global economic conditions due to low confidence in the U.S. economy and uncertainty over the European sovereign debt and financial crisis, growth in the fourth quarter slowed to 1.8%.

In Canada, final domestic demand grew by 3.0% in 2011, decelerating from its 4.5% growth rate in 2010. Consumer spending slowed from 3.3% in 2010 to 2.2% in 2011. The expiration of government stimulus measures—such as the tax rebate on home renovation projects—combined with slow income growth, a rising level of consumer debt and relatively high inflation on food, gasoline and energy prices, all contributed to the erosion of household spending power.

Personal disposable income grew by 3.3% in 2011, compared to 4.9% in 2010. Debt levels rose at a faster pace, aided by historically low interest rates that increased the ratio of household credit/market debt to personal disposable income to 149%, from 145% in 2010. On the housing front, residential construction increased slightly to

174,344 units in 2011 from 166,175 units in 2010, in spite of the federal government tightening mortgage regulations in March, making it more difficult for some homebuyers to obtain financing needed to purchase a home.

The personal savings rate fell in 2011 from 4.8% to 3.8% the previous year.

DRIVERS OF GROWTH

BUSINESS INVESTMENT

Business investment continued to serve as an engine of Canadian economic growth in 2011. Firms that had delayed purchasing equipment during the recession began to buy in 2010 and continued into 2011, and investment in machinery and equipment (M&E) grew by 13.7%. This was the second year in a row that M&E investment climbed over 11%—surpassing the pre-recession high. Driving this growth were falling prices of machinery and equipment imports due to a strong Canadian dollar boosted by high commodity prices, as well as a growing shortage of skilled labour.

CONSUMER PRICES

In 2011, the consumer price index (CPI) increased by an annual average of 2.9%, compared to 1.8% in 2010. For the year as a whole, prices increased in all eight major components of the CPI, with gasoline and food experiencing the largest increases. Following a 17.5% decline in 2009 and a 9.1% rise in 2010, gasoline prices increased by 20% in 2011—the largest annual average rise in a decade. Food prices rose 3.7% after increasing 1.4% the previous year. The cost of transportation went up 6.4% on average in 2011; this compares to a 4.3% increase in 2010. In addition to paying higher prices for gasoline, consumers also paid more in passenger vehicle insurance premiums. On an annual basis, the Bank of

Canada's Core CPI increased 1.6% in 2011 compared to 1.8% in 2010. The rise in 2011 was the smallest annual average increase in the Core CPI since 2005.

THE CANADIAN DOLLAR

The Canadian dollar remained strong in 2011. For most of the year, the dollar traded close to or above par vis-à-vis the U.S. dollar. The average value of the Canadian dollar against the U.S. dollar was U.S.\$0.989, compared to U.S.\$1.029 in 2010. The dollar reached its lowest level in July, trading at U.S.\$0.944, and also depreciated in early October amid growing fears of another financial crisis in the Eurozone, which caused investors to retreat to the American dollar. By the end of that month, however, the Canadian dollar had returned to above parity and reached its highest trading point for the year at U.S.\$1.06. Canada's healthy fiscal situation and strong banking sector, the U.S.'s and Europe's economic woes, and upheaval in oil-producing nations (which caused oil prices to rise) all contributed to the Canadian dollar remaining close to or above parity throughout the year.

TRANSPORTATION SECTOR

In 2011, the transportation services sector represented 4.2%¹ of Canada's GDP, or \$53 billion (see Table EC1). Truck transportation represented the largest segment of transportation services and accounted for 31% of the sector's share of GDP; the air and rail segments represented 12 and 11%, respectively, while water transportation represented about 2%. The remaining output came from the transportation support and scenic and sightseeing activities segments, which includes airport operations, operations of terminals and harbours, and arrangement of freight transportation services.

When examining the transportation sector's economic performance, the inventories-to-shipments ratio is useful to consider, as it reflects the level of activity in the freight sector—if the economy is growing, inventories tend to be low and shipments high, and demand for transportation services is healthy. Conversely, when the economy slows, business activity decreases and inventories tend to accumulate, with fewer shipments and thus a lower demand for transportation services. Throughout 2011 the inventories-to-shipments ratio reflected the uncertain global economic context. In January inventory levels had returned to their normal pre-recession levels and stood at 1.28, suggesting that businesses had a little over a month's worth of inventories. However,

as a series of economic shocks perturbed the world economy during the first half of the year, business confidence was affected and economic activity slowed. As a result, the inventories-to-shipments ratio increased to 1.38 in June—its highest level for 2011. As the temporary shocks subsided, the ratio gradually decreased as the number of shipments rebounded; by December, the inventory-to-shipment ratio was 1.29, reflecting a return to pre-recession levels of inventory stocks.

The Ivey Purchasing Managers Index (PMI) is another useful indicator for the transportation services sector. This economic index measures monthly changes in dollars of purchases from a panel of purchasing managers from across the country. It is often used as an anticipatory indicator for transportation services, as it reflects the order book of businesses. A figure above 50 reflects an increase, while below 50 is a decrease. In 2011, the PMI reflected the same pattern as the inventories-to-shipments ratio: despite a strong start to the year with the PMI posting levels of 70.8 and 73.2 in February and March respectively, it experienced volatile fluctuations ranging from 46.8 to 65.5 mid-year, but ended the year at 63.5 as businesses began to regain confidence and pick up their order books.

In terms of passenger traffic, the observed slowdown in global economic activity for 2011 as compared to 2010 was apparent for air passenger traffic. Although the total number of enplaned and deplaned passengers in Canada increased by 3.2% in 2011, this marked a slowdown from the 4.4% increase in the total number of enplaned and deplaned passengers observed for 2010. The slowdown in air passenger traffic for 2011 stemmed not only from the growing global economic uncertainty, but also from the sharp volatile increases in oil prices, strongly correlated to jet fuel prices, observed in 2011. Given that fuel costs account for roughly 30 per cent of an airlines' operating expenses, in 2011 airlines were forced to increase their prices and reduce capacity in order to recover the losses resulting from the large oil price fluctuations.

Conversely, strong inflationary pressures in 2011, such as a 20% increase in gasoline prices along with other factors, had a notable impact on Canadians' disposable incomes and favoured more economical urban modes. As a result, in 2011 the number of total urban passenger trips for the ten major Canadian urban transit operators² increased 5.3% to 1.6 billion trips for the year. This was a greater increase than the 4.2% increase observed in 2010.

1 Excludes warehousing and pipelines.

2 Passenger trips based on the 10 major Canadian urban transit operators, represents about 80 per cent of total urban transit traffic in Canada. The top 10 transit properties in Canada are: Toronto Transit Commission, Société de transport de Montréal, Vancouver Regional Transit System, OC Transpo(Ottawa), Calgary Transit, Edmonton Transit, Go Transit (Toronto), Réseau de transport de la capitale (RTC - Québec City), City of Winnipeg Transit System, Montreal Region Transit.

The rail passenger traffic sector, which is a sector dependent on both domestic and international tourism, was on the bottom end of a slow and uneven recovery for travel markets following the recession. In 2011 this sector had not yet recovered from the recession. Nonetheless, the impacts from the slowdown in economic activity throughout 2011 were still apparent, but to a lesser degree than for the airline sector. The number of passengers recorded in 2011 was virtually unchanged from the previous year and stood at roughly 4.09 million passengers, a very slight decrease from the 4.1 million passengers recorded in 2010. However, still shy from the 4.5 million passengers recorded in 2008.

Overall, for 2011, growth experienced in the transportation sector's GDP surpassed the Canadian average. On a year-over-year basis, the sector's GDP growth increased by 3%, while that for all industries increased by 1.9%. This performance suggests that as demand for Canada's natural resources from emerging economies becomes increasingly significant, traditional trading patterns are changing. This, in turn, affects the rationale for using transportation services.

4.2 INTERNATIONAL TRADE

2011 OVERVIEW

The main risks to the Canadian economy in 2011 were largely external, as the world economy experienced a series of unexpected shocks. During the first half of 2011, unrest in the Middle East and North Africa disrupted the world supply of oil. This caused oil prices to reach record highs and bolstered the Canadian dollar above parity. The persistently strong Canadian dollar continued to be a challenge for Canadian exporters.

In March, the devastating mega-earthquake/tsunami off the coast of Japan severely disrupted that country's critical contributions to the global manufacturing supply chain. This led to depressed world output, including in Canada, in automotive as well as other manufacturing supply chains. Japan is Canada's third largest trading partner in terms of exports. Furthermore, large-scale floods in Australia and the United States reduced demand and disrupted output in sectors such as agriculture and coal. This caused supply shortages and price increases that further hampered the global economy's growth.

In addition to the temporary shocks of 2011, the major element impeding a strong global economic recovery was Europe's inability to quickly resolve and somewhat contain its sovereign debt problems. This significantly impacted global economic expansion by triggering

financial-market volatility and damaged investor and household confidence. The effects of the European sovereign debt crisis have rippled through most major developed economies in the world, including the United States, Canada's largest trading partner.

On the whole, the global economic environment in 2011 was volatile, generating uncertainty and causing Canada's trade balance to fluctuate from quarter to quarter. For the year, total merchandise trade, on a customs basis, was \$893 billion (see Tables EC6 and EC7), representing an 11.2% increase from 2010. Total exports were \$447 billion, increasing 12.1% from 2010 levels, while total imports were \$445 billion, 10.4% greater than in 2010. This resulted in a trade surplus of \$1.7 billion—an improvement over Canada's trade deficit of \$4.4 billion in 2010.

Canada's international trade activity remains largely dependent on the health of the United States economy and is export-oriented. In 2011, Canada's total merchandise trade with the U.S. was \$551 billion and represented 62% of Canada's total trade activities (see Table EC6). Canada's total merchandise exports to the U.S. were \$330 billion, representing 74% of all of Canada's merchandise exports, while imports from the United States to Canada were \$221 billion, representing about 50% of all of Canada's imports. Over the past year, the U.S. economy experienced modest growth, posting GDP growth of 1.7% (compared to 3.0% in 2010), not only as a result of the European debt crisis but also due to the country's own domestic sovereign debt issues. Confidence in U.S. policymaking hit new lows in 2011, as political standoffs hampered compromise on how to cut the U.S. long-term debt ratio. This resulted in growing uncertainty of the U.S. economy's direction and significantly damaged consumer and business confidence. Despite historically low interest rates, heightened risk aversion and low private sector investment ensued. The fact that the fragile economic recovery in the U.S. was most evident in the truck transportation sector is not surprising, given that 57% of the value of Canada's trade with the United States is done by road mode, while 17% is by rail, 16% by pipeline, 6% by marine and 5% by air.

Canada's total trade with the rest of the world in 2011 was \$342 billion (see Table EC7), and was import-oriented, as roughly \$117 billion were exports and \$225 billion were imports. As such, Canada had a trade deficit in 2011 of \$107 billion with the rest of the world (excluding the U.S.). Canada's second largest trading partner is China; Canada's total trade with China in 2011 was \$64 billion, a 12.4% increase from 2010. Canadian exports to China were \$16 billion, while imports from China were \$48 billion.

IMPACT OF THE GLOBAL RECESSION ON CANADA'S TRANSPORTATION SERVICES SECTOR

The Canadian economy was impacted by the 2008–09 financial crisis but generally fared better than most other countries through the recession. In 2009, the country's GDP³ contracted by 3.1%, but by 2010, GDP had surpassed its 2008 pre-recession levels, expanding by 3.6% (see Table EC1)

As with most other sectors of the economy, the transportation services sector was impacted by the recession. The sector as a whole contracted by 5% in 2009, but by the second quarter of 2010 returned to its pre-recession levels, and for 2010 as a whole expanded by 5.7%. However, each segment of the transportation sector was impacted differently by the recession; those segments most dependent on industrial activity and international trade—such as rail and water—were impacted to a greater degree.

Rail and water are two transportation industries that have not yet fully recovered from the recession. Given that two thirds of the goods carried by rail move across Canada's land or sea borders, this sector is highly sensitive to global economic conditions. In 2009, the rail sector's GDP contracted by 13%, yet expanded by 11.5% in 2010. For 2011, the sector expanded only by 0.4%. As a result of the marked slowdown in global economic activity in 2011, the rail sector's GDP still remains below its 2008 pre-recession levels.

Of the entire transportation sector, the water transportation sector fared the worst. This sector's GDP contracted by 14.3% in 2009 and expanded only by 3.6% in 2010 and 1.0% in 2011. The Canadian water transportation industry is highly dependent on international trade, mostly U.S. markets. It is estimated that 40%⁴ of industry activity is derived from the international movement of goods or foreign passengers. It is important to note that in this context, water-borne traffic that passes through Canadian ports is not captured within the industry, since that traffic is carried by foreign-flagged ships. One reason why water transportation has not recovered as quickly as rail is that a large part of the growth in rail-related exports was driven by Asia, and Canada does not have many water transportation companies covering those international routes.⁵ The recovery in the water transportation

sector has been delayed by the long and slow recovery in the U.S. economy.

The air transportation mode is also dependent on international trade—more than half of the passengers that enplane or deplane at Canadian airports are travelling to or from international destinations. In 2009, the air sector contracted by 3.6% as the number of Americans entering Canada by plane dropped by 9%, and the number of tourists from the United Kingdom, Mexico and Japan was also very low in 2009 and 2010. Table A18 shows overall passenger enplanement and deplanement, and reflects a 5.3% drop in volumes between 2008 and 2009. However, in 2010, the air sector's GDP had expanded by 8.0%. This sector recovered the fastest from the recession. The fact that the Canadian economy recovered much more quickly from the effects of the recession than other countries resulted in Canadians travelling more, both domestically and internationally. Growth in Canadian international travel was particularly robust, as the strong Canadian dollar made foreign destinations cheaper. Furthermore, the emergence of developing countries as economic powers also helped offset some of the losses, as visitor counts from emerging markets—particularly China and India—have continued to rise.⁶

The trucking sector also recovered fairly quickly from the recession. In 2009, this sector's GDP contracted by 6.7%. It reached its lowest point during the second quarter of 2009, but by the second quarter of 2010 it had regained its pre-recession level and expanded 8.1% for the year as a whole. The key characteristic that helped the trucking sector recover from the recession is its reliance on the domestic economy—particularly the retail, manufacturing and wholesale sectors. Given that Canada's economy has recovered faster than most other countries from the recession, declines observed in other transportation sectors highly dependent on international trade were much smaller for trucking firms. However, the impact of the recession on the U.S. economy, Canada's largest trading partner, was particularly evident in the trucking sector, where 57% of the value of goods traded between Canada and the U.S. are moved by truck. During the recession, the number of two-way truck border crossings decreased from 11.5 million to 9.8 million in 2009 (see Table RO19). In 2010, the number of two-way truck border crossing increased to 10.5 million, and have remained at this level in 2011, therefore full recovery from the recession has not yet occurred.

3 Refers to GDP at basic prices in 2002 constant dollars; All-industries by North American Industrial Classification System code.

4 Conference Board of Canada estimate.

5 Conference Board of Canada document produced for Transport Canada.

6 Conference Board of Canada document produced for Transport Canada.

4.3 DEMOGRAPHICS

One of Canada's greatest long-term economic challenges is its aging population. In 2010, the number of Canadians aged 65 and older was 4.8 million, or 14.1% of the country's total population. By 2030, this is projected to reach 9.5 million, or 22.5% of the total population. In 2011, the 55-years-and-over age group formed one third of the working age population, up from one quarter 15 years ago. This demographic transition will see an increasing share of Canadians move out of their prime working age and into their retirement years, resulting in slower growth in the labour force. In fact, the Parliamentary Budget Office projects that slower labour growth as a result of Canada's ageing population will reduce annual average real GDP growth from 2.6% observed over 1977–2010 to 1.8% over 2011–2086.

This is a structural issue that cuts across all regions and sectors of the economy, and one that sits front and centre in the transportation sector. During the last decade, the number of persons 55 years of age or older employed in the transportation sector doubled. In 2011, of the 843,400 people employed in the transportation sector, 22% were 55 years of age or older, compared to 11.4% in 2000. Meanwhile, the number of people employed in the 15 to 24 age group has declined from 7.9% in 2000 to 5.9% in 2011, and those in the 25 to 54 age group fell to 72.3% in 2011 from 80.7% in 2000. As compared to the business sector in general, the number of employees in the 55 years of age or older group increased from 10% in 2000 to 17% in 2011, while those in the 25 to 54 age group declined from 74% to 68% and those in the 15 to 24 age group only declined by 1% from 2000 to 2011, going from 15% to 14%.

In 2011, the water transportation mode of the transportation sector had the largest number of older workers: roughly 27% of employees in that sector were in the 55 to 64 age group. However, the transit and ground passenger sector as well as the trucking sector also had a large number of older employees. The transit and ground passenger sector had 23% of its employees in the 55 to 64 age group, while the trucking sector had 17%.

It is predicted that labour shortages will affect the operations of the economy significantly in the coming years. For example, persistent shortages will force businesses to find new ways of increasing productivity levels—such as becoming more capital-intensive—in order to stay productive.

4.4 FINANCIAL PERFORMANCE OF MAJOR TRANSPORTATION STAKEHOLDERS

In 2010, Canada's transportation industry registered strong growths in revenues and income as the economy recovered from the 2008–09 recession. A summary of the financial performance of the transportation industry can be found in Table EC71.

AIR

Canadian air carriers in 2010 had operating revenues of \$17.4 billion, up from \$15.4 billion in 2009, representing a 12.7% increase year over year. Operating expenses grew at a slower pace than revenues, increasing by 8% between 2009 and 2010. This translated into an industry-wide profit of \$868 million, up 581% compared to the \$127 million in profits reported in 2009. More detailed information on the financial performance of Canada's major air carriers for 2011 can be found in Section 6.2.

MARINE

Due to the discontinuance of Statistics Canada's Annual Survey of Water Carriers, no information is available on the financial performance of the marine mode.

RAIL

In 2010, Canadian rail freight carriers had operating revenues of \$9.4 billion. This represents an increase of 12.2% from 2009 revenues of \$8.4 billion, which declined 15.2% compared to 2008 revenues. Operating expenses increased 11.3% in 2010, reaching \$7.5 billion. This provided a favourable decrease in operating ratio to 80.3%. More detailed information on the financial performance of Canada's major railways in 2011 can be found in Section 8.2.

ROAD

According to Statistics Canada's Annual Trucking Survey (ATS), the for-hire trucking industry posted a 4.9% increase in operating revenue, from \$38.9 billion 2009 to \$40.8 billion in 2010. This compares to a 4.6% increase in operating expenses, from \$36.2 billion in 2009 to \$37.9 billion in 2010. The largest increase in operating expenses was fuel, at 12.2%.

4.5 PRODUCTIVITY OF THE TRANSPORTATION SECTOR

OVERALL TRANSPORTATION

In 2011, Transport Canada conducted a study on productivity in the Canadian air and rail sectors. One key finding was that labour productivity growth in the Canadian air and rail transportation sectors from 1997–2010 outperformed that of the business sector. For example, output per labour advanced at a 5.0% average annual rate for air transport and 3.4% for rail transport, compared to only 1.3% in the business sector (see Tables EC68 and EC69).

Output levels in the transport sector—generally measured as tonne-kilometres or passenger-kilometres—grew 9.9% in 2010, as economic activity regained its footing from the 2009 global economic crisis. Public carriers⁷ outpaced private carriers⁸ with a 13.7% increase in output compared to 9.3%, respectively. Total factor productivity (TFP) levels rose by 5.6%, which indicates that output increased more than the amount of input used to produce it. In terms of mode-specific total factor productivity levels, only the levels for the air and rail mode are reported. Due to data limitations, the TFP levels for the truck and marine modes cannot be examined here.

AIR

The air sector raised its output by 8.1%, with TFP productivity levels increasing 3.1%. An increase in the efficiency of capital use (10.0%) helped offset a decline in labour productivity (-14.6%). The airline industry used 12.1% more labour in 2010 than in 2009, while output grew by only 8.1%.

RAIL

FREIGHT

Total output for freight rail carriers in 2010 increased 11.3% compared to 2009, but shipments of agricultural goods rose only 0.5%. Most of the growth in shipments was seen in the category “Other Commodities”, which includes chemicals, petroleum, building materials and

machinery equipment, among others. Tonne-kilometres increased 20.6% in 2010. Total productivity for the sector rose 5.1%, due primarily to increases in labour (8.1%) and capital (11.4%) efficiencies.

PASSENGER

Output in the passenger rail sector decreased by 1.1% from 2009 to 2010. This was due to a reduction in passenger counts in most corridors. Fuel and labour productivity helped offset a reduction in capital efficiency to stabilize total productivity of the sector at 0.5% growth in 2010.

4.6 ENERGY PRICES AND USAGE

For all segments of the transportation sector, energy costs represent an important part of operating expenses. The fact that oil and energy prices dropped during the economic downturn helped reduce some of the sector’s costs while revenues were low. However, a challenge for the transportation sector is that energy prices are uncertain and can quickly fluctuate, making it difficult to predict how these prices will affect operating costs on an ongoing basis.

CRUDE OIL PRICES

The annual average price of crude oil continued to increase from its five-year low of U.S.\$61.80 in 2009. The average price of a barrel of West Texas Intermediate (WTI) rose 19.6% from 2010 to U.S.\$94.87 in 2011.⁹ Meanwhile, the average annual price of Brent crude oil reached a record \$111.26 per barrel in 2011, up 39.8% from 2010. In April 2011, the average price for Brent reached \$123.26, the highest it’s been since July 2008 and the third highest ever in nominal value.¹⁰ Table EC63 provides more information on the price of crude oil for both WTI and Brent.

Energy analysts are increasingly of the view that the price of Brent is a better proxy for the international price of oil, while WTI is a better proxy for the U.S. market. In 2010, the price for both was on average almost identical, but 2011 brought a growing disparity between the two as Brent prices increased more rapidly than WTI prices. On average, the price for Brent was 17.3% higher than for WTI during 2011, with a peak difference

7 VIA Rail and urban transit operators.

8 Freight railways and airlines.

9 Source: Energy Information Administration.

10 Not taking inflation into account.

of 31.9% in July 2011. This trend continued in the first quarter of 2012, as Brent prices rose 16.3% compared to 7.7% for WTI.

REFINED FUELS PRICES

The retail price of unleaded motor gasoline climbed 19.6% from its average price in 2010. The 2011 national average price for unleaded gasoline was \$1.23 per litre, compared to \$1.03 per litre in 2010. Crude oil remained roughly half (49.3%) of the total cost of the pump price, while taxes¹¹ (30.7%), refinery operating margins (13.9%) and marketing operating margins (5.9%) made up the rest. Table EC64 provides retail gasoline prices for select cities.

The 2011 Canadian average retail price of diesel increased 23.5%, from \$1.00 per litre in 2010 to \$1.24 per litre in 2011. The 2011 price was comprised of crude oil (49.0%), taxes (24.4%), refinery operating margins (18.3%) and marketing operating margins (8.1%). Table EC65 provides retail diesel prices for select cities while Table EC66 provides a breakdown of the price components of road fuels.

The Canadian price for jet fuel rose 32.1% from 2010 to \$0.77 per litre in 2011. The 2011 average price is still lower than the historical high of \$0.85 seen in 2008. The price of aviation gasoline increased 16.3% from 2010 to 2011, to reach \$1.09 per litre.

The average spot price¹² of ultra-low sulphur number 2 diesel used for rail transportation rose 28.2%, to \$0.81 in 2011.

The average spot price of marine bunker fuel grew 32.6%, from \$0.56 per litre in 2010 to \$0.75 per litre in 2011.

It should be noted that for both aviation and marine, there are tax exemptions for fuel purchased for an international voyage. Table EC67 provides retail prices for aviation, marine and rail fuels.

CONSUMPTION

OVERALL CANADIAN ECONOMY

Energy consumption in the Canadian economy rose 2.1% from 2009 to 2010. This included increases in energy demanded in the mining, forestry, construction and agriculture sectors. Energy demand in the transportation sector, including motor gasoline and diesel consumption, increased 3.0%.

TRANSPORTATION SECTOR

Gasoline sales increased 1.1%, from 40.2 billion litres in 2009 to 40.6 billion litres in 2010. This includes retail pump sales as well as refinery sales of gasoline to the manufacturing and commercial sectors. Total sales of diesel fuel rose 6.6%, from 16.5 billion litres in 2009 to 17.6 billion litres in 2010, which includes a substantial increase of 29.1% in refinery sales to rail companies. Retail pump sales of diesel grew 1.7%.

The domestic consumption of jet fuel declined by 1.0%, from 4.7 billion litres in 2009 to 3.4 billion litres in 2010. This includes a decrease of 7.0% in fuel sold to Canadian airlines, which fell from 4.1 billion litres to 3.8 billion litres. Total energy demand in the aviation sector fell 1.4%, from 205 petajoules¹³ in 2009 to 203 petajoules in 2010.

Marine energy consumption rose marginally from 117 petajoules in 2009 to 118 petajoules in 2010, while rail energy consumption remained stable from 2009 to 2010 at 88 petajoules.

In the road mode, total energy demand climbed 2.8%, from 2.05 petajoules in 2010 to 2.11 petajoules in 2011. Alberta had the highest increase in use, consuming 7.0% more energy in 2010 than in 2009. Finally, pipeline energy consumption dropped almost 10.0%, from 137 petajoules in 2009 to 124 petajoules in 2010.

The data above show a strong dependency of the transportation sector on fossil fuels. As these fuels become increasingly expensive, the transportation sector is seeking innovative ways to reduce its dependency on them. In aviation, for example, the International Civil

11 Taxes that apply on gasoline prices include the federal excise tax of 10¢/l, a provincial fuel tax that varies between 6.2¢/l in the Yukon to 20.06¢/l in British Columbia, a local fuel tax in Montreal, Vancouver and Victoria, the 5% Goods and Services Tax (which is also charged on the aforementioned taxes) and the provincial sales tax or the provincial component of the Harmonized Sales Tax in Newfoundland and Labrador, Nova Scotia, New Brunswick, Quebec and Ontario.

12 A spot price reflects the price paid for immediate purchase and delivery, as opposed to a contract where terms are agreed in the present but delivery and payment will take place in the future.

13 When modelling energy consumption due to economic activity, it is sometimes useful to convert various fuels to a common energy measurement, one of which is known as a petajoule. The conversion multiplier for one million litres of a certain fuel to a petajoule is as follows: motor gasoline = 0.035, diesel = 0.0383, turbo jet fuel = 0.0374, aviation gasoline = 0.03352, heavy fuel oil = 0.0425.

Aviation Organization's Committee on Aviation and Environment Protection has been examining issues such as alternative fuels with a lower carbon footprint, improved air navigation to reduce fuel burn and advanced materials to make lighter aircraft. Canada's railways have invested heavily in purchasing new, more fuel efficient locomotives, which has translated into reduced energy consumption per tonne-kilometre carried (see Table EN29). In the marine mode, programs like shore power help ships reduce their fuel consumption while docked by using the local electricity grid rather than their own engines. Slow steaming—meaning to reduce the cruising speed of ships—has also helped them become more fuel efficient. Finally, in the road mode, improved engines, long-combination vehicles, aerodynamic aids, electric and hybrid vehicles, and the

use of public transit all reduce dependency on fossil fuels. This will not only help the industry contain its operating costs, but will also help it be more environmentally sustainable by reducing its carbon footprint. Sections 6.5, 7.5, 8.5 and 9.5 all present various ways in which the air, marine, rail and road modes manage to reduce their fuel consumption.

However, while individual modes have shown some success at reducing their energy intensity (i.e., their energy use per unit of output), they still need to decouple economic growth from growth in energy use to help reduce the total level of emissions from transportation.

GOVERNMENT EXPENDITURES AND REVENUES FROM TRANSPORTATION

5

All three levels of government in Canada provide funds to and collect revenues from the transportation sector. This chapter highlights key public expenditures and revenues as they pertain to transportation.

5.1 INTRODUCTION

Transportation funding is shared across all three levels of government. Generally, federal funding pertains to interprovincial or international transportation, provincial

funding pertains to intra-provincial transportation and municipal funding pertains to local transportation. Of course, exceptions do exist; Addendum tables G1 to G7 provide a detailed breakdown of government expenditures and revenues in transportation.

Government expenditures in transportation

| | Selected expenditures (million dollars) | Level of government | | | TOTAL |
|-----------------------------|--|----------------------|-------------------------|------------------------|----------|
| | | Federal (2011–12) | Provincial (2010–11) | Municipal (2010–11) | |
| Air | CATSA | 515.0 | n/a | n/a | 515.0 |
| | Subsidies | 39.5 | n/a | n/a | 39.5 |
| | Airports | 35.6 | n/a | n/a | 35.6 |
| | Other | 283.6 | 50.9 | n/a | 334.5 |
| | Sub-Total | 873.7 | 50.9 | n/a | 924.6 |
| Marine | Coast Guard | 689.0 | n/a | n/a | 689.0 |
| | Ferry Subsidies | 290.8 | n/a | n/a | 290.8 |
| | Ports | 175.0 | n/a | n/a | 175.0 |
| | Other | 218.1 | 232.8 | n/a | 450.9 |
| | Sub-Total | 1,372.9 | 232.8 | n/a | 1,605.7 |
| Rail | Subsidy to VIA Rail Canada | 493.8 | n/a | n/a | 493.8 |
| | Grade Crossing improvement | 14.6 | n/a | n/a | 14.6 |
| | Other | 9.2 | 74.1 | n/a | 83.3 |
| | Sub-Total | 517.6 | 74.1 | n/a | 591.7 |
| Road and transit | Infrastructure Canada | 670.7 | n/a | n/a | 1,170.6 |
| | Other federal departments | 284.0 | n/a | n/a | 284.0 |
| | Bridges | 156.6 | n/a | n/a | 156.6 |
| | Transit | 24.1 | 4,156.1 | 2,693.5 | 6,873.7 |
| | Other | 23.0 | 11,855.5 | 11,644.7 | 23,523.1 |
| | Sub-Total | 1,158.4 | 16,011.6 | 14,338.2 | 32,008.1 |
| OTHER AND MULTIMODAL | | 631.0 | 378.0 | 468.5 | 1,477.5 |
| TOTAL | | 4,553.6 | 16,747.4 | 14,806.7 | 36,107.7 |

Please see Addendum Tables G1, G2, G3 and G5 for more details

5.2 AIR EXPENDITURES

The National Airport System (NAS) was created as a result of the National Airports Policy of 1994, and comprises 26 airports, which are operated by local, non-profit, airport authorities. However, Transport Canada still owns land and infrastructures at 17 non-National Airport System (NAS)¹ airports across the country as well as one water aerodrome (see table A31).

In 2010–11, Transport Canada's actual costs to operate these airports were \$15.5 million, plus \$15.0 million for capital projects. In the same period, Transport Canada also collected approximately \$8.1 million in revenues. In 2011–12, the estimated costs for operating these airports are \$15.5 million plus \$25.2 million for capital projects. For 2011–12, total projected revenues are \$8.9 million.

The National Airports Policy² also created the Airport Capital Assistance Program (ACAP)³ in 1995 to help eligible airports with safety-related capital projects. To be eligible, an airport must receive year-round regular scheduled passenger service that generates minimum traffic of 1,000 passengers per year; meet airport certification requirements; and not be owned by the federal government.

In 2011–12, ACAP funded 29 new safety-related projects at 23 airports at a total estimated cost of more than \$21 million. These projects included rehabilitation of runways and airside manoeuvring surfaces, purchasing of heavy airside mobile equipment and installation of wildlife fencing. Since its inception in 1995, ACAP has funded 680 safety-related projects at 171 airports for a total of over \$559 million (see Map 11 on ACAP projects). For the 2007–2011 period alone, ACAP investments reached \$152.2 million across the country, broken down by province⁴ as shown on the table to the right (see Tables 5.1 and A4).

Most provinces and territories also own a number of airports and aerodromes across the country, usually in remote or northern areas. For example, Newfoundland and Labrador owns and operates 21 airports⁵, Quebec 27 (in addition to seven heliports), Ontario 29, Manitoba 23, Saskatchewan 17, the Northwest Territories 27 and

Table 5.1

ACAP Investments 2007–2011

| Province | Amount (\$M) |
|---------------------------|--------------|
| British Columbia | 21.0 |
| Alberta | 14.1 |
| Saskatchewan | 0.9 |
| Manitoba | 20.5 |
| Ontario | 41.9 |
| Quebec | 25.5 |
| New Brunswick | 2.0 |
| Nova Scotia | 1.1 |
| Newfoundland and Labrador | 2.7 |
| Nunavut | 16.1 |
| Northwest Territories | 4.6 |
| Yukon Territory | 1.6 |
| Total | 152.2 |

Source: Transport Canada, ACAP program

the Yukon 29. The three Territories own and operate their respective capital's airports. The remainder of Canada's airports, particularly those with commercial services, are generally owned and operated by the community they serve.

Both federal and provincial governments also invest regularly in major airports to maintain or improve infrastructure and help those airports to remain competitive. In 2011, the federal government committed \$52.9 million from the Gateways and Border Crossings Fund (GBCF) to assist seven Eastern Canadian Airport Authorities, and much of this funding was matched by contributions from other levels of government. This \$52.9 million in funding was shared by Quebec City for a runway upgrade (\$21.6 million), Fredericton for runway and lighting upgrades (\$5.4 million), Moncton for a runway extension (\$4 million), Charlottetown for a terminal expansion (\$1.2 million), Halifax for a runway extension

1 More information on the NAS available at <http://www.tc.gc.ca/eng/programs/airports-policy-nas-1129.htm>

2 See <http://www.tc.gc.ca/eng/programs/airports-policy-menu-71.htm>

3 See <http://www.tc.gc.ca/eng/programs/airports-acap-menu-327.htm>

4 There is no funding for Prince Edward Island, as the only passenger airport in that province—in Charlottetown—is a Transport Canada-owned airport and thus ineligible for ACAP funding.

5 Eight on the island of Newfoundland and 13 on the Labrador coast.

(\$9 million), Gander for a runway upgrade (\$3.3 million) and St. John's for a new instrument landing system (\$8.6 million). These projects also benefited from \$24.7 million in provincial funding.

While the Government of Canada does not directly subsidize air transport, some provinces have established programs to attract new air services, maintain existing airport assets, or help passengers from remote areas access more affordable fares. Examples include:

- Taking Flight: An Air Access Strategy for Newfoundland and Labrador, introduced in October 2010 to enhance air access to, from and within the province. The five-year strategy is currently funded at \$5 million in the form of two rebate programs: one for provincial airport authorities' business development initiatives and another for air carriers' route development and advertising.
- In New Brunswick, the province is also contributing \$500,000 towards runway rehabilitation and lighting and navigational system upgrades at the Miramichi airport. In addition, some airports qualify for provincial property tax exemptions, and international carriers that refuel in the province may qualify for a fuel tax rebate of 2.5 cents/litre.
- In Quebec, the Air Transportation Assistance Program, created in 2006 and renewed in 2011, is providing \$1 million per year for a three-year period ending in 2014. The program aims to share financial risk related to the start-up of new air services or the resumption of an abandoned service. It will also contribute to market studies for the implementation of new services or find methods and procedures more respectful of the environment. The program also co-funds infrastructure projects that improve access to airports. Finally, the province's Airfare Reduction Program, which provided \$932,000 in 2011, allows residents of remote and isolated regions to travel at a reduced cost for personal reasons or when accompanying a patient who requires healthcare services, through a partial refund of their airfare.
- The Ontario Ministry of Transportation, through its Remote Airport Program, owns and operates 29 remote airports and provides subsidies for basic infrastructure and other capital works.
- The Manitoba Airport Assistance Program (MAAP), which has been in place for about four decades, provides operational and maintenance grants to airports that do not receive scheduled services. Grants are \$1,200 for airports with unpaved runways and \$2,400 for airports with paved runways. MAAP funding totals \$87,000 annually. Manitoba owns and operates 23 airports in the northern part of the province, at an annual expense approaching \$11 million. These airports mostly serve First Nations communities with no other year-round transportation connection to the outside world. As well, Manitoba exempts (by refund) international cargo flights from the provincial aviation fuel tax. Domestic cargo flights pay a reduced rate of provincial aviation fuel tax.
- The Saskatchewan Ministry of Highways and Infrastructure has maintained its Community Airport Partnership (CAP) program since 2007–08. It provides capital contributions on a 50/50 cost-shared basis to rehabilitate and upgrade strategic regional community airports. This program was funded at \$700,000 in 2011. Saskatchewan also offers the Airport Assistance Program, which focuses on operations and maintenance assistance to community airports. This program has been in place since 1988, and in 2011 provided \$110,000.
- Alberta's Strategic Transportation Infrastructure Grant—Community Airport Program provides funding assistance to community-owned, public-use airports for their rehabilitation and construction projects. Approximately \$2.7 million in projects was approved in 2010. In addition, municipalities may choose to fund projects that support the infrastructure needs of regional and community airports under Alberta's Municipal Sustainability Initiative (MSI). Municipalities have committed \$9.58 million towards capital and operating projects for airports under MSI since the program's launch in 2007. As for provincial fuel taxes, international flights have enjoyed an exemption from having to pay them since 2004.
- British Columbia, through its Transportation Partnerships Program (TPP) and various federal/provincial infrastructure programs, has contributed \$65.4 million to projects at 36 community airports since 2003. The TPP does not have a budget allocation in the current year. In addition, the province has a number of travel support programs, such as the Air Ambulance Program, Medical Transportation Supplement, Crime Victim Assistance Program and Travel Assistance Program, all of which can assist residents with associated travel costs, including aviation. On another note, in early 2012, British Columbia eliminated its provincial fuel tax on all international flights.

SAFETY

On the safety front, Canada has been active in the International Civil Aviation Organisation (ICAO)'s technical cooperation initiatives in the Asia-Pacific Region since 2003. Specifically, Canada participates in the Cooperative Development of Operational Safety and Continuing Airworthiness Program (COSCAP) for North Asia, which provides assistance to the People's Republic of China, the Democratic People's Republic of Korea, Mongolia, and the Republic of Korea.

The program aims to enhance the safety and efficiency of air transport by strengthening the flight safety oversight in these countries. It establishes a regional core of highly qualified flight operations and airworthiness inspectors to perform the full range of flight safety inspection and certification functions.

Transport Canada's overall contribution to COSCAP takes two forms: grants and in-kind contributions. Through grants, the department contributes up to \$130,000 a year to the project. The last contribution was in 2009 for \$130,000. Transport Canada will also make a contribution in 2012 for a similar amount. In-kind contributions include:

- participation in Steering Committee meetings for the North Asia program;
- provision of technical expertise, including a Transport Canada technical expert who serves as the head of the North Asia program;
- provision of subject matter experts to provide training courses as training needs are identified; and
- provision of other technical assistance as requested.

Through ICAO, Transport Canada also supports the operation and financing of facilities and services provided by Denmark (Greenland) and Iceland for aircraft flying across the North Atlantic. In 2011, Canada contributed approximately \$50,000 to these countries to support these services.

SECURITY

Finally, on the security front, the Airport Policing Contribution Program (APCP) was instituted in April 2002 during a time of significant financial difficulty for airports following the terrorist events of 9/11. The aim of the contribution program was to provide funding to help airports manage in an environment of increased security costs. The program currently helps smaller

airport operators pay for a portion of the overall cost of enhanced aviation security policing. Until March 2008, the program was managed by the Canadian Air Transport Security Authority (CATSA)—the agency responsible for screening people and baggage at Canadian airports. Since then, it has been managed by Transport Canada. In 2011, the four recipients of the contribution program were Kelowna International Airport, Hamilton International Airport, Greater London International Airport, and Victoria International Airport.

The 2010 federal budget allocated CATSA and Transport Canada \$1.5 billion over five years to make Canada's domestic air transportation system less vulnerable to terrorist attacks and improve the security of all air travellers. In addition, that budget allocated \$95.7 million over five years for air cargo security, as well as \$17.6 million per year in ongoing funding.

The Government of Canada budgeted \$21 million over five years to upgrade elements of CATSA's checked baggage screening equipment that are reaching their end of life. As these upgrades are completed at airports, air travellers flying from Canadian airports with U.S. pre-clearance facilities will no longer be required to have their baggage re-screened if connecting at a U.S. airport, making connections through U.S. cities easier and reducing the risk of bags not being placed on connecting flights. While these changes will make Canada-U.S. air travel more convenient, they will also maintain a high level of security.

In 2011, CATSA also improved its service delivery model—which involves third-party screening contractors—by creating a new, four-region contracting model. Reducing the number of regions from six to four, and the number of contracts from 17 to four, has increased CATSA's operational and management efficiency. The new contracts came into force on November 1, 2011 and expire March 31, 2017, with an option to extend for up to an additional five years. These contracts are worth up to \$2 billion over the 2011–2017 period. Table A31 shows the companies now responsible for delivering screening services at designated airports in Canada.

5.3 MARINE EXPENDITURES

FERRIES

Ferry services often act as an extension of the road network, providing linkages where bridge construction would be technically and economically unfeasible.

Through the Ferries Services Contribution Program, Transport Canada is responsible for ensuring that federally owned ferry assets contribute to a safe and reliable transportation system, and supports three interprovincial ferry services in Eastern Canada:

- between Cap-aux-Meules, Îles-de-la-Madeleine, QC and Souris, PEI, operated by CTMA Traversier Ltée (CTMA) since 1971;
- between Saint John, NB and Digby, NS, operated by Bay Ferries Ltd (BFL); and
- between Wood Islands, PEI and Caribou, NS operated by Northumberland Ferries Ltd. (NFL) since 1941.

In support of these services, Transport Canada owns four ferry vessels and six shore facilities—leased to operators for a nominal amount—as well as the ferry terminal in Yarmouth, NS.

In 2010–11 Transport Canada spent \$31 million on the Ferry Services Contribution Program; the amount for 2011–12 is projected to be approximately \$33.4 million. In 2011 the federal government began working with the provinces and local communities to develop a long-term approach to these services; that collaboration continues into 2012.

In 2010, the federal government provided an additional \$76.4 million for these ferry services: \$31.7 million in Budget 2010 and \$44.7 million announced in November 2010. The latter was part of a three-year extension of ferry services to March 31, 2014.

On the west coast, British Columbia has had sole responsibility for its coastal ferry services since 1977, when the governments of Canada and British Columbia entered into an agreement whereby BC would assume sole responsibility for ferry and coastal services in return for an ongoing indexed grant. The initial amount of the grant was \$8 million per year; in 2011–12, it was \$27.5 million.

Provincial governments also provide important funding for ferry services. Their contributions include:

- \$1.3 million in Newfoundland and Labrador for Labrador Marine to provide ferry service between the west coast of Newfoundland and Blanc Sablon, Quebec. In 2011–12, Newfoundland and Labrador estimates spending \$110 million on its marine operations, including \$39.3 million for the construction of ferry vessels.

- \$1 million from each of the provinces of New Brunswick and Nova Scotia to support the Saint John, NB to Digby, NS ferry service operated by Bay Ferries Ltd., in addition to the federal contribution received by the operator. Nova Scotia's contribution is part of the \$8.3 million it estimates it will have spent on ferries in 2011–12.
- Operation of four cable and three self-propelled ferries by the government of New Brunswick. Of the 14 mostly year-round ferry services in New Brunswick, 11 are provided by the province's 15 vessels and are free of charge. These carried 4.5 million passengers in 2010–11. The province spent \$45 million to build a new ferry—the MS Grand Manan Adventure, linking North Head on Grand Manan Island and Blacks Harbour, NB—and covers operating costs of the ferry.
- A subsidy from Quebec's Ministry of Transportation for five year-round ferry services and eight contracted-out seasonal or long-haul services operated by the provincial Crown corporation Société des traversiers du Québec. In 2010–11, the amount of that subsidy was \$82.3 million.
- Operation of six ferries on five routes in the northern part of Manitoba by the provincial government that carried 98,305 vehicles in 2010–11.
- Operation of 13 seasonal ferry services—12 of which are free of charge—by the Saskatchewan Ministry of Highways and Transportation. In 2010–11, the Saskatchewan government spent \$3.4 million on this service.
- Operation of seven ferries by Alberta Transportation as part of its highway network, at a cost of \$1.1 million in 2010–11.
- A \$153-million grant from the province of British Columbia in 2010–11 for BC Ferries' operation of its 25 routes and 35 vessels in addition to the province's indexed federal grant.

TRANSPORT CANADA PORTS

Under the National Marine Policy framework, the Port Divestiture Program was established to transfer ownership and operation of regional/local ports from Transport Canada to other federal departments, provincial/territorial governments, or local interests, including municipalities. In 2007, the Port Divestiture Program was renewed for five years, ending in March 2012. The department received \$61 million to transfer ports and \$51 million to operate and maintain non-divested ports.

All ports divested with an operating agreement receive contribution funding, which is used to operate and maintain the existing port property in compliance with safety and operating standards.

In 2010–11, two ports were divested: Port Stanley in Ontario, with a contribution of \$13.4 million, and Bamfield East in British Columbia, with a contribution of \$620,000. As well, six parcels of land in Victoria Harbour were sold, generating \$1.44 million in revenues. Additional divestitures are expected to be completed before March 31, 2012.

In 2010–11, actual operating costs for Transport Canada's remaining 69 ports was \$18.5 million plus \$7.6 million for capital projects. Transport Canada also collected approximately \$10.5 million in revenues. Projected costs for Transport Canada to operate its remaining 67 ports in 2011–12 are \$12.7 million plus \$12 million for capital projects, while anticipated revenues are approximately \$10.2 million.

BOATING SAFETY

Historically, the federal government has leveraged the support of a wide-reaching network of volunteer-based organizations to promote boating safety. In June 2008, Transport Canada established the five-year Boating Safety Class Contribution Program, with a maximum funding level of \$1.75 million until March 31, 2013. The program's overall goal is to promote boating safety in Canada by providing financial contributions for projects that raise boating safety awareness and focus on safe boating practices.

Most of the projects are undertaken by not-for-profit organizations dispersed across Canada. Since 2009, a total of 26 projects have received funding. The program's targeted approach involves ranking proposals as per Transport Canada's priorities, based on the Canadian Red Cross report, *Boating Immersion and Trauma Deaths in Canada: 18 Years of Research*.⁶

TRAINING ASSETS

The Divestiture of Marine Training Assets program was established in 2006 to formalize the ending of the Simulated Electronic Navigation (SEN) and Marine Emergency Duties (MED) training programs. The objective of the program is to transfer ownership of SEN and MED training equipment and facilities from Transport

Canada to seven provincial governments that provide marine training and certification through provincial marine training institutes. The program has enabled the transfer of eight marine training simulators, with contributions, between 2007 and 2010 to British Columbia, Ontario, Nova Scotia and Newfoundland and Labrador. In 2011, the remaining two Transport Canada-owned simulators were transferred to Quebec through a contribution agreement valued at \$1.45 million, which concluded all simulator transfers. Over the next few years, Transport Canada will divest itself of its last MED training facility at Port Colborne, Ontario, as well as other miscellaneous MED training assets at provincial marine training institutes.

5.4 RAIL EXPENDITURES

PASSENGER RAIL

The federal government provided \$481.6 million in funding to VIA Rail in 2011. Of this, \$264.8 million was used for operations and \$216.8 million for capital investment. Operating revenues totalled \$287.2 million in 2011 and expenses were \$552 million.

The capital expenditure is part of a \$923-million contribution that runs from 2007 to 2014. The goals of this program are to ensure VIA Rail's equipment, stations and other capital assets are in a good state of repair, to improve safety and accessibility, and to improve passenger service, with particular emphasis on the Quebec–Windsor Corridor, which accounts for the bulk of VIA Rail's ridership.

For rolling stock, this program will:

- rebuild the F40 locomotive fleet used nationally and the Light Rapid and Comfortable (LRC) fleet used in the Quebec–Windsor Corridor;
- refurbish and rebuild part of the fleet of cars used on the western transcontinental train;
- rebuild the Rail Diesel Cars (RDC) used on VIA Rail's regional and remote services; and
- make accessibility, safety and operational enhancements to the Renaissance cars used on the Montreal–Halifax route and the Quebec City–Windsor Corridor.

In 2011, VIA spent \$70.3 million on the projects listed above. Total costs for these projects will be \$288.5 million.

6 See http://www.redcross.ca/cmslib/general/2011_boating_fnl.pdf

Infrastructure improvements are being made in the Montreal–Ottawa–Toronto triangle and in southwestern Ontario on the Georgetown–Kitchener–London and Chatham–Windsor route segments. Improvements include the installation of additional main line track and sidings, new and upgraded signalling to control train movements, upgraded road crossing protection, and new fencing and bridge repairs on VIA-owned tracks. In 2011, VIA Rail spent \$123.7 million on these infrastructure projects; the total cost of the project will be \$474.5 million.

VIA Rail is also undertaking a major program to upgrade its stations. In 2011, a new station was completed in Smiths Falls, Ontario and major repairs were completed in Vancouver and Winnipeg. Construction began on station improvement in Belleville, Oshawa, Cobourg and Windsor. In 2011, VIA Rail spent \$7.3 million on stations. The total cost of the project will be \$60 million.

The Government of Canada also contributes financially to four regional and remote passenger rail services through its Regional and Remote Passenger Rail Services Class Contribution Program (RRPRSCCP). The program supports two Aboriginal-owned remote passenger rail services: the Keewatin Railway Company, located in northern Manitoba between The Pas and Pukatawagan; and Tshiuetin Rail Transportation, located in northeastern Quebec and western Labrador between Sept-Îles and Schefferville. A third remote passenger service, the Algoma Central Railway, owned by CN Rail and located in northwestern Ontario between Sault Ste. Marie and Hearst also receives support under this program. Remote rail services provide access to the national transportation system for communities with no other year-round surface transportation options. The fourth remote service, Ontario Northland, is a provincial Crown agency of the Province of Ontario and also receives funding from the provincial government.

Under the RRPRSCCP, the federal government directed \$14.9 million in 2011 to four shortline railways as shown on Table 5.2: Keewatin Railway Company (Manitoba), \$2.0 million; Ontario Northland Transportation Commission (Ontario), \$2.5 million; Algoma Central Railway (Ontario), \$2.2 million; and Tshiuetin Rail Transportation (Quebec and Labrador), \$8.2 million. Combined, these four carriers transported 67,725 passengers in 2011: Keewatin Railway Company, 4,687 passengers; Ontario Northland Transportation Commission, 39,579 passengers; Algoma Central railway, 5,666 passengers; and Tshiuetin Rail Transportation, 17,793 passengers.

Federal funding provided under the RRPRSCCP aims to ensure the continuation of safe, reliable and sustainable regional and remote passenger rail services and provides funding necessary to ensure the continuation of non-VIA remote and regional passenger rail services. For three of the four proponents, the federal government is the only government that contributes to the railways.

RAIL SAFETY

Several public funding initiatives are aimed at improving rail safety. As part of Canada's Economic Action Plan, Budget 2009 allocated a total of \$72 million for rail safety over five years, plus an additional \$15 million on an ongoing basis. Also allocated was \$44 million over five years for rail safety initiatives that enhance regulatory oversight and enforcement capacity, and for research and development projects to advance new rail safety technologies, as well as \$28 million over five years for the Grade Crossing Improvement Program that aims to improve safety at public grade crossings across Canada.

GRADE CROSSING IMPROVEMENT PROGRAM

The Grade Crossing Improvement Program (GCIP), funded under section 12 of the *Railway Safety Act*⁷ (RSA), is designed to cover up to 80% of the costs of a crossing improvement project. Funding for construction costs applies to safety improvements only, and does not include future maintenance costs. The authorities involved (usually road authorities and railways) negotiate responsibility for the remaining costs. Examples of eligible expenditures include the:

- installation of flashing lights, bells and gates;
- addition of gates or extra lights to existing signal systems;
- interconnection of crossing signals to nearby highway traffic signals; and
- modification of nearby intersections, including the addition of traffic control signals.

In 2011–12, Transport Canada approved funding for 810 projects across Canada, with total funding of nearly \$14 million. The number of projects increased significantly from previous years due to a renewed focus on replacement of incandescent lights with LEDs, as encouraged by Transport Canada to meet the new standard.

7 See <http://www.tc.gc.ca/eng/acts-regulations/acts-1985s4-32.htm>

Table 5.2 Statistics for Passenger Regional and Remote Rail Services for 2011

| Length of Railway (owned, leased) | Number of Passengers–2011 | Operating Revenues¹ | Revenue-Tonne Kilometres² | Employees–2011 | Federal Subsidy |
|--|----------------------------------|---------------------------------------|---|-----------------------------|------------------------|
| 627 miles owned 505.2 miles leased | 67,725 | \$11,440,429 | 229,460 | 65 full-time 76 seasonal | \$14,900,000 |

1 Revenues generated by the four recipients. The majority of the recipients reported an operating deficit.

2 Applicable for only two recipients.

GRADE CROSSING CLOSURE PROGRAM

Funded under section 12.1 of the *Railway Safety Act*, the Grade Crossing Closure Program (GCCP) is designed to provide a maximum investment of \$5,000 for closing a restricted crossing, and \$20,000 for closing an unrestricted crossing. Eligible crossings include those where a safety concern or hazard exists, or where closing the crossing will divert users to an adjacent crossing that has a higher level of safety.

In 2011–12, Transport Canada approved funding for 44 projects across Canada, with total funding of approximately \$250,000.

OPERATION LIFESAVER

Operation Lifesaver promotes public awareness to help save lives and reduce suffering from injuries incurred at highway/railway crossings and from trespassing on railway property. In 2011–12, Transport Canada provided a contribution of \$300,000 to the Railway Association of Canada to support this project’s objectives.

5.5 ROAD EXPENDITURES

Road infrastructure funding is shared between all three levels of government, with most coming from provincial/territorial and municipal governments, because they own and operate the majority of Canada’s road network. The federal government, in addition to providing road funding, also owns some key infrastructure and regulates interprovincial and international trucking.

FEDERAL GOVERNMENT’S ROLE IN ROAD INFRASTRUCTURE

The *Constitution Act* assigned jurisdiction over infrastructure works such as highways, roads and streets to provincial and territorial governments, with the exception

of international or interprovincial structures. Nevertheless, in order to promote and maintain efficient transportation of goods and people, the federal government provides significant funding for key strategic road infrastructure.

Launched in 2007, the Building Canada Plan focuses on building a stronger, safer and better Canada through modern, world-class public infrastructure. This seven-year plan supports projects that contribute to cleaner air and water, safer roads, shorter commutes, and better communities. In addition, Canada’s Economic Action Plan announced in Budget 2009 was designed to fight the effects of the global recession by providing significant infrastructure-related stimuli across the country.

The federal government delivers a broad range of infrastructure programs, providing flexible funding support for public infrastructure projects together with provincial, territorial, municipal, not-for-profit and private sector infrastructure partners. Funding activities are broadly grouped as follows:

1. Building Canada Plan: \$33 billion in programs (announced in Budget 2007).
2. Economic Action Plan: \$5.5 billion in programs (announced in Budget 2009).
3. Other programs: over \$6 billion in programs that are winding down, including Canada Strategic Infrastructure Fund, Border Infrastructure Fund and Gateways and Border Crossings Fund.

Federal investments made under these programs support infrastructure projects, including those that align with the National Highway System (NHS) and public transit properties.

With respect to the NHS alone, the 2009 report from the Council of Ministers Responsible for Transportation and Highway Safety indicated that investments in the NHS grew from \$2.3 billion in 2006 to \$4.6 billion in 2009. Of that amount, \$547 million came from the federal government.

Significant federal investments in infrastructure over the past decade, together with leveraged investments from funding partners, have contributed to the ongoing renewal and improvement of Canada's core public infrastructure.⁸ The age of infrastructure is often used as an indication of its current state; the average age of Canada's core public infrastructure peaked in 2001 at 17.0 years. Between 2001 and 2010, this average age has fallen to 14.7 years—including a drop of a full year between 2008 and 2010. Unprecedented infrastructure investments made across the country by all orders of government—including those made in the context of Canada's Economic Action Plan—are likely to contribute to a further decline in the average age of Canada's public infrastructure in the years to come.

CONFEDERATION BRIDGE

May 31, 2012 marks the Confederation Bridge's 15th year of operation. The bridge connects the provinces of Prince Edward Island and New Brunswick and fulfils the Government of Canada's constitutional obligation to provide a link between the island and the mainland. Transport Canada assumed federal responsibility in 1999 and oversees the operating agreement with Strait Crossing Development Inc. (SCDI), which is responsible for the day-to-day operations of the bridge. The 12.9-kilometre bridge is one of Canada's top engineering achievements of the 20th century and is the world's longest bridge over ice-covered water. The bridge replaced the Borden-Cape Tormentine Ferry Service, resulting in a reduction of more than 44,000 tonnes of greenhouse gas emissions per year. The bridge has reduced travel time to and from the island from 45 minutes down to 15 minutes and eliminated the wait time prior to crossing. The bridge's owner and management won the Gold Award for Leadership in Public-Private Partnerships from the Canadian Council for Public-Private Partnerships in 2009.

FEDERAL BRIDGES

The federal government has an inventory of some 500 highway-related bridges open to the public, which represent a very small subset of all bridges in Canada (approximately 1%). These bridge assets fall within four federal departments/agencies: Public Works and Government Services Canada, Parks Canada, the National Capital Commission, and Transport Canada. The first three own and operate the structures themselves, while Transport Canada's portfolio of bridges is managed by Crown corporations or shared governance regimes (such as Federal Bridge Corporation Limited, Blue Water Bridge Canada, Buffalo and Fort Erie Public

Bridge Authority [Peace Bridge Authority] and the St. Lawrence Seaway Management Corporation).

The Federal Bridge Corporation Limited and its three subsidiaries—Jacques Cartier and Champlain Bridges Incorporated, Seaway International Bridge Corporation, Ltd., and St. Mary's River Bridge Company—together own, manage and operate several significant bridges in Ontario and Quebec. In 2011–12 the Corporation was responsible for more than \$216 million in operating and capital funding. The corporation also looks after major multi-year projects, including:

- customs plaza rehabilitation in Sault Ste. Marie;
- new low-level North Channel Bridge in Cornwall;
- rehabilitation of Honoré Mercier Bridge in Montreal;
- major repair of the Champlain Bridge in Montreal; and
- safety repair and asset preservation program in Montreal for Highway 15, the Bonaventure Expressway, the Jacques Cartier Bridge, the Honoré Mercier Bridge, the Melocheville Tunnel and the Champlain Bridge Ice Control Structure.

PUBLIC TRANSIT

Public transit is primarily a municipal responsibility in Canada. However, in some cases, provinces play an important role, either in providing operational or capital funding or in supporting long-term planning, since municipalities are a provincial responsibility. Provincial involvement is closely tied to the concentration of urban populations, as public transit is a more prevalent means of transportation in large metropolitan areas.

Several examples of provincial government involvement in transit systems are described below.

Direct operating and capital funding

Prince Edward Island's 2011 budget set aside \$342,000 to enhance public transit in Charlottetown, Stratford and Cornwall and to operate the '7-5-3' transit line between Summerside and Charlottetown. The province of Quebec's transit policy has eight programs that provided \$800 million between 2007 and 2011. These programs helped finance the purchase of new equipment, making buses and taxis accessible, promoting transit and absorbing Montreal's subway deficit. The Ontario government budgeted \$125 million in 2011 in transit operating funding. Manitoba provided \$44 million

⁸ Statistics Canada defines "core public infrastructure" as comprising the following asset categories: bridges, roads, water, wastewater, public transit, and cultural and recreational facilities.

in its 2011 budget to support transit, with \$41 million allocated to Winnipeg alone. In Saskatchewan's 2011 budget, the province provided \$2.9 million in operating funds and \$275,000 in capital funds through its Transit Assistance for People with Disabilities program. British Columbia provided \$6.9 million to Translink to support the U-Pass program, which offers transit passes to students at Vancouver's two universities, Simon Fraser and the University of British Columbia.

Provincial agencies as transit operators

In Quebec, the Metropolitan Transportation Agency (*Agence métropolitaine de transport* [AMT]) plans metropolitan transit in the greater Montreal area. It operates the region's commuter rail network and coordinates various express bus services as well a metropolitan-wide payment structure. AMT is financed by clients, the municipalities it serves and the provincial government, which was expected to contribute \$7.1 million to AMT through one of its eight transit funding programs.⁹ In Ontario, Metrolinx coordinates and integrates all modes of transportation in the Greater Toronto and Hamilton Area. Metrolinx launched *The Big Move: Transforming Transportation in the Greater Toronto and Hamilton Area* in September 2008. Metrolinx has three operating divisions: GO Transit (trains and buses), Air Rail Link, and Presto (electronic regional fare card). Metrolinx received \$68 million in direct grants from the Ontario government in 2009–10. On the west coast, BC Transit is the provincial agency responsible for transit outside the Greater Vancouver Regional District, and is financed by the province (\$114.1 million) and the 58 communities it serves (\$55.4 million from all communities). BC Transit contracts out operations of its 1,028 vehicles to 38 different companies or agencies.

Dedicated taxation

Some provinces have chosen to redirect part of specific tax or transport-related fee revenues directly to public transit. In Quebec, for example, AMT received \$56.1 million from vehicle registrations and \$102.5 million from Quebec's gas tax, including an additional tax levy on gasoline sold in the Montreal metropolitan area and whose proceeds go towards AMT's transit system. Ontario's 2011 budget called for a transfer of \$311 million in gas tax revenues to transit, while BC's budget transferred \$323 million in gas taxes to Translink.

Capital funding for large projects

Some provinces provide funding for large transit-related infrastructure projects that could not be financed

by municipalities and commuters alone. For example, in Montreal, expansion of subway and commuter train networks is financed by the province, as is the purchase of new subway cars. In Ontario, the new \$8.2-billion Eglinton-Scarborough Crosstown rapid transit link will be financed entirely by the provincial government, through Metrolinx. In the Vancouver area, the province will contribute \$583 million to the new \$1.4-billion Evergreen Skytrain line between Burnaby and Coquitlam (see Section 9.4).

General funding

Provinces also transfer funds to municipalities for general purposes; public transit services, when offered to municipalities, can be one 'general purpose' that benefits from such funds.

Public transit, by definition, entails some form of public cost-sharing participation. Usually, major capital projects are fully or mostly financed by various levels of government while transit passenger fares usually cover a share of the operating costs, the balance being financed by different levels of government or dedicated taxes. Figure RO23 and Table RO23A shows the sources of operating funding at a national level and for selected transit companies across the country. For transit authorities in Table RO23A, outside of Southern Ontario, fares cover between a third to half of the transit company's operating costs. Southern Ontario—particularly Metrolinx, the Ontario Government agency responsible for GO Transit—has some of the highest cost recovery ratios, with close to 86% of operating expenses being covered by fare and other revenues. Dedicated taxes, such as a gas tax, represent a relatively small amount of revenues, if any, with the exception of Translink, which draws from a diversified, dedicated tax base from property, fuel, and parking taxes as well as power levies.

FEDERAL PUBLIC TRANSIT TAX CREDIT

This tax credit became effective July 1, 2006 and was designed to ease the financial barrier preventing greater utilization of mass transit for transportation in urban areas. The program initially allowed individuals to claim a non-refundable tax credit for the cost of monthly public transit passes or passes of a longer duration. The tax credit has since been extended to electronic fare cards and weekly passes used on an ongoing basis. The program aimed to increase transit use by making it more affordable, reducing traffic congestion in urban areas, and lessening environmental impacts of urban transportation.

9 AMT's financing comes from the Programme d'aide gouvernementale à l'amélioration des services en transport en commun.

INTERCITY BUS

Intercity bus transit does not generally receive direct public funding. Its model in Canada is usually based on provincial governments allowing companies to operate a monopoly for certain key “trunk routes”, with profits cross-subsidizing less-travelled regional routes. One exception is in Manitoba, where the provincial government subsidizes Greyhound Canada’s services; in 2011–12, this subsidy was valued at \$3.9 million, and at \$3.12 million for 2010–11.

ROAD SAFETY FUNDING

The provinces and territories spend over \$100 million per year for road safety. Through a multi-year contribution program, Transport Canada shares in the cost of advancing national consistency, harmonization and implementation of the National Safety Code. The contribution program, which runs from 2009 to 2015, will enable \$26.7 million to be transferred from the federal government to the provinces and territories.

In the context of the National Safety Code (NSC), in 2011, the federal government executed multi-year contribution agreements (2009–10 to 2014–15) with each of the provinces and territories to share in the costs to advance national consistency and harmonization and to work towards establishing a national regulatory framework for motor carriers. The program will help ensure that all jurisdictions build a harmonized safety fitness framework that provides for the safe transportation of passengers and goods while minimizing compliance and regulatory costs. This approach to the regulation of motor carriers represents Canada’s consensus choice as the most efficient and effective approach for the safe regulation of motor carriers. The NSC program contributes towards Canada’s economic growth and social development, as well as ensuring high standards for a safe transportation system.

Canada executed a multi-year contribution agreement (2009–10 to 2014–15) with the Canadian Council of Motor Transport Administrators (CCMTA) to help develop and maintain Canadian motor vehicle instructor, inspector and commercial vehicle driver training materials. The uniformity and quality of inspections are essential to the fair and equitable treatment of motor carriers under federal jurisdiction, which is a key part of Transport Canada’s mandate under the *Motor Vehicle Transport Act*. Annual funding provided for this activity is up to a maximum of \$50,000 per year. In addition,

since 2006, the Canadian National Road Safety Vision 2010 (RSV 2010) cost-shared contribution program has supported related research and outreach activities. The contribution program was designed to support RSV 2010 and to provide a focal point to leverage partner funds to help make Canadian roads safer. The program was renewed for one year in 2011–12 and funded an additional eight projects. Over the life of the program, it successfully provided seed money of \$1.3 million and leveraged \$1.9 million, or approximately 60% of total funds, in partner monies to advance road safety research and outreach programs.

INTELLIGENT TRANSPORTATION SYSTEMS

Under the Strategic Highway Infrastructure Program (SHIP), Transport Canada invested \$131,327, matched by public partners, on two Intelligent Transportation Systems (ITS) projects. In collaboration with British Columbia, the first project involved a research project related to Freight Security. The second project, in collaboration with the Agence Métropolitaine de Transport de Montréal, funded a system to deliver traveller information (e.g. train delays) to customers via their personal digital devices.

TECHNOLOGY AT THE BORDER

Under the Security and Prosperity Partnership (SPP) initiative, Transport Canada has contributed \$2.3 million to the total \$4.6-million cost for the installation of border wait-time measurement systems at four Canada-U.S. border crossings (Aldergrove and Sumas in British Columbia, and the Peace Bridge and Queenston-Lewiston Bridges in Niagara Falls, Ontario). Up-to-the-minute wait-time information will be made available to border and transportation agencies to better manage their resources, and to drivers to make informed decisions about when and where to cross the border.

Also under the SPP, Transport Canada spent \$1.1 million, which was matched by public partners. This includes a project with Whatcom County in Washington State to develop a shared Canada-U.S. database to collect and disseminate border-related information to improve cross-border movements. Transport Canada’s spending also includes work with New Brunswick to create a regional ITS border architecture to optimize the planning and deployment of advanced technology on cross-border routes.

ENVIRONMENT AND ROAD TRANSPORTATION

FEDERAL PROGRAMS TO PROMOTE SUSTAINABLE ROAD TRANSPORTATION

The federal government invested \$463 million between 2007 and 2011 into programs promoting sustainable transportation, mainly in the road mode.

ecoAUTO Rebate Program

The ecoAUTO Rebate Program was designed to promote greater adoption of fuel-efficient vehicles by providing financial incentives toward their purchase. The program, administered by Transport Canada and delivered in partnership with Service Canada, offered Canadians a cash incentive—in the form of a \$1,000 to \$2,000 rebate—by buying or leasing a more fuel-efficient vehicle. The program issued more than 169,200 rebates, totalling \$264 million between 2007 and 2011.

ecoENERGY for Personal Vehicles Program

The ecoENERGY for Personal Vehicles Program was designed to assist Canadians with buying, driving, and maintaining their vehicles in a manner that reduces fuel consumption and greenhouse gas emissions. Several information-based initiatives were created, including a Fuel Consumption Guide, a training curriculum for novice drivers, and awareness campaigns for experienced drivers that focused on idle reduction, tire inflation, and ecoDriving (improved driving habits). Resulting information products of these initiatives are available on the program's website.¹⁰ Between 2007 and 2011, \$21 million was spent on program efforts.

ecoMOBILITY

The ecoMOBILITY Program was designed to address the financial and informational barriers preventing municipal stakeholders from implementing transportation demand management initiatives aimed at shifting personal automobile travel to other modes, reducing the number and length of car trips, and shifting trips to less congested times and routes. The program offers financial support to municipalities in their efforts to steer residents towards less polluting forms of transportation, providing financial assistance with transportation demand management (TDM) projects that reduce emissions. ecoMOBILITY is also helping build national capacity to implement TDM measures through research,

training, professional development, and the development of materials and resources. Between 2007 and 2011, \$9.3 million was invested in ecoMOBILITY.

Information about the program's conclusion in 2012 and the projects it supported is available on the ecoMOBILITY website.¹¹

Moving On Sustainable Transportation

Transport Canada established the Moving On Sustainable Transportation (MOST) Program to financially support educational awareness and analytical projects that stimulate the development of innovative tools, approaches and practices aimed at making sustainable transportation a reality. The program is slated to end in 2012; information about the program and the funded projects is available on the MOST website.¹²

Retire Your Ride

Retire your Ride is a national vehicle scrapping program created for Canadians as an incentive to retire their older, more polluting vehicles (model year 1995 and older). Eligible individuals receive a free annual transit pass, membership in a car-sharing program, a rebate on the purchase of a newer vehicle (model year 2004 and later), or \$300 cash. The primary goals of the program were to reduce smog-forming emissions and GHG emissions by promoting sustainable transportation alternatives.

The program was delivered by a national not-for-profit organization and a network of provincial delivery organizations. Announced in Budget 2007 and ended on March 31, 2011, the program spent a total of \$92 million. Detailed program results can be found on the Retire Your Ride website.¹³

5.6 MULTIMODAL EXPENDITURES

REDUCING THE ENVIRONMENTAL FOOTPRINT OF TRANSPORTATION

The Government of Canada has committed, by the year 2020, to reduce national GHG emissions by 17% from their 2005 levels. Additionally, the government is working to reduce air pollutant emissions, including nitrogen oxides (NO_x), sulphur oxides (SO_x), particulate matter (PM_{2.5}), volatile organic compounds (VOCs), and carbon monoxide (CO).

10 See <http://oee.nrcan.gc.ca/transportation/personal/17604>

11 See <http://www.tc.gc.ca/eng/programs/environment-ecomobility-menu-eng-144.htm>

12 See <http://www.tc.gc.ca/eng/programs/environment-most-menu-711.htm>

13 See <http://www.retireyourride.ca/home.aspx>

In Budget 2011, the government announced the allocation of \$48 million over two years to develop transportation sector regulations and next-generation clean transportation initiatives.

THE ecoFREIGHT PROGRAM

Transport Canada's ecoFREIGHT program engaged the freight transportation industry in a greater uptake of technologies and practices that reduce fuel consumption, air contaminants, and GHG emissions. The program came into effect in April 2007 and ended in March 2011. The program included six initiatives, described in Table G8.

SUPPORTING TRANSPORTATION RESEARCH

Research and development (R&D) is essential to support innovation, and provides key science-based inputs into policy and regulatory decision making. To undertake R&D and share financial and project risks, Transport Canada partners with other government departments, academia, and the private sector. These partnerships invigorate the innovation process for the overall public good, while also taking into consideration various stakeholder needs. R&D alliances also allow Transport Canada to leverage at least two dollars in R&D support for each dollar it invests.

Over the past few years, Transport Canada maintained a number of socio-economic research (SER) inventories. This enabled the department to identify areas of socio-economic research underway or planned for the upcoming fiscal year in an effort to determine synergies and opportunities for collaboration. To this end, the inventory assists in planning and coordination and in showcasing socio-economic research initiatives (both in-house and external). More importantly, it serves as a valuable tool to ensure research spending is efficient and effective.

In 2009–10, Transport Canada spent approximately \$250,000 on five SER studies. During 2010–11, Transport Canada spent approximately \$537,900 on 12 different SER studies, and in the 2011–12 year, the department spent approximately \$94,300 on five SER studies.

The Railway Research Advisory Board (RRAB) has been an advisory body to Transport Canada and, since 1996, has been almost exclusively concerned with safety-related research and development (R&D) in line with the mandate accorded to it by Transport Canada, reflecting the department's priority.

For 2010–11, the RRAB had a \$1.7-million budget and \$700,000 in kind, with Transport Canada contributing \$1.2 million and \$69,000 in kind. Thirty three projects were underway during the course of 2010–11. Technical work on 11 projects was completed and reports describing the work performed and results achieved are undergoing the publication process. Summaries of these reports are currently being prepared by the RRAB Technical Committee in order to identify results of research in a timely fashion. Complete reports will be available for download at a future date from an RRAB website currently in development. In 2010–11, the RRAB worked to successfully establish a Canadian Rail Research Laboratory focusing on Ground Hazards and Winter Operations at the University of Alberta, which could become part of the Association of American Railroads (AAR) Affiliated Laboratory Program with three American universities.

In the area of dangerous goods, Transport Canada was involved in several research projects in 2011, including:

- Investigation of Multiple Tank Car Rollover Derailments Related to Double Shelf Couplers and its Solutions, where Transport Canada worked with the National Research Council of Canada to better understand tank car domino rollover derailments.
- Assessing the Toxicity of the Transport of Petroleum Sour Crude Oil, which provides Transport Canada with important data and information regarding proper classification, safety marking and methods of containment selection for petroleum crude oil during transport. The objective is to correlate the hydrogen sulphide concentration in petroleum sour crude oil to the toxic vapours it generates during transportation in highway tanks.

On the international stage, Canada is an active participant at the International Transportation Forum/Organisation for Economic Cooperation and Development's Joint Transportation Research Center (JTRC). It contributes €40,000 a year to the International Transportation Forum to support the JTRC's program of work.

5.7 GOVERNMENT REVENUES FROM TRANSPORTATION

Transportation activities generate revenues for governments in Canada (see table G4). The most significant source of revenues is taxes applied on motor fuels—gasoline and diesel fuel as primary sources of energy powering transportation vehicles in Canada. Taxes are levied by the federal, provincial and territorial governments.

Government revenues from transportation

| | Selected Revenues (million dollars) | Level of government | | TOTAL |
|-------------------|--|----------------------|-------------------------|----------|
| | | Federal (2011–12) | Provincial (2010–11) | |
| Air | Air Travellers Security Charge | 618.1 | n/a | 618.1 |
| | Airport ground lease (est.) | 256.2 | n/a | 256.2 |
| | Aircraft services | 36.1 | n/a | 36.1 |
| | Other | 21.6 | n/a | 21.6 |
| | Sub-Total | 932.0 | n/a | 932.0 |
| Marine | Coast Guard services | 39.7 | n/a | 39.7 |
| | Returns from Port Authorities | 15.7 | n/a | 15.7 |
| | Harbour fees | 10.0 | n/a | 10.0 |
| | Other | 8.1 | n/a | 8.1 |
| | Sub-Total | 73.6 | n/a | 73.6 |
| Rail | Leases of hopper cars | 14.4 | n/a | 14.4 |
| | Sub-Total | 14.4 | n/a | 14.4 |
| Road | Road fuel taxes (2010–11) | 4,574.2 | 7,256.4 | 11,830.6 |
| | Road safety fees | 4.9 | n/a | 4.9 |
| | PWGSC Bridges | 0.3 | n/a | 0.3 |
| | Sub-Total | 4,579.5 | 7,256.4 | 11,835.9 |
| Multimodal | Other fuel taxes (2010–11) | 213.0 | n/a | 213.0 |
| | Licenses | n/a | 3,693.3 | 3,693.3 |
| | Sales tax equivalent | n/a | 1,352.3 | 1,352.3 |
| | Other revenues | 12.0 | n/a | 12.0 |
| | Sub-Total | 225.0 | 5,045.5 | 5,270.5 |
| TOTAL | | 5,824.4 | 12,301.9 | 18,126.4 |

Please see Addendum Table G4 for more details

Tax applied to motor fuel sold to consumers generates revenue for governments and differs based on the type of fuel, the province/territory/region and the date of purchase.

Like most countries, Canada has excise taxes on gasoline and diesel motor fuels (propane, natural gas, ethanol and biodiesel are exempt). The federal excise tax is fixed—10¢/litre on gasoline and 4¢/litre on diesel fuel. Therefore, the share of the pump price attributable to the tax fluctuates. In addition, a federal sales tax (GST) of 5% is added across the country.

Provinces and territories in Canada also place excise taxes on these motor fuels and in some provinces, a provincial sales tax (PST), which may be combined with the GST into a single harmonized sales tax (HST in the Atlantic region, Ontario and British Columbia) is added as well.¹⁴ Quebec calculates its fuels sales tax after the GST. Within some provinces, the fuel tax is applied at a different rate in metropolitan areas (e.g. Montreal, Greater Vancouver, Victoria) or certain bordering regions with another Canadian province. Across Canada, total motor fuel taxes vary greatly, from 17.0¢/litre in the Yukon to 41.01¢/litre in Greater Vancouver.

¹⁴ HST, GST, or GST + PST, where applicable, are calculated on the retail price that includes excise taxes, and are applied after manufacturers' and retailers' costs and profit margins. Unlike excise taxes, since these sales tax are a percentage of the retail price, the amount collected will vary proportionally to the price, even though the rate itself is fixed.

The Government of Canada collects about \$5 billion per year in excise taxes on gasoline, diesel, and aviation fuel, as well as approximately \$1.6 billion per year from GST revenues on gasoline and diesel (net of input tax credits). Provinces and territories gather more than \$8 billion annually in fuel tax revenues.

Fuel tax exemptions exist for international transportation. For example, the federal fuel excise tax does not apply to international flights, nor do most provincial fuel sale taxes, except in Ontario. In February 2012, British Columbia eliminated provincial fuel taxes on fuel used by international flights. For road and rail, a distance-based formula is used to allocate fuel taxes to jurisdictions within which transportation occurs, rather than the jurisdiction in which the vehicle was fuelled.

The second most important source of government revenues from transportation activities is licensing and registration fees tied to the issuance of drivers' licences and vehicle registration/licences. As with fuel taxes, significant variations in these fees can be found across the country, especially in annual fees for drivers' licences. Provinces and territories collect \$3.5 billion annually in licences and fees.

Various other sources of transportation-related proceeds generate roughly \$800 million annually at the federal level—\$370 million from different Transport Canada levies and \$430 million from other federal department fees and charges. Of these other sources, two are most significant: the Air Travellers Security Charge (ATSC) and the airport lease.

The ATSC came into effect in April 2002 to fund the air travel security system, which includes the Canadian Air Transport Security Authority (CATSA)—the federal authority responsible for the security screening of air passengers and their baggage. In addition to CATSA, the air travel security system includes Transport Canada regulations and oversight as well as the placement of Royal Canadian Mounted Police officers on selected domestic and international flights. The ATSC is payable

by air travellers who principally and directly benefit from the Canadian air travel security system. ATSC rates have been adjusted several times, since proceeds must ensure revenues roughly equivalent to expenses over time. ATSC revenues include any applicable GST or the federal portion of the HST. The ATSC applies to flights between 89 designated airports in Canada where passenger pre-boarding screening is conducted by CATSA. For transborder and international travel, the ATSC generally applies only to flights departing from Canada; foreign governments may impose similar security charges on return travel. ATSC rates were increased in 2010. Annual proceeds from the ATSC are approximately \$400 million.

Airport leases yield an annual sum of approximately \$250 million, which is calculated through a formula that applies an escalating rate to an airport's gross revenues. Canadian airports are federal assets developed and paid for by taxpayers. Rents therefore constitute a return on assets paid for by all Canadians. Under the government's airport operations commercialization policy, airports were leased to non-government entities. Four airports—Vancouver, Calgary, Edmonton and Montreal—were transferred to local airport authorities (LAAs) in 1992. In 1994, the National Airport Policy permitted the establishment of Canadian Airport Authorities on different principles than the LAAs.

An economic downturn. Record-high fuel prices. New entrants to the field soaring to success; new tools and policies advancing safety and security. 2007–2011 was an eventful half-decade for Canada’s aviation sector

6.1 OVERVIEW OF AIR TRANSPORTATION

Air transport is an important component of Canada’s overall transportation mix, with local, regional, national and international airlines flying passengers and cargo to destinations across the country and around the world.

Canada’s air sector depends on its 1,889 aerodromes¹, including 26 airports that are part of the National Airports System² (NAS); 570 certified airports, heliports and waterdromes that support scheduled and non-scheduled flights; and 1,297 registered aerodromes and 22 other aerodromes (see Addendum Table A1). Of Canada’s aerodromes, more than 55% are land aerodromes, 26% are heliports and 19% are water aerodromes. NAS airports³ are owned by Transport Canada and operated by non-for-profit, non-share capital airport authorities. Canada’s 26 NAS airports handle roughly 90% of all scheduled passengers and cargo volumes in Canada, are particularly important to Canada’s trade (see Addendum Tables A22, A23, A24, and A25) and tourism industries, and contribute to national prosperity and international competitiveness. Canada also has smaller registered and certified airports and certified heliports, some of which serve communities without highway access—places where aviation is the only year-round transportation option.

At the end of 2011, 1,497 air operators held 2,224 Transport Canada-issued air operator certificates⁴: 768 were domestic, 358 were scheduled international and 1,098 were non-scheduled international licence authorities (see Addendum Table A6). Canada is home to large

international air carriers, such as Air Canada, WestJet, Jazz, Air Transat and Sunwing as well as a number of smaller regional carriers and freighter operators.

Transport Canada sets and enforces all airport safety and security standards, certifies and regulates all airports, and ensures that Canada’s more than 34,000 civil aircraft (see Addendum Table A9) conform to national and international standards.

The Canadian Transportation Agency—an independent, quasi-judicial, federal administrative tribunal with a mandate set out in the *Canada Transportation Act*—administers the air transport licensing regime. That regime requires domestic air services operators—in addition to having an operating certificate issued by Transport Canada—to be majority-owned and controlled by Canadians and have proper liability insurance. The Canadian Transportation Agency also verifies the financial fitness of applicants starting operations and oversees licensing of international scheduled and non-scheduled services to and from Canada, administering the permit system for international charter operations. This protects advance payments received by airlines for international passenger charter flights originating in Canada.

Scheduled international commercial air transport services between two countries are governed by bilateral air transport agreements. Since the inception of the Blue Sky Policy in 2006, Canada has proactively pursued more liberalized agreements. By the end of 2011 Canada had bilateral air transport relations with 98 partners, including open agreements covering 40 countries (see Addendum Table A12).

1 Figure accurate as of February 2, 2012.

2 The NAS includes airports in all national, provincial and territorial capitals, as well as airports with annual traffic of 200,000 passengers or more.

3 Except for Kelowna, Whitehorse, Yellowknife and Iqaluit

4 An operator can hold multiple certificates.

A large proportion of aircraft in Canada is used for general aviation (GA), often the only service provided in many Canadian airports, particularly in Northern Canada as well as the first rung in the career ascension of aspiring pilots and aircraft mechanics.

NAV CANADA, a privately run, not-for-profit corporation that owns and operates Canada's civil air navigation system, oversees the safe and orderly flow of air traffic in Canadian airspace, in compliance with provisions in the *Aeronautics Act*.

Finally, the Canadian Air Transport Security Authority (CATSA) is responsible for security screening at designated Canadian airports and operates under provisions in the *Aeronautics Act*. CATSA is a Canadian Crown corporation created in 2002 under the *Canadian Air Transport Security Authority Act* and reports to the Government of Canada through the Minister of Transport.

6.2 2011 YEAR IN REVIEW

ECONOMIC FRAMEWORK AND INFRASTRUCTURE

- In 2011, passenger traffic at Canadian airports increased by 2.5% compared to 2010, to a total of 78.4 million travellers. Year over year, domestic, Canada-U.S. and other international traffic increased by 2.4, 1.6 and 0.4%, respectively. Overall, Canadian airports weathered the economic downturn of 2008–09 successfully and are now positioned for growth. (see Addendum Tables A19A and A19B)
- In terms of carrier-specific performance, Air Canada and its regional affiliates transported almost 34 million passengers and posted a load factor⁵ of 81.6%, while WestJet carried more than 16 million passengers and posted a load factor of 79.7%. Porter Airlines carried 2.1 million passengers and posted a load factor of 61.7%. Major scheduled carriers and charters reported an overall load factor of about 73% in 2011 compared to 74.1% in 2010.
- From a financial standpoint, of note in 2011:
 - Air Canada reported a net loss of \$249 million on revenues of \$11.6 billion. Its EBITDAR⁶ was \$1.2 billion and its operating profit was \$179 million.

- WestJet reported a net profit of \$148.7 million on revenues of \$3.1 billion. Its EBITDAR was \$596.8 million and its operating profit was \$256.6 million.
- Chorus Aviation, parent of Jazz Aviation, reported a net profit of \$68.1 million on revenues of \$1.7 billion. Its EBITDAR was \$38 million and its operating profit was \$102 million.
- For the fiscal year ending October 31st 2011, Transat A.T. a tour operator that owns Air Transat, reported a net loss of \$12.2 billion on revenues of \$3.7 billion. It should be noted that these figures reflect the entire group and not just the Air Transat component, which is not reported separately.

- Canada's air cargo trade in 2011 grew 9.2% from 2010 to reach \$110 billion, with the volume of revenue cargo coming into and being sent from Canadian airports totalling 739 million tonnes, a 9.1% decrease from the previous year (see Table A19C).
- Canada's passenger air carriers continued to tightly manage supply, keeping it balanced with demand; 2011's high load factors demonstrate the success of these efforts. Most carriers' yields⁷ improved reflecting their ability to increase fares and offset higher costs—such as fuel—while maintaining and even improving viability. In 2011, Air Canada reported a 3.3% increase in yield compared to 2010, while WestJet reported an 8.3% increase. That said, seat sales remained common, particularly among carriers serving the Eastern Triangle (Montreal-Toronto and Toronto-Ottawa).
- Clause 27 of *An Act to amend the Canada Transportation Act and the Railway Safety Act and to make consequential amendments to other Acts* came into effect, setting in motion the development of regulations by the Canadian Transportation Agency—regulations that will require air carriers operating in Canada to reflect all fees and taxes in their advertised fares. Air Canada, WestJet and Porter began voluntarily advertising all inclusive fares during the winter of 2012.
- In 2011, Canada concluded new or expanded air transport agreements with a number of countries around the world. These countries included Brazil, Mexico, Japan and China. In addition, other agreements were negotiated in 2011 but had not yet been announced at time of printing.

⁵ The ratio of occupied seats to available seats.

⁶ Earnings Before Interest, Taxes, Depreciation, Amortization and Rent. It is the airline equivalent of Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA), but rent is added to adjust for the fact that some airlines rely more on leasing aircraft than owning them, which would create distortions with EBITDA.

⁷ Revenue per passenger-kilometre.

- The year 2011 witnessed a few changes on the aviation landscape (see Addendum Table A11). Most importantly, in May, Sky Regional, a division of Skyservice Business Aviation, launched its operations under the Air Canada Express banner, offering 93 flights per week (up to 15 flights per day) between Montreal and Toronto Island (Billy Bishop Airport) with a fleet of five Canadian-built Bombardier Q-400. This marked a return of the Air Canada brand to the Toronto Island airport after a five-year hiatus.
- A number of new routes were launched by Canadian carriers in 2011. Amongst them, Air Canada started new flights between Gander and Toronto, Montreal and Antigua as well as new flights to Toronto Island. WestJet launched new routes between Orange County and either Vancouver or Calgary and between Las Vegas and Prince George, Hamilton or London, as well as a number of new routes to Mexico or the Caribbean. Air Transat began serving Istanbul and Lisbon from Montreal, Birmingham or Faro from Toronto and Glasgow or Manchester from Calgary or Vancouver. Finally, Porter Airlines opened three new destinations from Toronto Island: Charlottetown, Sault Ste. Marie and Burlington, Vermont.
- Three new international carriers began year-round scheduled service to Canada in 2011: Qatar Airways started thrice-weekly service between Montreal and Doha using a Boeing B-777-200 aircraft; China Southern started three weekly flights between Vancouver and Guangzhou, also with a Boeing 777-200; and COPA launched four flights a week between Toronto and Panama City using a Boeing B737-700. (see Addendum Table A14)
- On the cargo side, China Southern inaugurated the first freighter service between Vancouver and Mainland China, with three weekly Boeing 777-200F flights to Shanghai. Qatar Cargo launched a weekly Boeing 777-F freighter flight between Luxemburg, Toronto and Chicago, and Icelandair returned to Halifax with a weekly Boeing 757-F freighter flight between New York, Halifax, Reykjavik and Liege.
- The year 2011 also saw three significant foreign carriers exit the Canadian market: Virgin America, which terminated its two daily flights between Toronto and California (San Francisco and Los Angeles), Astraeus which terminated its seasonal flights between Deer lake and Reykjavik and Lan Chile, which put an end to its five weekly flights to New York and Santiago, Chile (see Addendum Tables A13 and A14)
- On October 30, 2011, a new 51,000-m² terminal building was opened at the James Armstrong Richardson Winnipeg International Airport. This terminal building, with an annual capacity of 5 million passengers, was designed by the world famous architect César Pelli. The new terminal is considered to be one of the greenest in North America and cost \$200 million. The project is part of a \$585-million redevelopment plan at the airport. The new terminal, with its 11 jet bridges and seven ground-loading gates replaces the older terminal built in 1964—now slated for demolition—that had 10 jet bridges and one ground-loading gate.
- The redevelopment of Edmonton City Centre Airport (Blatchford Field) continued in 2011 with the award by the City of Edmonton of a contract to create a master plan for the 217-hectare site. The airport still has one active runway and a NAV CANADA control tower.

ENVIRONMENT

- The domestic aviation sector produced 8.5 megatonnes (Mt) of carbon dioxide equivalent (CO₂e) in 2008 (see figure EN7). Of domestic greenhouse gas (GHG) emissions created by transportation, 5% were generated by aviation—only 1% of Canada's total emissions.
- In 2009, aviation accounted for the following from the transportation sector: 2% of PM_{2.5} emissions, 6% of SO_x emissions, 7% of NO_x emissions, 2% of VOC emissions and 1% of CO emissions⁸ (See figure EN8).
- Canadian aviation fuel standards for Jet A and Jet A-1 fuels⁹ were amended in 2011 to allow up to a 50% blend of synthetic source material in jet fuel, which could reduce net GHG emissions.
- The International Civil Aviation Organization's (ICAO) Committee on Aviation Environmental Protection (CAEP) continued to work on its priorities of developing emissions standards for CO₂ and for particulate matter.

SAFETY

- In 2011, Canada recorded the lowest total number of accidents (211) for Canadian registered aircraft excluding ultralights since 1976 when the Transportation Safety Board of Canada began recording such data (see Addendum Tables S18 to S21).

8 Particulate matter, sulphur oxide, nitrogen oxide, volatile organic compounds and carbon monoxide respectively.

9 These are types of fuel used in aviation. Jet A is found mainly in the United States and has lower freezing and flash points than Jet A-1.

- Globally, 2011 was a very good year for aviation safety with 0.37 accidents per million departures by Western-built jets¹⁰, down from 0.61 in 2010, according to the International Air Transport Association. This represents one accident per 2.7 million flights.
- Two Canadian carriers had accidents in 2011: First Air in Resolute Bay; and Arctic Sunwest Charters in Yellowknife. The first accident, involving a Boeing B-737, resulting in the deaths of 12 people while the second, involving a DeHavilland DHC-6, resulted in the deaths of both of the aircraft's pilots.
- Canada and China signed a technical agreement to streamline Chinese certification of the Bombardier CSeries airliner. This could help the future CSeries and other Canadian-built aircraft better access to this market; it is already estimated that over the next 20 years China will import 1,400 aircraft with 100- to 149-seat capacities, such as the CSeries.
- Transport Canada repatriated full responsibility for certification and oversight of business aviation operating under a Private Operator Passenger Transportation Certificate.¹¹ This was previously delegated to the Canadian Business Aviation Association.
- The Canada-European Union Bilateral Aviation Safety Agreement came into force in 2011. Under this agreement, the European Aviation Safety Agency (EASA) will recognize certification of Canadian aviation products and services and vice versa, allowing the Canadian aviation industry to be more competitive in the European market. EASA and Transport Canada will also work together to enhance civil aviation safety by resolving safety issues.
- Transport Canada proposed regulations requiring private and commercial aircraft with six or more passenger seats to install and operate Terrain Awareness and Warning Systems (TAWS). These provide aural and visual alerts to flight crews when an aircraft's path is predicted to collide with terrain, water or obstacles. TAWS increase the time available to flight crews to take corrective action.

SECURITY

- In 2010, the federal government provided long-term funding for the Air Cargo Security Program, aiming to make this element of Canada's growing trade and economic networks more secure. In 2011, the program changed from a voluntary/non-mandatory pilot project to a formal, regulated program that specifies

how air cargo is accepted, handled and transported. Significant effort has been invested in working with partner countries and organizations to create common standards, definitions and procedures that will improve the security of air cargo internationally.

- Transport Canada pre-published the *Canadian Aviation Security Regulations, 2012* in the Canada Gazette, Part I, the Government of Canada's official newspaper—marking Transport Canada's first step toward renewing aviation security regulations in response to the challenges and opportunities of the 21st century. This renewal will also make aviation security regulations less burdensome to industry, and more user-friendly.
- Transport Canada announced improvements to the systems for screening passengers and their belongings, including new equipment and lane configurations that improve the flow of passengers and bags through security screening checkpoints at major Canadian airports.
- Transport Canada made changes to the list of items passengers cannot bring with them onto aircraft. Small scissors and tools not longer than six centimeters (excluding the handle) are now permitted in carry-on baggage. Please turn to Section 6.7 for more details.
- The Government of Canada budgeted \$21 million over five years to upgrade elements of the Canadian Air Transport Security Authority's checked baggage screening equipment that are reaching their end of life. Under the terms of the 2011 Action Plan on Perimeter Strategy and Economic Competitiveness, as these upgrades are completed, air travellers flying from Canadian sites with U.S. pre-clearance facilities will no longer be required to have their baggage re-screened if connecting at a U.S. airport, making connections through U.S. cities easier and reducing the risk of bags not being placed on connecting flights. While these changes will make Canada-U.S. air travel more convenient, they will also maintain a high level of security.

6.3 2007–11 RECAP

ECONOMIC FRAMEWORK AND INFRASTRUCTURE

In the 2007–2011 period, two new Canadian air carriers set up operations at Billy Bishop Toronto City Airport: Porter Airlines and Sky Regional (operating as Air Canada Express). Launched in October 2006, Porter

10 That is, jets built in North America, South America, Europe and Japan.

11 Issued under the *Canadian Aviation Regulations* Section 604.

Airlines now flies a fleet of 26 Canadian-built Q400s to 13 Canadian and six American cities, and has become the second most prominent carrier in the busy Montreal–Toronto–Ottawa triangle. Of Canada’s major scheduled air carriers, Porter Airlines has experienced the most dramatic growth during this five-year period, while WestJet significantly expanded its international network.

A number of Canadian carriers entered and exited the market between 2007–2011, with the most notable entry being Sky Regional Airlines and exits including leisure carriers Harmony Airways in 2007, Zoom Airlines in 2008 and Skyservice Airlines¹² in 2010.

The peak crude oil price of U.S. \$147 per barrel in July 2007 presented the industry with record fuel costs. The collapse of petroleum prices worldwide following the global financial crisis that began in 2008 was unforeseen, leaving a number of commercial air carriers with higher-priced fuel hedge arrangements for some of their fuel requirements. To this day, managing fuel-cost fluctuations remains an important challenge for air carriers.

The recession of 2009–10 produced the worst economic climate since the Great Depression, with decreased discretionary spending causing soft demand. Capital costs rose amid tighter credit conditions, as did fuel prices. Although many in the air carrier industry maintained tight control over capacity and controllable costs during the recession, some carriers (notably Porter and WestJet) continued to grow.

Over the 2007–11 period, Air Canada saw its revenues rise from \$10.6 billion to \$11.6 billion, while net income went from a \$429 million profit to a \$249 million loss. At WestJet, revenues rose by nearly half, increasing from \$2.1 billion to \$3.1 billion, a situation due largely to the carrier’s fleet expansion over the period, going from 70 to 97 aircraft. WestJet’s net profit, however, went from \$189 million to \$148 million. During the period, fuel cost per litre rose by 29.9% at Air Canada and 27.1% at WestJet while both yield and load factor stayed relatively constant. This increase in fuel price largely explains why the two carriers’ increased gross revenues did not translate into higher net earnings.

Several airports expanded or opened new terminal buildings between 2007 and 2011, including Quebec City (2008), Kuujuaq (2008), Halifax (2009), Winnipeg (2011) and Edmonton (completed in early 2012).

Canada’s three largest airports have looked to air-rail links to alleviate some roadside access challenges. Vancouver was first with the Canada Line in 2009. Toronto–Pearson is expected to follow suit in 2015 with

the Union Station–Pearson Airport Air Rail Link and Montreal is currently studying building a link between the airport and downtown. Air–Rail links are further explained in Section 8.4. Meanwhile, Toronto Island Billy Bishop Airport is planning to augment its ferry service between Toronto Island and Eiranne Quay at the foot of Bathurst Street with an 250 metre underwater pedestrian tunnel expected to cost \$86.2 million and to be completed in 2014.

ENVIRONMENT

Between 1990 and 2008, GHG emissions from domestic aviation rose from 6.4 Mt to 8.5 Mt—an increase of 2.1 Mt CO₂e at an average annual growth rate of 1.6% (34% overall) (see Addendum Figure EN3). While this increase was caused by a rise in total passenger kilometres, it was also mitigated by improvements in aircraft efficiency and the replacement of older and less efficient aircrafts.

Transport Canada expects domestic air traffic to grow at an average annual rate of 2.8% until 2020, and international air traffic to grow at an annual rate of 4.4%. This in turn will mean higher aviation-related GHG emissions for Canada. Domestic GHG emissions are forecasted to climb by 31% between 2008 and 2020, from 8.5 Mt to 11.1 Mt (an average of 2.2% per year).¹³

Canada has continued to actively participate in the International Civil Aviation Organization Committee on Aviation Environmental Protection in leadership roles, by providing expert technical advice to working groups and economic and forecasting advice to support groups. Canada’s participation contributes to the successful development of environmental standards and best practices that will lead to reduced noise and air pollutant and GHG emissions, both nationally and globally.

SAFETY

In 2009, Canada celebrated its 100th anniversary of powered flight. During the 2007–11 period, Canada also experienced significant changes in the approach to aviation safety since that first powered flight by the Silver Dart in 1909.

Internally, Transport Canada began reorganizing its aviation safety directorate to more closely relate to today’s operating environment. Transport Canada also introduced modern management concepts, practices and processes to strengthen internal systems and advance aviation safety.

¹² A separate company from Skyservice Business Aviation, parent of Sky Regional Airlines.

¹³ Environment Canada. 2011, Canada’s Emissions Trends.

Externally, Transport Canada continued overseeing the implementation of the Safety Management System (SMS). In 2008, Canada's largest passenger air carriers completed implementation of SMS. Since then, Transport Canada has conducted SMS assessments of all Canada's airlines to verify that the SMS in these companies is effective and contributes to a healthier safety culture within the organization.

Today, SMS policies, processes, procedures and systems cover more than 90% of revenue passenger kilometres.

Other notable highlights during this period include:

- In June 2007, Transport Canada introduced regulations¹⁴ requiring Canadian commercial aeroplanes to be equipped with an Airborne Collision Avoidance System (ACAS). ACAS reduces the risk of mid-air collisions by identifying the presence of a nearby aircraft and providing a visual notification and an audio warning to avoid a loss of separation.
- At the European Union–Canada Summit held in Prague, Czech Republic in May 2009, Prime Minister Stephen Harper and European Commission President José Manuel Barroso signed the Canada–European Union Agreement on Civil Aviation Safety. The agreement came into force on July 26, 2011.
- In the fall of 2010, officials from approximately 190 member countries attended the ICAO 37th General Assembly in Montreal. Canada was re-elected to the Council, ICAO's executive body. At the assembly, Canada confirmed its commitment to increasing aviation safety. ICAO also supported the concept of a State Safety Program, an initiative already in development in Canada.
- In November 2010, an amendment to the Canadian Aviation Regulations¹⁵ limiting the departure speed of aircraft to a maximum of 250 knots came into effect. Lower-speed take-offs reduce the risk of mid-air collisions, particularly with birds, which can result in aircraft damage and injuries to passengers and crew.

SECURITY

In January 2007, the Canadian Air Transport Security Authority (CATSA) implemented its mandated program for screening airport workers and non-passengers. The

program involves the random selection and screening of airport employees, flight crews, construction personnel and other non-passengers (and their belongings) who enter restricted airport areas. CATSA was also already administering the Restricted Area Identity Card (RAIC) at Canada's 28 major airports¹⁶—the first dual biometric (iris and fingerprint) airport access identification system for non-passengers to be used anywhere in the world. Overall, the combined programs represent a significant improvement to Canada's aviation security system.

In June 2007, Transport Canada introduced a program to prevent people who may create an immediate security threat from boarding commercial flights. Called the Passenger Protect Program, it works by maintaining a Specified Persons List that the Government of Canada provides to air carriers. Air carriers must screen all passengers for flights to, from or within Canada against the persons on this list. If a person is on the list and Transport Canada suspects that they may pose a threat, the department can disrupt their ability to cause harm or threaten aviation by taking action, such as preventing them from boarding an aircraft.

In response to new terrorist tactics, Transport Canada introduced millimetre-wave full-body screening technology at major Canadian airports in 2010. By the end of 2011, 53 such scanners had been deployed at 23 airports. Transport Canada is also exploring the benefits of advanced auto-detection software for this equipment, and will consider deployment of the software at Canadian airports.

Between 2006 and 2009, Transport Canada designed and tested various elements of an improved Air Cargo Security Program with the goal of improving air cargo security—an important part of Canada's trade and economic networks. The aim is to achieve air cargo security compatibility with the highest standards in the world. In support of the initiative.

6.4 ECONOMIC FRAMEWORK AND INFRASTRUCTURE

CANADIAN COMMERCIAL AIR CARRIERS

Canada is home to a wide variety of air carriers, including the following:

14 See <http://www.gazette.gc.ca/archives/p2/2007/2007-06-27/html/sor-dors133-eng.html>

15 See <http://www.gazette.gc.ca/rp-pr/p2/2010/2010-11-10/html/sor-dors219-eng.html>

16 Made up of the 26 NAS airports and two non-NASI.

Air Canada, Canada's largest airline and the world's 15th-largest passenger airline (in terms of passenger volume) as of 2010. Air Canada, with a workforce of 23,700 employees in 2011, transports passengers and cargo to 181 destinations worldwide on both scheduled and chartered flights. Air Canada has a mainline fleet of 205 aircraft, augmented by 157 aircraft flying under the Air Canada Express banner. A founding member of the Star Alliance (see Addendum Map 10)—the largest airline alliance in the world, started in 1997—Air Canada also has a freight carrying division, Air Canada Cargo. Air Canada's network is enhanced by five regional airlines—Jazz Air, Air Georgian, Exploits Valley Air Services Ltd., Sky Regional Airlines and Central Mountain Air—primarily operating feeder flights (i.e. connecting smaller cities with Air Canada's domestic hub airports) under the Air Canada Express brand, code-sharing agreements with more than 20 airlines and Air Canada Vacations, a tour operator subsidiary offering a full collection of leisure travel packages.

WestJet Airlines Ltd. provides scheduled and charter air service to 76 destinations in Canada, the United States, Mexico and the Caribbean. Canada's second-largest carrier, WestJet also has code-share agreements with five foreign carriers¹⁷ and interline agreements with 15 foreign carriers. WestJet employs 7,141 people, or "WestJetters" and finished 2011 with a fleet of 97 aircraft, all Boeing B-737.

Jazz Aviation LP, a former subsidiary of Air Canada, now controlled by the holding company Chorus Aviation. Jazz Aviation's activities as a regional feeder for Air Canada make up its core operations. Operating 133 aircraft under the Air Canada Express banner, with 15 more on order, Jazz services 53 Canadian and 28 U.S. destinations; it serves more Canadian points than any other airline. Jazz began diversifying in 2010 by operating six Thomas Cook Airlines-owned Boeing 757s under the Sunquest banner; this activity was terminated in April 2012. Jazz finished 2011 with 4,777 employees.

Air Transat, a business unit of integrated international tour operator Transat A.T. Inc. Air Transat is a holiday travel airline that carries millions of passengers each year to destinations around the world, with a fleet of 23 Airbus wide-body jets¹⁸, supplemented by additional service supplied by CanJet's fleet of Boeing B-737.

Porter Airlines, a regional airline headquartered in Toronto operating regularly scheduled flights between Toronto and 19¹⁹ Canadian and American locations. Porter flies 26 Canadian-built Bombardier Dash-8 Q400 turboprop aircraft.

Canada is also home to some air cargo carriers, such as:

Kelowna Flightcraft Air Charter, which operates Canada's largest cargo airline, and has long-term operating leases with both Purolator Courier and Canada Post. Kelowna Flightcraft operates 23 aircraft, including 18 under the Purolator banner.

Cargojet, which is Canada's second-largest all-cargo airline. Cargojet operates an overnight network of 13 freighter aircraft flying to 12 destinations coast to coast, as well as from Newark, New Jersey to Bermuda and Hamilton, Ontario to Katowice, Poland. Cargojet transports small parcels for large integrators such as UPS, as well as heavy and containerized freight. It employs about 400 people.

Many other Canadian airlines also offer passenger and/or cargo services. These include, among others, Sunwing, CanJet, First Air, Canadian North, Air North, Air Creebec, Air Inuit, Bearskin Airlines, Perimeter Airlines, Air Express Ontario, Air Labrador, Provincial Airlines, Air Saguenay, Flair Airlines, Kenn Borek Air and Propair.

The industry as a whole faced many challenges in the wake of nearly frozen commercial credit markets following the global financial crisis that began in the fall of 2008. This provoked a liquidity crisis at Air Canada in particular. Air Canada has since undertaken to financially and operationally restructure, focusing on key objectives including tight supply management, attracting higher-yielding premium-paying traffic, and containing its controllable costs through a Cost Transformation Program, which in 2011 generated operational savings and revenue gains in excess of its \$530 million year-end target by the end of the third quarter of 2011.

WestJet remains one of the few consistently profitable air carriers in North America. The company embarked on its next stage of growth by migrating its internal computer reservation system (CRS) to a Sabre platform in 2008. The new system has allowed WestJet to merchandise its services and expand its network by aligning with other air carriers, including Cathay Pacific, American Airlines, Air France-KLM, Korean Airlines, EL

17 American Airlines, Cathay Pacific, Delta, Japan Airlines and Air France-KLM.

18 A mix of Airbus A-310, A-330-200 and A-330-300.

19 As of March 2012.

AL Israel Airlines, Emirates and Air India. 2011 also saw WestJet successfully bid for 16 landing/takeoff slots at LaGuardia Airport in New York City, potentially increasing its appeal to business traffic between Canada and the United States. WestJet plans to use these slots to launch a new Toronto-LaGuardia service in June 2012.

Canada's northern-based air carriers continued to evolve and serve the unique needs and operating conditions of Canada's North. These carriers serve a widely dispersed market of approximately 110,000 people from networks built around four hubs situated at Iqaluit, Rankin Inlet, Yellowknife and Whitehorse. With relatively little in terms of surface infrastructure, Canada's North is highly reliant on air transportation for the supply and movement of cargo (e.g. food, fuel) as well as passenger services (including emergency medical evacuations). The region is, however, rich in natural resources, which has been driving increased economic activity. Both WestJet and Air Canada started new services to Yellowknife and Whitehorse. Air Canada also began offering services to Iqaluit from Ottawa and Montreal in March 2010, but withdrew from that market in July 2011.

In the coming years, high fuel costs will continue to challenge the air industry, as will intense competition, while margins will continue to be thin in many markets. Some airlines—notably Air Canada—also face the challenge of negotiating new labour agreements. Environmental considerations—for example, emissions trading and noise—will increasingly factor into airlines' operational decisions as they seek ways to mitigate their environmental footprint.

As a result of a decision by the Canadian Transportation Agency, beginning in January 2009, Air Canada, Jazz and WestJet, which provide the majority of domestic air service in Canada, offer a second seat free of charge to passengers with disabilities travelling in Canada who require an attendant or additional seating for themselves due to their disabilities.

Twelve air carriers have adopted a Multiple Format policy for persons with disabilities, and will provide information on services in alternate formats, such as electronic, audio, large print, and Braille upon request.

BLUE SKY POLICY AND AIR TRANSPORT SERVICES AGREEMENTS

On November 27, 2006, the Government of Canada introduced the Blue Sky Policy, a new international air transportation policy to help further connect Canadians to the world. The policy calls for a proactive approach to negotiating expanded air transport agreements, recognizes the unique characteristics of Canada's aviation market, and provides guidance on dealing with situations where:

- country-specific discriminatory airport access and/or facilitation issues seriously limit the ability of Canadian airlines to operate services to another country;
- the business environment presents major obstacles—such as fund transfers and provisions on double taxation—to Canadian airlines' commercial operations;
- foreign carriers appear to be contravening rational business principles or are protected from normal market conditions, resulting in a markedly unbalanced playing field; or
- foreign carriers would be reasonably expected to offer a level of service that would significantly reduce or effectively eliminate competition in some markets/routes, resulting in a net loss for Canada.

When one or more of these situations arise, a more gradual approach to expanding the bilateral air transport agreement is advocated.

Since the launch of the Blue Sky policy, the Government of Canada has negotiated air transport agreements covering almost 60 countries, in addition to the Open Sky agreement already in place with the United States, including:

- Open Skies-type agreements with 12 countries: Ireland, Iceland, New Zealand, Barbados, the Dominican Republic, Costa Rica, South Korea, Jamaica, Switzerland, Trinidad & Tobago, El Salvador, and Brazil;

- Expanded agreements with nine countries: Mexico, Japan, Jordan, Singapore, the Philippines, Morocco, Egypt, Cuba and Algeria; and
- New 'first-time' agreements with nine countries: Kuwait, Serbia, Croatia, Panama, Turkey, South Africa, Ethiopia, Qatar and Tunisia.

A comprehensive air transport agreement between Canada and the European Union's 27 member states was also signed in 2009. This includes countries with which Canada did not previously have air transport agreements—Cyprus, Estonia, Latvia, Lithuania, Luxembourg, Malta, Slovakia, and Slovenia. Including the Open Skies agreement Canada signed with the United States, Canada has also negotiated open agreements—accelerated under the Blue Sky Policy—with 40 countries²⁰ that represent more than 72% of Canada's international air passenger traffic and 90% of Canada's overall air merchandise trade.

CURRENT TRENDS IN GLOBAL ALLIANCES

Airline industry consolidation continued during the period covered by this report as legacy carriers struggled with the economic downturn, increased domestic competition and fluctuating fuel prices. In the United States, the industry witnessed the mergers of U.S. Airways and America West, Delta and Northwest, United and Continental; in Europe, the mergers of Air France and KLM; and British Airways and Iberia; while in Latin America, two competing groups, LAN and TACA, have established a network of national carriers. The global economic shift toward Asia and the emergence of mega-carriers in Latin America and the Middle East may accelerate consolidation in the coming years, increasing the levels and forms of airline collaboration aimed at improving operational efficiencies and reducing cost structures.

The emergence of Metal Neutral Joint Ventures (MNJVs) as a form of cooperation is the latest attempt by legacy carriers to settle into the new competitive landscape. MNJVs involve full coordination of major airline functions (e.g. revenue management and marketing/sales), and allow airline partners to share information about pricing, capacity and frequency. Examples of approved MNJVs include Lufthansa-All Nippon Airways (ANA), United/Continental-ANA, American-Japan Airlines (JAL), Delta-Virgin Australia, American-Qantas, and the most recent STAR Alliance MNJV (Lufthansa-United-Continental-Air Canada) in the transatlantic market, known as Atlantic++.

So far, only one MNJV has been approved by Canadian competition authorities: the Atlantic ++ Joint Venture on transatlantic routes involving Air Canada, Lufthansa, and United-Continental. This MNJV was granted antitrust immunity by the U.S. Department of Transportation in 2009. In 2011, Canada's Competition Bureau challenged a proposed second MNJV focused on transborder flights and composed of Air Canada and United/Continental. The Bureau has referred the issue to the Competition Tribunal.

AIRPORTS

The effectiveness of Canada's airport and air-navigation sector is recognized domestically and internationally, with highlights from the past few years including:

- the Greater Toronto Airport Authority (GTAA) winning an International Air Transportation Association (IATA) Eagle award in 2010 for outstanding performance in customer satisfaction, cost efficiency and continuous improvement;
- NAV CANADA winning the IATA Eagle award in 2010 and 2011 for best air navigation service provider in the world;
- the Vancouver International Airport winning the Eagle award in 2007 for outstanding performance in customer satisfaction, cost efficiency and continuous improvement;
- Ottawa MacDonald–Cartier International airport being ranked number one in North America and number two in the world in 2011 among airports serving two to five million passengers by the Airports Council International (ACI) Airport Service Quality (ASQ) Awards; and
- Since 2002, Halifax Stanfield International Airport has won 16 first prizes in various categories at the ACI ASQ Awards, in addition to finishing second or third eight other times.

Airport authorities across the country have spent billions on capital programs to improve and expand their airports (see Addendum Table A2). For example:

- in 2007, Vancouver International Airport completed a \$1.4-billion capital program that included a four-gate expansion to the International terminal;

20 The 12 previously listed, the 27 EU countries and the United States.

- the Greater Toronto Airports Authority completed its airport development program in 2007 and the expansion of Terminal 3 in 2010; airport development over the last 15 years has resulted in more than \$5 billion spent; and
- Calgary International Airport is in the midst of a \$2-billion airport development program expected to be completed by 2015, which will include a new runway (to be opened in 2014) and a new international terminal (to be opened in 2015) (see textbox below).

NEW RUNWAY AT CALGARY AIRPORT

Construction of a fourth runway at Calgary International Airport began in April 2011 and is expected to be completed by May 2014. The new 4,267-m (14,000-ft) runway—the longest in Canada—will be able to safely accommodate the largest aircraft flying today. Built on a north-south axis, it will be located 2,170 m east of the existing runway 16-34 (currently the longest at the airport), and will run parallel to it. Parallel runways with such spacing between them drastically increase an airport’s capacity by allowing simultaneous operations on each runway—reducing delays that the airport authority estimates would exceed an average of 10 minutes by 2013. The airport authority expects the airport’s runway system capacity to increase from 250,000 movements per year to 350,000 once the project is completed. This \$620-million project is financed entirely by the Calgary Airport Authority and is part of a \$2.05-billion project that will also see the construction of a new 22-gate international terminal building. Funding from these projects come from the airport improvement fee charged by the airport.

Canada’s large airports (see Addendum Map 5) are not the only ones enjoying success: airports in Gander, Deer Lake and Fort McMurray all enjoyed strong growth in 2011, as their passenger traffic grew by 18.9%, 8.6% and 6.9% respectively.

National Airport System airports offer such features as accessible parking, accessible washrooms, relieving areas for service animals, TTY phones for persons with hearing impairment, and accessible local transportation from the airport. These air terminal operators have also adopted a Multiple Format policy.

Several airports have won accessibility awards for their inclusive design. The Vancouver International Airport won the Rick Hansen Accessibility Award, and provides such features as elevators with voice “floor callers”, tactile maps of the terminal buildings, and

high-contrast floor markings for passengers with visual impairments; dedicated video monitors for passengers with hearing impairment; and lift-equipped shuttle bus service from parking lots. The Ottawa International Airport won the City of Ottawa Accessibility by Design award, and the Edmonton International Airport received several awards for accessibility, including the inaugural Percy Wickman Accessibility Award in recognition of its commitment to making the airport one of the most accessible in Canada.

FUNDING OF THE AIR TRANSPORT SYSTEM

There are a number of different economic models around the world that determine who will pay for the air transportation system. The degree to which users, or the general taxpayer shoulder the burden of paying for the air transport system varies from country to country. Some countries have a system that is far more based on the ‘user-pay’ principle for all or almost all aspects of the system, others provide substantial funding from general government revenues.

Canada’s air transportation system is based on the ‘user pay’ principle, minimizing the burden to taxpayers. Canadian airlines, air navigation services and most National Airport System (NAS) airports are operated by private entities—independent of government—that must recoup their costs to remain viable. This is done most often through various fees (see Addendum Table A5 for airport improvement fees at NAS airports) and surcharges charged to the user. All airline tickets contain a number of additional surcharges, fees and taxes beyond base airfare. Canadian federal government charges are the Goods and Services/Harmonized Sales Taxes, and the Air Travellers Security Charge. In addition, some taxes or charges do not appear on an airline ticket but are rather incorporated into the base fare. This includes the federal fuel excise tax (which applies only to domestic flights) and airport rent at larger, federally owned airports. Together these represent a small share of overall ticket prices, which fluctuate depending on the route and fare basis.

CROSS BORDER LEAKAGE

One issue that has been raised by stakeholders is the fact that many Canadians travel across the border by car to fly out of U.S. airports located in close proximity to Canada. The primary reason cited for this is the

disparity in total airfares between the two countries. In addition to base fares (before the addition of charges, fees, and taxes) which are often substantially lower in the U.S., the number and amount of charges, fees and taxes are often higher for flights originating in Canada. This reflects not only the greater use of the user-pay system in Canada, but also the charges levied by the U.S. on flights coming into that country, which are not levied on flights originating in the U.S. The precise number of Canadian passengers flying from U.S. airports is difficult to ascertain, although anecdotal evidence suggests it is in the millions. There is also anecdotal evidence to suggest U.S. passengers drive across the border to fly out of Canadian airports, although in this case it appears the reason is choice of destinations rather than cost. Again the precise numbers are difficult to determine.

GENERAL AVIATION (GA)

Of the close to 35,000 aircraft registered in Canada,²¹ some 85% are operated for GA purposes.

Canada's GA component has a fleet of over 29,000 aircraft out of a total of 34,947 Canadian-registered aircraft. GA aircraft flew a total of more than 1.7 million hours in 2010. The Private Owners segment represents a third of the GA fleet and reported in 2010 an average of 42 hours of flight time per aircraft. The most active GA segment is Air Taxi Operators, whose 2,752 aircraft reported flying an average of 131 hours each in 2010. About 50% of balloon operations—which also fall under the banner of GA—are used to generate revenue, while the remainder are dedicated to private recreation. Also in this component, ultra-light aircraft are used principally for recreational purposes (8–12%); amateur-built aircraft are almost exclusively recreational, with less than 6% devoted to commercial use.

The fractionally owned partnerships (FOP) segment of Canadian GA is similar in concept to the time-sharing of aircraft. Owners are primarily concentrated in a small number of markets (i.e. Toronto, Calgary, Montreal and Vancouver). In 2008, FOPs involved 32 aircraft, each logging 459 hours of average annual use—a very small proportion of total GA activity. This contrasts with U.S. FOP operators who have an average fleet of 190 aircraft, with each aircraft flying 800 to 1,000 hours a year.

Flight training also falls under GA activity, and has become an important Canadian export to countries such

as China. Canada's small airports and flight schools provide an array of flight training programs for foreign pilots, with the Flight Training segment of GA (639 aircraft) flying an average of 328 hours per aircraft—a total of 5.3% of GA activity.

Close to 1,900 aerodromes across Canada host GA operations.²² While most do not host regularly scheduled air services, these smaller aerodromes connect the communities they serve to the rest of the country. They facilitate GA and other activities, such as operating as bases for aircraft designed to fight forest fires or infestations (such as the pine-beetle), medical evacuation (i.e. 'medivac'), disaster evacuation and recovery, or aerial mapping and cartage for natural resource development. However, access to aerodromes and airports remains a persistent GA issue. Some small aerodromes face financial viability and noise issues, or pressure to redevelop their land with more lucrative real estate projects. Meanwhile, some larger airports with limited space and capacity would prefer to focus on commercial air services rather than general aviation. These pressures are already impacting GA, forcing it to relocate some of its activities.

6.5 ENVIRONMENT

AIR POLLUTION AND EMISSION MITIGATION

AIRPORTS AND NOISE

Aircraft noise pollution is produced by any aircraft or its components, during various phases of flight: on the ground while parked such as from auxiliary power units, while taxiing, during take-off, over-flying while en route, or during landing. Areas most affected are those in the immediate vicinity of airports, underneath and lateral to departure and arrival paths. There is often a trade-off that takes place between air emission and noise, where improvements in fuel consumption can lead to increase in noise and vice-versa.

Airports are heavily involved in community relations programs and stakeholder consultation mechanisms related to noise.

Transport Canada implements regulations that adopt the latest international aircraft noise emission standards,

²¹ See Table A9 in the Addendum.

²² Please see Table A1 in the Addendum for a breakdown by aerodrome type.

and supports individual airport noise-management programs by enacting enforceable noise-abatement procedures and restrictions that address local concerns.

AIR TRANSPORT AND POLLUTANTS

Air pollutant emissions from aircraft engines include NO_x (nitrous oxide), CO (carbon monoxide), SO_x (sulfur oxide), volatile organic compounds (VOCs), and particulate matter. These emissions occur during all phases of flight and affect local air quality (see Addendum Figure EN6).

GREENHOUSE GAS EMISSIONS (GHGs)

The most significant greenhouse gas emitted by aviation is carbon dioxide, a product of fuel burn.

JURISDICTION OF ENVIRONMENT AND AIR TRANSPORTATION

Aviation is an internationally integrated but nationally regulated industry—integrated when it comes to international air operations but still operating within the confines of a regulatory framework that governs the degree of integration. The industry operates within a framework of rules and standards set by the International Civil Aviation Organization (ICAO), including those established by its environmental committee, the Committee on Aviation Environmental Protection (CAEP). Transport Canada represents the Government of Canada at ICAO and CAEP, and has exercised its mandate for managing both domestic and international aviation emissions.

The *Aeronautics Act*, administered by Transport Canada, provides broad regulation-making authority over airlines, airports, airspace and aircraft through certification and regulation. The certification process is regulated by the Canadian Aviation Regulations made pursuant to the *Aeronautics Act*, and is applicable to aircraft both manufactured and registered in Canada. Under the 1944 Chicago Convention, the same rules—including those related to environmental protection—must be applicable to both the domestic and international aspects of aviation.

TREND OF DOMESTIC AVIATION GHG EMISSIONS

Aviation accounts for a little more than 5% of all transportation-related SO_x and NO_x emissions, but contributes about 2% or less to the transportation-related emissions of other air pollutants (see Figure EN4).

Emissions in general increased between 1990 and 2009, with SO_x by 1,756 tonnes; NO_x by 23,898 tonnes; and VOCs by approximately 3,358 tonnes. PM_{2.5} and CO decreased by 96 tonnes and by approximately 6,745 tonnes, respectively (See Figure EN8).

REDUCING AVIATION EMISSIONS

INTERNATIONAL EMISSIONS

The aviation sector contributes 2% of global GHG emissions.²³ Given the international nature of aviation, Transport Canada participates at ICAO to develop global policy positions on aviation emissions.

At the ICAO’s General Assembly in 2010, member states adopted a resolution on aviation and climate change.²⁴ It set several voluntary goals for international aviation emissions, including:

- a global annual average fuel efficiency improvement of 2% until 2020;
- a medium-term aspirational goal of keeping global net carbon emissions from international aviation from 2020 at the same level; and
- a global aspirational goal of 2% annual fuel efficiency improvement from 2021 to 2050.

To help ICAO track progress towards reaching these goals, the resolution encourages member states to submit action plans detailing specific measures to address GHG emissions related to international aviation to ICAO by June 2012. Canada supports the resolution’s stated goals, and intends to submit an action plan explaining how the Canadian aviation industry will reduce GHG emissions.

23 Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. 2007. http://www.ipcc.ch/publications_and_data/ar4/wg1/en/contents.html

24 Resolution A37-19: Consolidated statement of continuing ICAO policies and practices related to environmental protection – Climate change. http://legacy.icao.int/env/A37_Res19_en.pdf 16 Made up of the 26 NAS airports and two non-NAS

CANADIAN AVIATION INDUSTRY'S VOLUNTARY AGREEMENT AND ACTION PLAN

Despite high and increasing demand for airline services in Canada, significant progress has been made to mitigate the sector's carbon footprint through voluntary measures undertaken by industry, the Government of Canada and NAV CANADA.

In June 2005, Canadian air carriers and Transport Canada signed the world's first voluntary agreement to address GHG emissions from both domestic and international aviation operations. This agreement established Canada (ATAC) and the National Airlines Council of Canada (NACC) report annually on the amount of fuel burned and activity measures such as available-seat kilometres.²⁵

As of 2009, Canada's aviation industry's fuel efficiency had improved by 1.9% annually since 1990—a 30% cumulative improvement—surpassing the agreed-upon goal in the voluntary agreement. Though in absolute terms domestic and international emissions have grown at an annual average rate of 1.4% between 1990 and 2009 (see Figure EN7), this increase would have been significantly higher without these fuel efficiency improvements.

In March 2010, Transport Canada and aviation stakeholders from the aerospace industry—air carriers, airports, the air navigation service provider, and the business aviation sector—formed a Working Group on Aviation Emissions. The Working Group provides a collaborative forum for information sharing and discussion, and is developing an action plan to reduce GHG emissions from the Canadian aviation sector between now and 2020. The action plan will form the basis of the Canadian government's response to the ICAO resolution of 2010.

NAV CANADA also supports pollution-prevention programs, focusing on performance-based navigation, en-route surveillance and communication, airspace utilization and airport operations. NAV CANADA estimates that, between 1997 and 2009, newly deployed navigation technologies and procedures have helped air operators save more than two billion litres of jet fuel—representing

about 5.4 million metric tonnes of CO₂ emissions—with additional reductions of more than three billion litres of jet fuel from these measures expected by 2016 (representing about eight megatonnes of CO₂ emissions over this 20-year period).²⁶

MEASURING AIRPORT EMISSIONS

Since the early 1970s when concerns were first raised regarding airport source impacts on ambient air quality, Transport Canada has supported air quality assessments at airports. More recently, domestic and international concerns surrounding GHG emissions and their effect on climate change have led the Canadian aviation industry to actively employ and conduct research into a variety of GHG reduction strategies including airspace optimization, new aircraft design, new low-carbon aviation fuels, and operation and market-based measures. Such strategies are often multi-purpose—for example, a given strategy may reduce GHG emissions while also providing cost and operational efficiencies.

Working in partnership with the Canadian Airports Council (CAC), Transport Canada developed a methodology and tool for conducting GHG emissions inventories at Canadian airports. Inventories have been completed for 26 NAS airports and the airports owned and operated by Transport Canada. The airports have established baseline inventories that indicate operational opportunities to reduce airport related emissions. This tool is currently being updated for use globally in cooperation with Airport Council International (ACI), and will be available in the spring of 2012.

Transport Canada continues to work cooperatively with the U.S. Federal Aviation Administration (FAA) and the U.S. National Aeronautics and Space Administration (NASA) as a funding sponsor for PARTNER: the Partnership for Air Transportation Noise and Emissions Reduction. PARTNER is a long-term partnership of academia, industry and government established to create a world-class consortium closely aligned with national and international needs to foster breakthrough technological, operational, policy and workforce advances for the betterment of mobility, the economy and the environment.

25 A measurement of passenger-carrying capacity calculated by obtaining the product of the number of seats available and the distance over which they are available.

26 NAV CANADA. 2011. NAV CANADA and the Environment. <http://www.navcanada.ca/NavCanada.asp?Language=en&Content=ContentDefinitionFiles%5CAboutUs%5CEnvironment%5CDefault.xml>

REDUCING EMISSIONS THROUGH REGULATION AND BEST PRACTICE GUIDANCE

Transport Canada is the lead federal regulatory department for aviation emissions. Because of the global nature of the industry, the department's regulatory framework aligns with international standards and recommended practices developed and adopted by the ICAO.²⁷

ICAO emissions standards are published in Annex 16 to the *Convention on International Civil Aviation, Volume I Aircraft Noise and Volume II Aircraft Engine Emissions*. ICAO developed these standards through its Committee on Aviation Environmental Protection (CAEP), a committee where Transport Canada actively participates on technical working groups to develop environmental standards according to the underlying principles of technical feasibility, economic reasonableness and environmental benefit, while also taking into account the environmental interrelationships. Current ICAO emission standards limit noise from aircraft and emissions of NO_x, unburned hydrocarbons, carbon monoxide and soot from aircraft engines. The latest ICAO standard for NO_x emissions for new aircraft engines will take effect in 2013.

CAEP's current priority is the development of a CO₂ standard for fixed-wing aircraft, which is targeted for 2014. CAEP is also developing a certification requirement in support of a non-volatile particulate matter standard applicable to aircraft engines, to be ready for 2016; a standard for volatile particulate matter will subsequently be developed. Transport Canada is providing expert technical advice as well as forecasting and economic analysis support to the task groups developing these new standards. Once completed and adopted by ICAO, Canada will also adopt the new particulate matter and CO₂ standards.

With respect to noise, CAEP continues to improve certification methods for cost-effective ways of limiting exposure to noise that may be experienced in the communities surrounding airports.

In collaboration with key aviation stakeholders, including international bodies such as ICAO, Transport Canada is undertaking research and development (R&D) in an effort to reduce aviation emissions. Current R&D activities include: standard development for aviation particulate matter emissions; GHG climate modeling to assess aviation impacts in Arctic atmospheric regions; and assessment of cleaner alternative aviation fuels.

ALTERNATIVE FUELS

The potential use of alternative fuels is being examined as an important part of the global strategy to reduce aviation emissions of CO₂. Air quality benefits will also be realized, as feedstocks for sustainable biofuels do not contain sulphur; the use of biofuels will therefore result in the reduction of SO_x emissions and substantial reductions in particulate matter emissions. Canadian researchers and stakeholders are conducting biofuel research to assess the viability of alternative aviation fuels, and to evaluate the potential effects on engine operations.

In 2011 the Canadian General Standards Board (CGSB) amended Canadian aviation fuel standards for Jet A and Jet A-1 to allow up to a 50% blend of synthetic source material in jet fuel.

LAND POLLUTION AND REMEDIATION

The impact of air transportation on the environment goes beyond air quality and emissions issues. Federal contaminated sites are a legacy of past practices, the environmental consequences of which were not fully understood at the time. The Government of Canada has responded through the establishment of the Federal Contaminated Sites Action Plan (FCSAP) Program in 2005. FCSAP is a cost-shared program that helps federal custodians to address eligible contaminated sites for which they are responsible. Transport Canada is a participant of this program and supports the program's objectives of reducing risks to human health and the environment and associated financial liability resulting from federal contaminated sites. Looking to the air transportation sector, the department's remediation of the Fort Nelson airport is an example of how historical contamination can be successfully remediated.

²⁷ Canada has adopted these ICAO standards for aircraft and engine emissions and references them in its Airworthiness Manual Chapter 516, made pursuant to the Canadian Aviation Regulations and under the *Aeronautics Act*.

FORT NELSON AIRPORT ENVIRONMENTAL REMEDIATION

As part of the transfer agreement of the Fort Nelson Airport to the local municipality, Transport Canada agreed to address the multiple contaminated sites at the airport totaling an estimated 165,000 m³ of contaminated soil—enough to cover more than 25 football fields with soil one metre deep. A 1997 Environmental Baseline Study identified 56 areas of concern. Remediation work began in 1999 and was scheduled to be completed in 2015. The project was accelerated between 2009 and 2011 as part of Canada's Economic Action Plan. During that period, 52,000 m³ of contaminated soil was placed in an on-site soil treatment facility and an additional 22,200 m³ of soil was remediated to below commercial industrial levels and is now available for re-use as backfill. Over 60% of the airport land is now remediated and work continues on the remaining areas.

WATER POLLUTION FROM GLYCOL

There are two types of glycol used in aircraft de-icing:

- **Ethylene glycol**, an organic compound widely used as automotive antifreeze and a precursor to polymers. In its pure form, it is an odorless, colorless, syrupy, sweet-tasting liquid.
- **Propylene glycol** is also an organic compound, which is colorless, nearly odorless, clear, viscous liquid with a faintly sweet taste, hygroscopic and miscible with water, acetone, and chloroform.

Aircraft de-icing and anti-icing fluids are a glycol based temperature depressant. Both ethylene and propylene glycols are used, however, ethylene dominates as it is a lower freezing point depressant. De-icing fluid is sprayed hot to aid in the removal of contaminants (frost, snow and or ice) off the wings and fuselage of an aircraft. Anti-icing fluid is sprayed cold and prevents snow and ice from remaining on the aircraft as it takes off. Transport Canada regulations prohibit aircraft departures with contaminated wings.

In the mid-1990's, Transport Canada and Fisheries and Oceans Canada developed a 100mg/l glycol end of pipe guideline for the release of glycol into a receiving stream. All Canadian airports have developed operational procedures and built the appropriate control structures to control the release of glycol into the receiving streams to meet this guideline. During snow-falls, or precipitation of any kind, the airport's deicing pads are used exclusively. Glycol is contained and collected from the de-icing pads and is directed to storage lagoons located on the airport grounds.

EXAMPLES OF GLYCOL MANAGEMENT/DE-ICING OPERATIONS:

- Toronto-Pearson airport allows frost de-icing on-gate with specific control and cleanup procedures. For snow and ice de-icing, the airport developed an infield centralized pad, the largest in Canada, capable of de-icing up to 12 aircraft simultaneously. This pad is underlain by a plastic membrane to ensure contamination is not released to the environment.
- Vancouver switched to a single contractor for all aircraft de-icing in 2009, which enabled a centralized management of all aircraft de-icing and improved data tracking. New de-icing equipment is fitted with high efficiency nozzles that allow removal of snow or frost with lower volumes of fluid; glycol blending has been implemented to reduce the concentration of chemical used and therefore reduce overall chemical use by at least 30%; in 2010–11, a trial of forced air equipment to pre-treat aircraft showed a 50% reduction in de-icing chemical used and de-icing bay time.
- Aéroports de Montréal (ADM) initially invested nearly \$40 million in the construction of a centralized de-icing centre at Montréal-Trudeau airport that allows used de-icing fluids to be recovered via a system of underground pipes. This system protects nearby streams from these fluids. An additional investment will be made in 2012 to increase by nearly 50% the capacity of the de-icing centre. In addition, de-icing trucks are equipped with state-of-the-art technology, including sensors, to achieve more targeted delivery of glycol and increase its effectiveness. This reduces the quantity of glycol used while ensuring compliance with the most stringent safety standards.
- In St. John's in 2007, a centralized de-icing facility and pad was constructed; all glycol was processed on site and residual shipped out of process for recycling. In 2011 an on site 3.8 million litres glycol effluent storage tank was constructed; and in 2012, a feasibility study was completed to construct an engineered wetland to process spent glycol;
- Ottawa has a bio-treatment system that collects all surface water in the vicinity of the central de-icing facility. Bacteria treat the glycol underground and degrade the glycol to acetate (i.e. vinegar) and the vinegar is then degraded naturally.
- Winnipeg constructed a central de-icing facility (CDF) in 2005 capable of retaining and storing 11 million litres of glycol. In 2012, the airport will construct additional supporting infrastructure, including a second cell adjacent to the glycol retention pond and an additional force main to transfer fluid between the 2 cells and ultimately to the sewer for disposal.

- Finally, Kelowna is considering a glycol blending facility, which will reduce the glycol consumption considerably. The airport authority is in the initial stages of their evaluation, but hopes to have it ready for implementation for the 2012–13 de-icing season.

6.6 SAFETY

OVERVIEW

Canada has one of the safest air transportation systems in the world. During the last decade, the rate of air transportation accidents has considerably declined from nearly eight accidents per 100,000 hours flown in 2000 to fewer than six in 2011—a drop of 25%. The total number of yearly accidents has also declined: the numbers reported in the last four years—211, 234, 231 and 234—are the lowest recorded figures in 15 years (see Tables S18 and S19). In fact, that’s more than 40 fewer accidents a year when compared to the previous 10-year average, an indicator of Canada’s solid aviation safety record.

Several key factors during the last few years have shaped the state of aviation safety today.

Foremost, Transport Canada has taken increasing steps to harmonize Canadian and international aviation safety policies, programs and standards, including in such areas as pilot licences, aircraft safety equipment and language proficiencies for communications with ground crews. In 2010–2011, Transport Canada participated in bilateral meetings with China, Korea, Israel, Brazil, Mexico, Singapore, Norway, Iceland, Switzerland, Trinidad & Tobago, the EU and the United States to discuss various aviation safety issues.

Transport Canada also works through the ICAO to advance Canadian interests—ICAO is the Montreal-based UN agency responsible for the safe and cooperative development of international civil aviation and of which Canada is a founding member. The department provides technical experts to assist in the development of standards and recommended practices for international civil aviation. Member states are expected to include these standards and recommended practises in their laws and regulations. Departmental experts also participate in several international panels, working groups and committees, including the SMS International Collaboration Group, the Best Practices Panel and the Western Hemispheric Dialogue. The goal of these activities is to advance world-wide aviation safety.

AIRLINE OPERATIONS

Number of Airline Operators (CAR 705) Certificate holders: 39

Airline transportation remains one of the safest means of travel for Canadians. During the last five years, Canadian-registered airlines operating under the Canadian Aviation Regulations (CARs) have averaged 3.6 accidents a year for an accident rate of 0.11 per 100,000 airline movements. Despite these trends, another trend, the rise in airline traffic, continues to spur numerous efforts to make this mode of transport even safer.

In November 2010, Transport Canada published regulations²⁸ prohibiting high-speed aircraft departures in Canada. Lower-speed take-offs reduce the risk of mid-air collisions—particularly with birds—which can result in aircraft damage and injuries to passengers and flight-crew members. Minimizing the risk of bird strikes can also reduce flight delays, cancellations and aircraft downtime. This is one in a series of smaller, incremental measures adopted during the last five years to improve airline safety.

SMS, on the other hand, was neither a small nor an incremental change. In fact, it is likely the largest shift in safety ethos in decades. SMS involves strengthening the safety culture within an airline by requiring that airline to design safe policies, processes and procedures to identify, assess and address safety risks. SMS organizations have processes in place to monitor, investigate and learn from every safety-related incident or issue.

Today, Canada’s largest passenger air carriers operate with SMS policies, processes, procedures and systems, and Transport Canada has completed SMS assessments on all large operators. The results of these findings, along

NACC carriers have collectively embraced the principles of safety management systems and embarked on a journey which brought about a fundamental change in the industry’s culture towards safety. Today, I can state unequivocally that such a transformation has taken place at all levels within our member airlines; employees, managers, and the highest echelons of the corporation up to the CEO level are engaged.

Captain Jacques Mignault
Safety Subcommittee National Airlines Council of Canada

28 See <http://www.gazette.gc.ca/rp-pr/p2/2010/2010-11-10/html/sor-dors219-eng.html>

with further observations from Transport Canada inspectors and a report from the Auditor General of Canada, revealed that there were opportunities to improve, standardize and advance SMS, something Transport Canada is working towards.

SMS represents the next step in making our exceptionally safe air transportation system that much safer.

SMALL AIR OPERATORS

Number of Air Taxi Operator Certificates (CAR 703): 538

Number of Commuter Air Operator Certificates (CAR 704): 89

When discussing safety, it is important to note the distinction between the two categories of smaller commercial air passenger transportation: air taxi operations, whose aircraft have nine or fewer passenger seats; and commuter operations, whose aircraft have 10–19 passenger seats.

During the last five years, the safety of commuter operations is comparable to airline operations, averaging four accidents a year. Within that period, air taxi operations have averaged more than 40 accidents per year, a figure that is neither unprecedented nor abnormal when compared with worldwide figures for this type of air travel. In 2010 and 2011, air taxi accidents fell to 38 and 40 accidents respectively.

In June 2007, Transport Canada significantly enhanced the safety of CAR 703 and CAR 704—air taxi and commuter air—operations by introducing regulations²⁹ requiring Canadian commercial airplanes to be equipped with Airborne Collision Avoidance Systems (ACAS), which function independently of ground-based air traffic control. ACAS reduces the risk of mid-air collisions by identifying the presence of a nearby aircraft and providing a visual notification and an audio warning to avoid a loss of separation.

Air taxi and air commuter operations are slated to adopt SMS over the course of a three-year phase-in period that will begin after SMS regulations for these sectors come into force (the date for which has not yet been fixed). To provide additional time to refine procedures, training and guidance material based on inspector and industry feedback, Transport Canada delayed SMS implementation for smaller operators, and also developed an action plan to strengthen SMS implementation.

FLOATPLANES

Floatplane operations, which largely fall into the air taxi category of operations, drew public attention in 2010 after a series of fatal accidents, prompting Transport Canada to implement an updated safety awareness campaign for floatplane passengers and operators, and conduct more unplanned inspections to ensure that floatplane companies are operating safely.

In October 2010, Transport Canada held a floatplane safety workshop in British Columbia to further improve the safety of floatplane operations. The workshop provided a forum for industry leaders and Transport Canada specialists to assess risk-mitigation strategies, including the use of pop-out windows and portable flotation devices (PFDs), and resulted in the formation of the Floatplane Operators Association³⁰, a group committed to advancing floatplane safety. Transport Canada is also in the process of proposing regulations that would require floatplane passengers to carry PFDs and crew members to undergo egress training to help passengers and crew members safely and quickly exit the plane in an emergency.

In relation to floatplane safety, Transport Canada also issued a Civil Aviation Safety Alert³¹ (CASA) on June 3, 2011 recommending the adoption of these four floatplane-safety best practices:

- use of upper body restraints by passengers in the front seat;
- comprehensive safety briefing to passengers, including proper usage of personal flotation devices during and after an evacuation;
- emergency evacuation training for flight crew; and
- adoption of aircraft-safety design improvements to facilitate evacuation.

29 See <http://www.gazette.gc.ca/archives/p2/2007/2007-06-27/html/sor-dors133-eng.html>

30 See <http://www.floatplaneoperators.org/>

31 See <http://www.tc.gc.ca/eng/civilaviation/opssvs/managementservices-referencecentre-casa-2011-03-1325.htm>

The European Aviation Safety Authority (EASA) subsequently recommended that the European floatplane industry adopt these practices.

BUSINESS AVIATION

Number of Private Operator Certificates (CAR 604): 200

Canada’s civil aviation system has two primary categories of aviation activities: commercial—operators holding a 703, 704 or 705 operating certificate—and private. Private operations can be further subdivided into business and personal operations, with business aviation operations consisting of an aircraft or fleet of aircraft operated by a business to transport passengers (for example, employees or clients).

Business aviation has historically been one of the safest sectors of air transport, a trend that has continued through the last five years with two business aviation accidents recorded.

Due to the safety record of this sector, regulatory amendments came into effect in 2005 allowing the Canadian Business Aviation Association (CBAA) to issue certificates and monitor operations of business aviation operators as a regulated third party. However, after determining the Canadian public would be best served if these activities were handled by the government, the Minister of Transport announced that effective April 1, 2011, Transport Canada would take back the certification and oversight functions for business aviation from the CBAA. With this change, Transport Canada is now responsible for issuing operating certificates to new applicants as well as processing changes to existing certificates.

Transport Canada intends to publish new regulations for this sector in *Canada Gazette*, Part II, in 2012—currently the department exercises its authority through an Interim Order.³²

GENERAL AVIATION

With 35,000 civil aircraft, Canada has the second largest civil aviation aircraft fleet in the world. Its commercial sector ranges from international scheduled services to small, one-aircraft charter companies and business aircraft operators, and the number of light recreational aircraft increases every year.

Personal aviation accounts for the majority of air transportation accidents, averaging 111 per year for the last five years; flight training follows with an average of 39 accidents per year, while aerial work averages approximately 23 per year.

Considering the nature of these operations, personal aviation is not expected to have a safety record that is on par with other forms of aviation.

Because general aviation continues to be an essential component of the Canadian lifestyle—connecting Canadians in large and small communities, contributing to the health of the economy and creating jobs—the aviation community depends on a safe, accessible and growing general aviation sector. Increasing costs, increasing regulations and decreasing airspace and airport accessibility dissuade many from participating in personal aviation.

As a result, introducing new regulatory amendments to enhance the safety of this sector can be a complex process as any initiative that includes a price tag can further restrict the viability of this sector.

In overseeing this sector, Transport Canada attempts to balance safety with sustainability.

AERONAUTICAL PRODUCTS, CERTIFICATION AND AIRWORTHINESS

AIRCRAFT MAINTENANCE

In Canada, approximately 904 aircraft maintenance organizations verify that all aeronautical products in Canada are maintained to national and international airworthiness standards. More than 14,000 aircraft maintenance engineers (AMEs) licensed by Transport Canada perform tasks according to approved maintenance programs to verify the continued safety of the aircraft. If any faults are detected—in the aircraft structure or systems and controls, for example—AMEs take the appropriate actions to get the aircraft back in the air.

32 See <http://www.tc.gc.ca/eng/civilaviation/standards/business-aviation-3934.htm>

The aerospace industry in Canada is experiencing unprecedented growth. Each year, Transport Canada approves more than 1,500 new and modified aeronautical products built or operated in Canada. Products range from advanced aircraft, avionics and electronics to space products and services. For example, in November 2010, Transport Canada certified the Bombardier Aerospace CRJ1000. Annual sales of Canadian aerospace products and services total more than \$20 billion – exports account for roughly 80% of this figure.

Due to the significant economic contribution of this sector, Transport Canada must not only be timely and thorough in its certification process, but also create the right conditions for prosperity. In relation to the former, Transport Canada attempts to find the right balance between speed and process.

Transport Canada specialists review and verify design and performance data, supervise and perform ground and flight tests, and award the Transport Canada Type Certificate. Transport Canada is also responsible for the continuing airworthiness of aeronautical products. In relation to the latter, Transport Canada pursues agreements with civil aviation authorities worldwide to facilitate the export of Canadian aeronautical products. On July 26, 2011, a Canada-European Union Bilateral Aviation Safety Agreement (BASA) came into force. Under the agreement, the European Aviation Safety Agency (EASA) will recognize certification of Canadian aviation products and services, allowing the Canadian aviation industry to be much more competitive in the European market. Civil aviation safety will also be enhanced, as EASA and Transport Canada will work cooperatively to resolve safety issues. A similar agreement was signed between Canada and the United States in 2000, and has had a positive effect on Canada's civil aviation industry.

Transport Canada is also working with the Federal Aviation Administration (FAA) to streamline FAA validations of Canadian design approvals in support of the business needs of the Canadian aviation industry.

AIRPORTS AND AERODROMES

When discussing aerodromes and the safety of Canadian airports, runway safety has been a prominent talking point. On March 16, 2010, the Transportation Safety Board of Canada (TSB) indicated that further measures were needed to reduce the risk of landing accidents and runway overruns at Canadian airports.

In response, Transport Canada is proposing regulations that will require certain designated certified aerodromes to install and maintain a Runway End Safety Area (RESA). Transport Canada is also revising TP 312 – *Aerodrome Standards and Recommended Practices*³³ in cooperation with industry experts. The updated version will address additional visual aids for pilots to help assess landing distances, Canadian and international RESA standards, and the engineered material arresting system (EMAS) as an added safety measure. Transport Canada is committed to conforming to ICAO's standard for a 150 metre-long RESA. The department has also begun a risk assessment of increasing the RESA to 300 metres.

Transport Canada has also taken added measures to increase the safety of runways during Canada's unique winters and issued several advisory circulars to reduce the risk of aircraft colliding with vehicles or other aircraft on the ground at Canadian airports.

ENGINEERED MATERIAL ARRESTING SYSTEM (EMAS)

Engineered material arresting system (EMAS) is an example of a ground arrestor system. Located beyond the end of the runway, EMAS is designed to stop an overrunning aircraft by exerting deceleration forces on its landing gear. Applying EMAS can mean the difference between an accident and a minor incident. EMAS is a soft ground arrestor, which deforms under the weight of the aircraft tire as it runs over it. As the tires crush the material, the drag forces decelerate the aircraft and bring it to a safe stop. EMAS is popular in the U.S at airports that have difficulties complying with FAA rules on runway safety.

AIR NAVIGATION

In Canada, NAV CANADA—a not-for-profit private company—provides national civil air navigation services, such as air traffic control, flight information and weather briefings, and oversees more than 12 million air traffic movements a year, including global air carriers entering Canadian airspace.

In early 2011, air traffic control safety came under scrutiny after several lone air traffic controllers were found to be sleeping on duty in the U.S. During this time, Canada's air traffic control system was touted as one of the safest and most successful systems in the world, due in part to NAV CANADA's policies that help avoid problematic situations such as those that occurred in

33 See <http://www.tc.gc.ca/eng/civilaviation/standards/business-aviation-3934.htm>

the U.S. For example, NAV CANADA controllers do not work alone and they must have at least 10 hours off between shifts. NAV CANADA also permits naps to mitigate the effects of fatigue, if needed.

NAV CANADA won its third Eagle Award³⁴ in 2011, which is given to the world's best air navigation service provider by the International Air Transport Association (IATA). The Eagle Award honours outstanding performance in customer satisfaction, cost efficiency and continuous improvement.

In addition to the national services provided by NAV CANADA, approximately 200 other organizations provide air navigation services on a local or regional basis. Transport Canada regulates and oversees this industry to verify its safety.

On December 21, 2011, air navigation safety was further improved when amendments to the Canadian Aviation Regulations came into force requiring a person responsible for a building, structure or object constituting an obstacle to air navigation to mark and light that obstacle. The amendments removed the necessity to use ministerial orders for the same purpose, which was a slower process that resulted in longer exposures to unsafe situations.

AUTOMATIC DEPENDENT SURVEILLANCE-BROADCAST (ADS-B)

On January 15, 2009, NAV CANADA began implementing the use of ADS-B in Northern Canada. ADS-B is a next generation air traffic surveillance system that uses a global navigation satellite system, aircraft avionics, and ground infrastructure to automatically transmit flight information between aircraft and air traffic control every second. This information includes aircraft identification, position, altitude and velocity. The benefits of ADS-B include enhanced safety by increasing the areas of surveillance coverage and fuel savings related to the opportunity for more user preferred routes. ADS-B will reduce separation minima for equipped aircraft and allow more aircraft to follow the most efficient flight trajectory.

NAV CANADA plans to install ADS-B initially in areas where radar services are not offered. When this is complete, Canadian airspace will be fully covered with radar and/or surveillance. Transport Canada does not mandate ADS-B in Canada, though its use is growing and may eventually replace the current ground-based radar surveillance system to some extent. In March, 2011, Transport Canada issued guidance material for aircraft owners and air operators regarding airworthiness and operational approval in relation to ADS-B.

RESEARCH AND DEVELOPMENT TO IMPROVE AVIATION SAFETY

Transport Canada's Transportation Development Centre (TDC) is currently carrying out R&D that aims to address two important aviation safety concerns: ground and airborne icing. Advances in materials and ice engineering over the past 20 years have led to the development of innovative technologies and materials that may significantly reduce ice accumulation on aircraft surfaces. Consequently, ongoing R&D activities of the Cold Climate Aviation Technologies (CCAT) program are investigating ice-phobic materials, alternative de-icing technologies and remote sensor technologies to enhance air safety and assess the effectiveness, usefulness and cost feasibility of these emerging technologies.

The CCAT R&D initiative aims to address important aviation safety concerns via the development of innovative solutions to ground icing and airborne icing of aircrafts. Through extensive R&D work and effective partnerships with organizations including the Federal Aviation Administration (FAA) and the National Aeronautics and Space Administration (NASA), the National Research Council (NRC) and Environment Canada (EC), the TDC has begun to carry out multiple aviation R&D activities, is investing close to \$2M (million) in R&D funding over three years and during this time is leveraging over \$12M from all its partners on various projects taking place worldwide.

R&D activities focusing on ground icing are carried out at various sites in Ottawa including the NRC's Propulsion and Icing Wind Tunnel (PIWT), the Climactic Engineering Facility (CEF) and Montreal's Pierre-Elliott Trudeau (PET) and Mirabel Airports. These sites allow the research teams to conduct controlled simulations of precipitation including snow or ice pellets and observe their interactions with anti-icing fluids, ice phobic coatings and other technologies in development that may enhance air safety. The PIWT permits the use of a cross-section of model Regional Jet (RJ) wing and the replication of aircraft take-offs in cold climate conditions thus permitting R&D teams to capture data and record observations that can help assess overall effects of new technologies.

The CEF is central into assessing the thresholds and limits of de/anti-icing fluids and observe interactions of new products in simulated precipitation conditions; new fluids that are being developed that aim to leave a

34 See <http://www.iata.org/pressroom/pr/pages/2011-06-06-03.aspx>

significantly lower environmental footprint compared to their predecessors and products inherent with ice phobic properties are constantly in development. The CEF can replicate outdoor temperatures into the lower -40 Celsius range on a year-round basis thus providing the TDC R&D teams with a suitable environment where various precipitation conditions (freezing rain, freezing fog) can be replicated in a controlled environment. The PET and Mirabel test sites also allow the R&D team to conduct seasonal outdoor simulations and full scale testing of aircraft and emerging technologies.

The impacts of climate change on Canada's northern transportation system may be significant. Current practices to ensure the safety of aircraft activities can create additional pressures on sensitive ecological regions. Further R&D in de/anti-icing technologies may lead to important advancements and could alleviate these risks in the future.

Through the CCAT initiative, Transport Canada is investing significant R&D resources to contribute to an international partnership between industry and government that will gather data on these phenomena and provide valuable information on the climate conditions attributed to ice crystal icing. The long-term objective is to improve scientific understanding of ice formation and growth processes in these conditions, and in turn, develop policy and regulations that promote operating an aircraft in a way that minimizes ice formation. The aviation sector—including engine and air-data probe manufacturers—stands to gain immense benefits from this knowledge-gathering exercise due to the improved diagnosis of engine icing/power loss and damage events, and the incorporation of design changes that will lead to safer engines.

HOW DOES ICING AFFECT SAFETY?

Airborne icing can occur in various forms of precipitation and at different altitudes during flight. It can affect aircraft travelling through broad areas of cloud associated with deep convection, where they occasionally experience ice crystal icing. This is a phenomenon that has been implicated in several jet-engine power losses and instrumentation malfunctions. Currently, aircraft technologies (i.e., radar, icing detection equipment) cannot effectively detect these conditions.

Ground icing occurs due to cold temperature precipitation on various sections of the aircraft, including its wings and engines, and poses a great risk to the airworthiness of the aircraft and the safety of passengers, as it can significantly impact aircraft performance. Currently aircraft operators and airport authorities generally mitigate ice accumulation with de/anti-icing fluids.

6.7 SECURITY

PASSENGER SCREENING

Following a review of CATSA—the agency responsible for screening people and baggage at designated Canadian airports—by the federal government in 2010, several changes were made the following year to improve passenger convenience and screening efficiency. To help passengers better plan for their trips, CATSA's website now displays the current screening point 'wait times' at eight of Canada's largest airports (Vancouver, Calgary, Edmonton, Winnipeg, Ottawa, Toronto, Montreal and Halifax). CATSA has also redesigned many of its screening checkpoints to improve the flow of passengers through the screening lanes. In addition, CATSA has created dedicated screening lanes for families, those with special needs, and frequent, known travellers.

In 2011, CATSA also improved its service delivery model—which involves third-party screening contractors—by creating a new, four-region contracting model. This reduced the number of regions by two and the number of contracts from seventeen to four³⁵. See Chapter 5.1 for more details.

35 Contract were awarded to G4S Solutions Canada (Pacific Region), Garda Security Screening (Prairies and Central Regions) and Securitas Transport Aviation Security (Atlantic Region)

AIR TRAVELLERS SECURITY CHARGE

The Air Travellers Security Charge (ATSC) came into effect in April 2002 to fund the air travel security system, including CATSA, Transport Canada's regulations and oversight activities, and the provision of Royal Canadian Mounted Police officers on selected domestic and international flights. The ATSC is payable by air travellers, who principally and directly benefit from the Canadian air travel security system. All ATSC funds, including any applicable Goods and Services Tax (GST) or the federal portion of the Harmonized Sales Tax (HST), are intended to fund the air travel security system. The charge is structured to provide revenues that are roughly equivalent to expenses for the air travel security system over time.

The ATSC applies to flights between the 89 Canadian airports³⁶ where CATSA provides air travel security services. The charge does not apply to flights that arrive at or depart from other Canadian airports. The ATSC also applies to transborder flights to the U.S. and other international locations that depart from Canadian airports. Upon ticket payment, the air carrier collects the fee, which is paid by those purchasing a passenger ticket. Current ATSC rates³⁷ are \$7.48 for domestic (one-way), \$14.96 for domestic (round-trip), \$12.71 for transborder, and \$25.91 for other international flights (See Addendum Table A30 for more details).

AIR CARGO SECURITY

In February 2011, the federal government announced a shared vision with the United States on perimeter security and economic development, which included working towards the development of a harmonized air cargo security strategy. This vision was a central component of the Action Plan on Perimeter Security and Economic Competitiveness announced December 7, 2011. The Action Plan will increase the speed of legitimate trade and travel, improve security in North America, and align Canada-U.S. regulatory approaches. A harmonized cargo security strategy will be developed as part of this Action Plan, including common standards for screening inbound air and marine cargo (at the last point of departure for air and first point of arrival for marine). Under the principle 'cleared once, accepted twice', this cargo would then be given accelerated passage if it crosses the land border. Canada and the U.S. will work to mutually recognize each other's air cargo security programs, helping to better utilize screening efforts and resources

and reduce the compliance burdens on industry. The Action Plan also promotes the harmonization of advance data requirements for clearing cargo shipments at the border, which will simplify the industry's reporting burden on both sides of the border. The development of a harmonized cargo security strategy will assist trade by promoting compatible screening methods for goods and cargo before they leave foreign ports bound for Canada or the U.S.

In addition to the work undertaken with the United States, Transport Canada worked at length with partner countries and international organizations, such as the ICAO and the World Customs Organization, to support the development of common standards, definitions and procedures to improve cargo security globally.

Transport Canada also introduced changes to air cargo security that outline new requirements for those handling air cargo in Canada. At the same time, a program was established to improve oversight within the air cargo security system, providing for ongoing inspections and compliance activities with air carriers and members of the air cargo security program. Extensive stakeholder consultations were undertaken to promote compliance with program requirements.

Evaluating screening technologies was another area of focus for Transport Canada's air cargo security program over the past year, with work undertaken to test and qualify screening equipment and develop standards for screening technologies and processes. Pilot projects were conducted with airport authorities, air carriers and freight-forwarding companies to pursue shared threat detection research, testing and evaluation efforts.

INTERNATIONAL HARMONIZATION

The Canada-U.S. Action Plan is a good example of bilateral harmonization, as is participation at the ICAO, where Canada works closely with international partners to share information and develop better and more harmonized security practices that make the movement of people and goods on a global scale possible. The following three areas are examples of Canada's harmonized aviation security practices and efforts.

Facilitation of duty-free goods

Through a bilateral agreement with the European Union, passengers whose flights originate in Canada and Europe can now pass through Canadian and European

36 For a list of airports, please see <http://laws-lois.justice.gc.ca/eng/regulations/SOR-2002-180/page-2.html#h-3>

37 ATSC rates are set by the Minister of Finance.

screening check-points while possessing duty-free liquids, aerosols and gels purchased within their originating airport—provided the items are packaged in specially designed security bags (security tamper evident bags). Based on a risk assessment, CATSA screens these bags in Canada using specialized equipment. Although these secure bags are a short-term solution for duty-free liquids, aerosols and gels, Canada is collaborating with international partners to develop a longer-term solution to reduce or eliminate current restrictions on these types of goods.

Known traveller and NEXUS

Transport Canada continues to evaluate approaches to screening that would more closely match the level of risk posed by a passenger and his or her baggage. Transport Canada is also working with CATSA to improve the flow of passengers through screening lanes while still maintaining a high standard of security. As part of this ongoing process, Transport Canada supported a joint project between CATSA and the Canada Border Services Agency in 2010 that tested a NEXUS priority lane³⁸ concept at domestic lanes in three major airports. To assess the program's success, the performance of the NEXUS priority lane is being measured; the results will be used to improve the program.

In early 2011, the NEXUS program was expanded to Canada's eight largest airports, where NEXUS members can now use dedicated lanes applying Canada's high security standard in a quicker process.

The 2011 Action Plan on Perimeter Strategy and Economic Competitiveness expanded the priority lane program to include designated NEXUS lines at U.S. trans-border security screening checkpoints. Just as at domestic checkpoints, adding a designated screening lane will result in improved screening efficiency and improved client satisfaction.

Harmonized prohibited items list

Taking into consideration investments made into new and improved passenger screening equipment and other security improvements, Transport Canada made changes to the list of items that passengers cannot bring with them onto aircraft. Small scissors and tools not longer than six centimetres (excluding the handle) are now permitted in carry-on baggage. Knives of

any size or length remain prohibited. These changes better align Canada's list with those of the ICAO and international partners, including the United States and European Union.

REGULATORY REVIEW

Through the Aviation Security Regulatory Review currently in progress, Transport Canada is reassessing its aviation security regulatory framework under the *Aeronautics Act*. The goals of the Review are to renew aviation regulations to respond to the challenges and opportunities of the 21st century, and to make them less burdensome for industry and easier for industry to understand regulatory requirements. Introducing requirements for Canada's aviation industry to put Aviation Security Programs into action is one element of this Review. These programs will further align Canada's regulations with international standards and practices set by the ICAO, and will help stakeholders improve their ability to respond to new and unforeseen threats and risks by:

- improving awareness and understanding of aviation security-related roles and responsibilities;
- encouraging and coordinating the sharing of aviation security information both inside and outside key stakeholder organizations, when and where appropriate; and
- engaging the entire stakeholder organization so as to be more involved and proactive in the management, coordination, integration and continuous improvement of security through management of risk, training, increased awareness and improved preparedness.

The first step of the regulatory modernization process was pre-publishing the Canadian Aviation Security Regulations, 2012 in the Canada Gazette, Part I in February 2011; the Regulations then came into effect January 1, 2012. The Canadian Aviation Security Regulations, 2012 completely replaced previous regulations with a more user-friendly structure and provisions that use clear, well-defined and modern language. The Regulations also include requirements for airports' Aviation Security Programs and their key tenants who have security responsibilities.

38 A NEXUS priority lane allows members of the NEXUS program (which expedites pre-approved travellers across the Canada-U.S. border) to pass through an accelerated screening process, reflecting the fact these individuals have already been vetted as part of the program.

With an improved, modernized infrastructure, a heightened emphasis on efficiency, safety, security and the development of environmental regulations that support international standards, marine transportation in Canada plays a critical role in trade growth and economic prosperity.

7.1 OVERVIEW OF MARINE TRANSPORTATION

Canada's marine industry comprises domestic marine service operators who provide both domestic and international shipping services, as well as international shipping lines calling at major Canadian ports. The domestic sector can be viewed under four geographical lenses: the Pacific west coast region; the Great Lakes/St. Lawrence; the Atlantic region, and the northern region.

The Pacific west coast region boasts a large and diverse fleet of vessels engaged in barging and towing of cargoes on inland waterways (e.g., Fraser River, Burrard Inlet), on coastal routes within the Gulf Islands and the Strait of Juan Fuca, and on routes to the Queen Charlotte Islands and Kitimat. Some of the larger operators in this region include Seaspans Marine Corporation, Pacific Towing Services Ltd. and SMIT Harbour Towing. There are also a number of ferry services in the area, mainly operated by B.C. Ferries (see the Ferry Services section in this chapter for more details).

Great Lakes/St. Lawrence area operators carry dry bulk and liquid bulk cargo, with vessels meeting the maximum size and capacity limits of the Great Lakes and the St. Lawrence Seaway system. The St. Lawrence Seaway Management Corporation, a not-for-profit corporation established by seaway users and other interested parties, follows its legislated mandate to administer, manage and operate the portion of the system under Canadian jurisdiction, while U.S.-based Saint Lawrence Seaway Development Corporation does the same for the U.S. segment. Key marine carriers in this area include: Fednav International Ltd., Algoma Central Corporation, Canada Steamship Lines and

Groupe Desgagnés. A recent study by the St. Lawrence Economic Development Council (SODES) and Quebec's department of transportation (MTQ) estimated that in Quebec alone, the marine industry produces \$3 billion in economic activity every year.¹

The marine industry in Atlantic Canada is engaged in a myriad of activities including container transportation to Newfoundland by Oceanex, oil platform resupply by companies like Secunda Marine, shuttling crude oil between platforms and oil terminals operated by companies such as Canship Uglund Ltd., and providing a large number of intra- and inter-provincial ferry services, such as Marine Atlantic and Northumberland Ferries. The region also has a rich shipbuilding history, which will be augmented even further by Halifax Shipyards carrying out a \$25 billion contract from the Department of National Defence to build 21 combat ships over the next 30 years (see Section 12.3).

In the northern region, marine transportation plays a key role in community resupply as well as resource development. Northern Canada makes use of two clearly delineated marine systems: the western Arctic and the eastern Arctic.

In the western Arctic system, marine operations primarily occur in the Mackenzie River Watershed (including the Mackenzie River and Great Slave Lake), the Arctic coast and islands, and Alaska, as well as Richmond, B.C., on occasion. A fleet of tugs and dual-purpose barges brings, among other things, bulk petroleum products and dry cargo for communities, defence installations, and oil and gas exploration sites across the North while transporting natural resources extracted in the North to markets in the South. The largest marine operator in the western Arctic is Northern

¹ Quebec Marine Industry Economic Impact Study, produced by Les Conseillers ADEC Inc. for the SODES and MTQ.

Transportation Company Limited (NTCL). As well, a ferry service operates in the Yukon along with five ferry services offered in the Northwest Territories.

The government of Nunavut coordinates the eastern Arctic sealift of dry cargo and bulk fuel for government departments, communities and residents. Sealift services are accessible to other shippers under the same contractual terms and conditions. Services include resupply to the eastern Arctic from Churchill and Montreal (and environs), dry cargo sealift, general cargo, use of roll-on/roll-off vessels, tug and barge combination, and delivery tankers for bulk fuel. Many commercial shipping companies operate in the eastern Arctic, including Nunavut Sealink and Supply Inc. (NSSI), Nunavut Eastern Arctic Shipping (NEAS), NTCL, Groupe Desgagnés and the Woodward Group.

Canada's ports and harbours are integral to Canada's transportation system. They serve as vital links and gateways that facilitate domestic and international economic activities. Canada is home to more than 540 ports and more than 940 small craft and fishing harbours (see Addendum Tables M2 and M7). Under the National Marine Policy, three categories of ports² exist: Canada Port Authorities (CPAs), regional/local ports, and remote ports. All major Canadian ports benefitting from international shipping services have links with the country's rail network. Ports with container-handling capabilities include Vancouver, Prince Rupert, Toronto, Montreal, Halifax, St. John's and Saint John. Ports such as Vancouver, Hamilton, Québec City, Sept-Îles and Saint John also handle significant volumes of bulk commodities. Map 12 and Table M23 shows volumes handled for most of the 17 CPAs. Of note, in February 2012, the Port of Oshawa became Canada's 18th CPA.

On the safety side, the Canadian Coast Guard, a Special Operating Agency within Fisheries and Oceans Canada (DFO), allows Canada to exert influence over its waters and coasts. The Coast Guard delivers on public expectations of clean, safe, secure, healthy and productive waters and coastlines. It achieves this mission through eight services, including marine navigation, environmental response services, search and rescue services and maritime security. The Coast Guard is also responsible for icebreaking, dredging and marine communications and traffic management.

Another key component of marine safety is pilotage, regrouped under four federal Crown corporations—the

Pacific Pilotage Authority (PPA), Great Lakes Pilotage Authority (GLPA), the Laurentian Pilotage Authority (LPA) and the Atlantic Pilotage Authority (APA)—that provide safe, reliable and efficient marine pilotage and related services for commercial vessels in the coastal waters of British Columbia, within the Great Lakes, in Canadian waters in the Laurentian Region and in Atlantic Canada.

7.2 2011 YEAR IN REVIEW

ECONOMIC FRAMEWORK AND INFRASTRUCTURE

- Canadian marine freight traffic reached 392 million tonnes in 2010³, an increase of 10% over 2009 (see Tables M18 and M23). Some 58 million tonnes were recorded in domestic traffic flows, 103 million tonnes in transborder traffic, and 231 million tonnes in other international traffic. Marine transportation services handled \$170.4 billion in international trade in 2010 (up 12% from 2009), with \$88.9 billion in imports and \$81.5 billion in exports (see Table M28).
- In 2010, the 17 Canada Port Authorities (CPAs) handled 269 million tonnes of port traffic—69% of Canada's total tonnage handled at all Canadian ports. The largest volumes in recent years passed through Vancouver, Montreal, Québec City, Sept-Îles and Saint John (see Map 12 and Table M23).
- In 2010, the rate of containerization⁴ was highest for freight unloaded at Pacific ports, reaching a record-high of 58.3% (see Table M26). Nationally, the containerization rate was 9.9% for outbound freight and 14.8% for inbound freight, or 11.6% overall.
- By volume, bulk cargo (largely natural resources) represented the largest share of port traffic tonnage. The most significant imports that moved through Canadian ports include petroleum products, minerals, and coal, while significant exports include minerals (iron ore), petroleum products, coal, and grain.
- The 2011 navigational season for the St. Lawrence Seaway—its 53rd—spanned a record 284 days, opening on March 22nd and closing December 30th. During that time, 37.5 Mt passed through the system, up 2.5% compared to the previous year. Increases in bulk liquid volumes, salt and scrap metal more than

2 At the end of 2010, Canada had 17 CPAs (one Harbour Commission), plus 41 regional/local ports and 26 remote ports operated by Transport Canada. A total of 239 other ports were previously operated by Transport Canada but have been transferred.

3 The most recent year for which information is available.

4 Share of total tonnage carried by container.

offset a 6% drop in grain volumes. The St. Lawrence Seaway Management Corporation also reached a new three-year labour agreement with its employees.

- As of January 2012, more than 62,000 vessels were registered in Canada, including 19,660 pleasure craft, 23,559 fishing vessels and 4,482 passenger craft. More than 45,000 of these vessels weigh less than 15 gross tons⁵—a volume measurement derived by multiplying a vessel's length, breadth and depth by a constant factor.
- Marine Atlantic Inc. chartered two new vessels in 2011 to replace its two oldest—the MV Caribou and the MV Joseph and Clara Smallwood. The new vessels—the MV Blue Puttees and the MV Highlanders—entered into regular ferry service in March and April 2011, respectively.
- Foreign participation in Canada's coasting trade—defined as the transportation of goods or passengers between points in Canada and any activity of a commercial nature—has remained low and focused primarily on tankers and special-purpose vessels for offshore activities (see Table M24).
- CPAs are financially self-sufficient (see Tables M8 and M9). In 2010, overall CPA revenue reached \$456.5 million—an increase of 18% over 2009. Total net income for CPAs totalled \$101.7 million. In 2010, gross revenue charges paid by CPAs to the federal government totalled \$25.8 million.
- In 2011, CPAs continued to expand their holdings and activities in response to commercial demands. They also undertook capital projects to modernize and improve Canada's marine transportation infrastructure, and pursued business opportunities with various shippers and marine terminal operators. CPAs also engaged in a number of capital and maintenance projects that aimed to develop or maintain port lands and assets. As well, shippers, marine operators and terminal operators invested in new marine terminals and new equipment.
- In 2011, Ridley Terminals Inc. (RTI)—a Crown corporation that operates a marine bulk terminal on land leased from the Prince Rupert Port Authority—handled 9.1 million tonnes of cargo. Strong global demand for coal continues to drive growth, particularly in Asia, and RTI forecasts increased throughput volumes, revenue and net income. In light of this expected growth, the federal government approved a multi-year capital project

for RTI to expand its capacity to handle coal and other commodities shipped through the facility.

ENVIRONMENT

- On October 25, 2011, Canada signed the 2010 Hazardous and Noxious Substances (HNS) Protocol (subject to ratification), which includes roughly 6,500 substances that may pose a pollution hazard or cause other damages or injuries. Should an incident occur, the Protocol allows access to an international fund, which, together with the shipowner's liability backed by compulsory insurance, will provide about \$500 million in compensation for any damage that may result.
- Transport Canada continued to develop new domestic regulations that support international standards to prevent pollution from vessels operating in Canadian waters. Implementation and enforcement of international standards remain ongoing, through inspections and aerial surveillance.
- Transport Canada adopted measures to further protect the environment from the introduction of invasive species into Canada's waters from vessels entering Canada, and continued strong advocacy efforts to harmonize associated regulations in both Canada and the United States.
- While the marine sector contributed to the majority of transportation-related SO_x⁶ emissions, it accounted for 6% of total SO_x emissions in Canada. The marine sector contributes marginally to emissions of air pollutants other than SO_x such as volatile organic compounds (VOCs) and greenhouse gases (GHG).
- In 2011, Transport Canada continued development of regulations to implement the North American Emission Control Area under the *Canada Shipping Act, 2001*. A formal discussion paper was released to stakeholders last fall that set out the regulatory approach and included an alternative regime to control air emissions for vessels operating in the Great Lakes.
- In March 2011, the International Joint Commission published its 15th biennial report on the Great Lakes Water Quality Agreement. The report contains 32 recommendations including the establishment of an incident command system-type structure to prevent and respond to the emergence of aquatic invasive species.

5 For further details on registered vessels, see <http://wwwapps.tc.gc.ca/Saf-Sec-Sur/4/vrqs-srib/default.htm>

6 Sulphur oxide.

SAFETY

- In 2011, Transport Canada continued to address marine public safety through regulatory development, inspection and enforcement, alignment with international standards, and improved training of marine inspectors.
- Transport Canada emphasized safety within the Canadian shipping industry by completing its two-year pilot project on safety management systems and holding public and internal consultations on proposed regulations for mandatory implementation. Canada is also moving toward regulated inspections based on risk factors such as compliance history, vessel age and type, and area of operation. Through this approach, vessel inspections will occur where most needed, based on assessed risks to Canadian citizens, waterways and ports.

SECURITY

- In the context of the Perimeter Security Action Plan announced in December 2011, several marine transportation initiatives aimed at enhancing security will be pursued in the coming months and years, including:
 - establishing a unified approach to screening cargo arriving from offshore through the creation of a strategy to identify and manage risks with inbound cargo arriving in Canadian ports and airports;
 - managing traffic in the event of an emergency by developing regional-level recovery plans should freight flows be disrupted; and
 - developing and implementing processes, procedures and policies to enable an effective, shared understanding of activities, threats and criminal trends or other consequences in the air, land and maritime environment.
- In December 2011, Canada and the United States agreed to the Regulatory Cooperation Council's (RCC) Joint Action Plan to increase regulatory transparency between the two countries. The Action Plan aims to better align the two countries' regulatory environments and thus reduce barriers to trade, lower costs for consumers and businesses, and foster economic opportunities on both sides of the border.
- Marine security initiatives include further harmonization of regulations and ongoing collaboration with the United States' marine security regime, as well as the expansion and development of joint programs in the Great Lakes and St. Lawrence Seaway.

- Transport Canada's outreach efforts in 2011 on several marine security issues included:
 - hosting an Integrated Maritime Commerce Resilience (MCR) planning workshop with the ports of Hamilton, Halifax and Montreal to encourage communication, coordination and collaboration between the ports in case of disruption to maritime commerce;
 - organizing three regional law enforcement workshops to bring together municipal, provincial and national police services with responsibilities for marine security to discuss best practices and lessons learned regarding Small Vessel and Facility (SVF) security;
 - conducting consultations on proposed amendments to the Marine Transportation Security Regulations (MTSR) at the Canadian Marine Advisory Council's annual meeting in November 2011; and
 - participating and representing Canada in marine security-themed workshops in the Americas under the Organization of American States' Inter-American Committee Against Terrorism Port Security Assistance Program.

7.3 2007–11 RECAP

ECONOMIC FRAMEWORK AND INFRASTRUCTURE

The 2007–2011 period was largely dominated by the worldwide financial crisis and economic downturn, which considerably impacted the Canadian economy. Despite the uncertainty of this period, various initiatives were undertaken to optimize the use of marine transportation and enhance the overall efficiency of Canada's transportation system. For example, amendments to the *Canada Marine Act* (announced 2008) created a more flexible financial regime for Canada Port Authorities and highlighted a long-term role for ports. These amendments were complemented by policy initiatives that focused on increasing revenue generation options for ports as well as strengthening international relations in support of trade through the Asia–Pacific Economic Cooperation Port Services Network. In the same vein, in the hopes of attracting new business, an incentive program was introduced by the St. Lawrence Seaway Management Corporation.

In 2009, Canada amended the *Marine Liability Act* (MLA) which allowed for Canada's ratification of the *International Convention on Civil Liability for Bunker Oil Pollution Damage, 2001* (Bunkers Convention) and

accession to the *Protocol of 2003 to the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1992* (Supplementary Fund Protocol), bringing the amount of compensation for oil pollution damage in Canada to \$1.3 billion (from just over \$500 million). The ratification of the Bunkers Convention introduced a compulsory insurance requirement for ships over 1000 gross registered tonnage that carry bunker oil: the shipowner's liability for bunker oil pollution damages must be covered. These legislative amendments also provided for:

- introduction of a maritime lien for Canadian ship suppliers and ship repairers against a foreign vessel for unpaid invoices;
- a general limitation period of three year for maritime claims; and
- exclusion of adventure tourism activities (such as kayaking and whitewater rafting) from the passenger liability regime in Part 4 of MLA to allow adoption of compulsory insurance regulations.

In 2010, Finance Canada waived the 25% tariff on the import of ferry boats of 129 metres or more, and on all general cargo vessels and tankers of any size, to encourage renewal of the Canadian fleet through lowered costs for such vessels.

Finally, the federal government invested significantly in Marine Atlantic Inc. (MAI), a Crown corporation that operates a ferry service between Port aux Basques, NL and North Sydney, NS, which fulfills a constitutional obligation. Additional funding of approximately \$950 million was announced between 2007 and 2010 to revitalize MAI and renew its fleet and shore facilities. Also in 2010, \$76.4 million was announced to support the extension of three other ferry services in Eastern Canada through March 2014, including remote service between Prince Edward Island and the Magdalene Islands in Quebec.

PORTS

Between 2007 and 2011, the federal government updated the legal and governance framework for CPAs to enable these ports to pursue commercial opportunities that support Canada's marine transportation infrastructure and trade objectives. This led to amendments to the *Canada Marine Act* in 2008 to allow increased borrowing authority, giving them greater flexibility to respond to investment opportunities. During that period, the government also issued 59 Supplementary Letters Patent—amendments to existing CPA Letters Patent. Most of these (48 in total) were issued to update real property holdings; five were issued to update port governance and activities; and three were issued to amend borrowing limits. The remaining three

Supplementary Letters Patent were issued to reflect administrative changes.

The federal government worked in partnership with CPAs and marine transportation stakeholders over the last five years to enhance port productivity and performance as well as Canada's supply chains and trade corridors:

- In 2008, the ports of Vancouver, Fraser River and North Fraser Port Authorities were amalgamated into Port Metro Vancouver. This was a key policy measure that positioned these ports to enhance investment opportunities, improve their competitiveness in the global market, and optimize port planning.
- In 2008, the Gateway Performance Table initiative was launched to examine current and future competitiveness of the Asia-Pacific Gateway as a supply chain portal. Phase 2 of the initiative was launched in late 2010 and focuses on performance metrics, operations optimization, and productivity for inbound and outbound supply chains.
- In 2009, Transport Canada completed a mandatory review of the Vancouver Container Trucking Regulations. Recommendations from the review included the formation of a Steering Committee, with representatives from the province of British Columbia and Port Metro Vancouver, to discuss emerging issues and work towards long-term stability.

ENVIRONMENT

Since 2008, Canada has either ratified or acceded to 12 International Maritime Organization (IMO) Conventions concerning protection of the marine environment, biodiversity, vessels, goods and personnel. This has enabled Transport Canada to fully enforce safety and environmental standards in accordance with the *Canada Shipping Act, 2001*. These efforts contributed to the successful adoption of the North American Emission Control Area (ECA) proposal, and to the development of environmental standards for ballast water and air emissions. Canada will continue to participate in the IMO work to advance uniform, global measures to address GHG emissions from existing marine vessels.

Beginning in 2008, a patchwork of state ballast water requirements on the Great Lakes, combined with separate and evolving regulatory programs involving the United States Coast Guard and the Environmental Protection Agency, significantly complicated environmental requirements for vessels operating in the Great Lakes. In particular, New York State introduced difficult ballast water requirements. In response, Transport Canada initiated an interdepartmental working group on ballast water to lead a Government of Canada advocacy campaign seeking continuance of seaway trade

and a compatible regulatory approach in our navigable boundary waters. Those requirements were withdrawn by New York State in February 2012.

Domestic marine GHG emissions increased by 16% between 1990 and 2008, from 5.0 Mt of CO₂e to⁷ 5.8 Mt of CO₂e (see Table EN10). This can be attributed to growth in total tonne-kilometres as a result of rising international trade, but the increase was somewhat mitigated by a shift toward larger, more efficient vessels. During the 2008 to 2020 period, domestic marine GHG emissions are expected to increase by 20% (or 1.5% annually), rising from 5.8 Mt to 7.0 Mt of CO₂e, due to traffic increase.

Between 1990 and 2009, domestic marine sector emissions of various air pollutants as a share of total emissions of that pollutant increased marginally or remained unchanged (see Table EN11), and overall air pollutant emissions from the marine sector decreased. Marine PM_{2.5} emissions⁸ fell by 1,583 tonnes (-14%), SO_x emissions fell by 31,965 tonnes (-28%), NO_x emissions⁹ fell by 17,387 tonnes (-13%), VOC emissions decreased by 659 tonnes (-14%) and CO emissions¹⁰ fell by 1,560 tonnes (-14%).

SAFETY

Canada's maritime safety record over the 2007–2011 period has shown marked improvements, as shown in Tables S14 and S15. During that period, accidents dropped 31.5%, from 400 to 274, while fatalities slipped from 13 to 12. The accident rate per million vessel-kilometres dropped by 10.1% to 19.5.

Transport Canada continues to evolve to meet the new strategic directions for safe marine transportation, working within the new regulatory regime established by the *Canada Shipping Act, 2001* which came into force July 2007. Several more regulations have been updated to align with the new Act and better serve the safety interests of the industry and Canadians. These include regulations relating to collision avoidance, fire drills, navigation and small vessel safety. The vessel registry has also continued to streamline its requirements and processes and has remained a key mechanism for distributing safety bulletins that help keep vessel owners informed of important safety information. Accidents and fatalities continue to decline.

Transport Canada is making significant headway in implementing a modern policy framework and program management tools related to vessel inspections that are risk-based, harmonized with international standards and that support appropriate delegation of some inspection responsibilities to qualified Transport Canada-approved organizations. Encouraging small vessel safety in Canada has been a particular focus. Efforts include the 2011 launch of the renewed Small Vessel Compliance Program (non-pleasure craft) for vessels under 15 gross tonnes and carrying 12 passengers or fewer, as well as improved standardization and delivery of national recreational boating safety programs. These national programs took a new, integrated approach to boating safety that incorporated compliance and enforcement, education and awareness, program management, and the regulatory framework.

SECURITY

Several new marine security measures, programs and protocols came into force between 2007 and 2011 and have changed how the marine industry maintains its levels of vigilance. Transport Canada, under its Marine Security Contribution Program, allocated \$7 million in funding for security enhancements in 2007 and \$12 million in 2008 before the program ended in November 2009 (a total of \$112 million was allocated under the program over its duration). Overall, some 1,226 projects were funded, including security improvements such as fences, security cameras and modernized perimeter security. Ports, marine facilities, domestic ferry terminal operators and domestic ferry vessel operators were able to apply for funds to help pay for improvements to meet their obligations under the Marine Transportation Security Regulations (MTSR).

In 2008, the Marine Transportation Security Clearance Program (MTSCP) was fully implemented at the following Canadian ports: Vancouver, Montreal, Halifax, Prince Rupert, Victoria, Windsor, Hamilton, Toronto, Québec City, Saint John, and St. John's, as well as at the St. Lawrence Seaway Management Corporation. The MTSCP aims to reduce the risk of security threats by preventing unlawful interference with the marine transportation system. This is accomplished by conducting background checks on marine workers who perform particular duties or who have access to certain restricted areas.

In 2009, the Marine Event Response Protocol (MERP) was developed and adopted as an Annex to the Federal

7 Carbon dioxide equivalents.

8 Particulate matter emissions.

9 Nitrous oxide.

10 Carbon oxide.

Emergency Response Plan. MERP is a means of coordinating a set of government responses to a significant marine event. That year, the Marine Security Program contributed to the development of a Maritime Annex to the Joint Framework for the Movement of People and Goods During and Following Emergencies, which was signed by the United States and Canada and that outlined communication and coordination procedures during situations that affect shared waterways. The Domestic Ferries Security Regulations also came into force in 2009 to increase the level of protection for 18 domestic ferry routes and 29 ferry facilities across Canada. These regulations provide a framework to detect security threats and to take measures to prevent security incidents that could affect domestic ferries and their facilities.

In 2010, the Small Vessel and Facility Security initiative launched several workshops for regional law enforcement—including one in Toronto. That same year, Transport Canada and the Canada–Newfoundland and Labrador Offshore Petroleum Board (C-NLOPB) signed a Memorandum of Understanding to foster greater coordination and collaboration and allow operators to use a single set of marine security-related requirements in order to meet both Transport Canada and C-NLOPB marine security requirements.

Transport Canada took measures to help ensure transportation security during major events hosted in Canada, such as the 2010 G20 summit in Toronto and the 2010 Winter Olympics and Paralympics held in British Columbia. Transport Canada's role in these types of events is to provide additional security assessments, establish measures for security zones, if required, and provide personnel for the respective joint operations centres.

Over a three-year period, Maritime Commerce Resilience projects were completed in the ports of Vancouver, Halifax, Hamilton and Montreal. The projects aimed to prepare the maritime community and government officials to coordinate and execute a swift, effective recovery in the event of man-made or natural disasters that significantly disrupt maritime commerce.

7.4 ECONOMIC FRAMEWORK AND INFRASTRUCTURE

INTERNATIONAL SHIPPING

Canada is situated along numerous international shipping routes that link North America with other

regions of the world. Many international container lines call at Canadian ports as members of alliances of container shipping companies and as independent lines. These include Maersk Line, Hapag-Lloyd, Mediterranean Shipping Company, OOCL, Hanjin Shipping, CMA CGM, and APL. A significant number of independent lines serve Canada as well. Liner services provide international shipping for containerized or break-bulk cargoes of higher value, and are offered on specific trade routes under a published schedule. Non-liner services do not have a fixed schedule and are operated on any shipping lane, carrying specific commodities (such as grain and crude oil). The *Shipping Conference Exemption Act* provides an exemption from certain provisions of the *Competition Act*. There are no conferences serving east coast ports and have not been since 2008, when the European Union (EU) made conference agreements illegal for all carriers serving the EU trade.

CRUISE SHIP INDUSTRY

Cruises visiting or departing from Canada are offered on both coasts and on the St. Lawrence from April through October. Cruises on the east coast offer itineraries that combine Canada and New England states, with most departing from or visiting Montreal, Québec City, Halifax, Charlottetown or Saint John. Cruises on the Pacific coast visit or depart from Vancouver or visit Victoria, with most sailings visiting Alaska. In 2011, the Port of Vancouver benefitted from 199 sailings from 27 vessels, and more than 663,000 revenue passengers (see Table M21). The port of Montreal had more than 38,000 international cruise ship passengers on 22 vessels. In Québec City, 20 ships from 16 different cruise lines brought more than 83,000 passengers. In Halifax, 122 cruise ship vessels brought more than 240,000 people to visit the city.

CANADA PORT AUTHORITIES (CPA)

The *Canada Marine Act* enacted in 1998 created a national system of ports vital to domestic and international trade. The 17 CPAs (18 since the inclusion of the Port of Oshawa in February 2012) are authorized under their Letters Patent to manage and operate specific ports at arm's-length from the federal government on a commercial basis, and are financially self-sufficient.

A recent study estimated that CPAs contribute about \$24.5 billion to the Canadian gross domestic product and provide almost 269,000 jobs (in full-time equivalent person-years).¹¹

11 CPCS Transcom Ltd. for the Association of Canadian Port Authorities (June 2011). Canada Port Authority Infrastructure Study.

CPAs play a critical role in supporting Canada's gateways and trade corridors, as they are often the entry and exit points into and out of Canada and handle the most significant share of Canadian trade (24% by volume) when compared to other modes and non-CPA ports.¹²

Canadian trade—both imports and exports—has been steadily increasing since 1995.¹³ Increasingly, Canada's major trade partners are located in Asia, prompting a shift in Canada's trade orientation from east (Europe) to west (Asia-Pacific region). Growth in Asia is expected to continue, which places increasing pressures on west coast ports (and on east coast ports for Asian cargo moving via the Suez and Panama canals).¹⁴

The increasing competitiveness of U.S. and Mexican ports and gateways is another important consideration for Canadian ports. American ports as well as inland transportation corridors have seen significant investment in recent years. The resulting increases in capacity and efficiency have challenged the competitiveness of Canadian ports and supply chains, particularly for traffic destined for the U.S. Midwest and North American heartland.¹⁵

By working in partnership with other transportation stakeholders, CPAs have remained competitive despite the recent global economic crisis. As well, CPAs have expanded their holdings and activities in response to commercial demands, undertaken capital projects to modernize and add to Canada's marine transportation infrastructure, and pursued business opportunities with various shippers and marine terminal operators. Shippers, marine operators and terminal operators have also invested in Canada's national port system through the construction of new marine terminals and the installation of new equipment. For example, in 2011:

- At Vancouver, Neptune Bulk Terminals (Canada) Ltd. (Neptune) has invested \$63.5 million in new equipment to improve its terminal coal handling capacity, optimize energy efficiency, and enhance its environmental performance at its North Vancouver facility. Neptune will also purchase and install a new \$45-million stacker/reclaimer, manufactured in British Columbia.¹⁶
- At the Port of Hamilton, Richardson International has invested \$5.5 million to expand its port terminal facility to increase handling and shipping capacity.¹⁷ As well, the Port of Hamilton completed road, rail, building and security improvements. New facilities by Parrish and Heimbecker as well as McAsphalt Industries have enabled bulk throughput capacity growth.¹⁸
- The Montreal Port Authority and Viterro Inc. announced that Viterro has commenced operation of the Grain Terminal previously managed by the Montreal Port Authority.¹⁹ As well, on February 3, 2011, the Montreal Port Authority and Canadian National signed an agreement to improve supply chain efficiencies for container traffic.²⁰
- At the Port of Trois-Rivières, Phase 1 of On Course for 2020—the program to modernize the CPA's facilities—was launched on May 19, 2011. Over the year that followed, 26,000 square metres of additional outdoor storage was created, two new warehouses were built, road access was improved, and port boundaries were properly defined to increase safety, security and productivity. Overall, this work has increased the port's capacity by 22%.²¹
- Using a \$30-million investment under the federal Infrastructure Stimulus Fund, the Sept-Îles Port Authority leveraged more than \$250 million of private sector investment in the natural resource sector in the North Shore of Quebec.²²
- At the Port of Saint John, the \$30-million expansion of American Iron & Metal (AIM) operations on the port's west side continued with a signed 40-year lease agreement.²³ As well, in 2011 the port welcomed cruise ships from two lines that have not previously docked in the city: MSC Cruises and Oceania Cruises. Estimates for 2011 calculate that more than 70 ships docked in Saint John, bringing in more than 200,000 passengers and close to 70,000 crew members.²⁴

12 CPCS Transcom Ltd. for the Association of Canadian Port Authorities (June 2011). *Canada Port Authority Infrastructure Study*.

13 CPCS Transcom Ltd. for the Association of Canadian Port Authorities (June 2011). *Canada Port Authority Infrastructure Study*.

14 CPCS Transcom Ltd. for the Association of Canadian Port Authorities (June 2011). *Canada Port Authority Infrastructure Study*.

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16 Association of Canadian Port Authorities. 2011. *ACPA Manifest* (Volume 8, No. 3, Summer 2011).

17 Association of Canadian Port Authorities. 2011. *ACPA Manifest* (Volume 8, No. 4, Autumn 2011).

18 Association of Canadian Port Authorities. 2011. *ACPA Manifest* (Volume 8, No. 3, Summer 2011).

19 Association of Canadian Port Authorities. 2011. *ACPA Manifest* (Volume 8, No. 4, Autumn 2011).

20 Association of Canadian Port Authorities. 2011. *ACPA Manifest* (Volume 8, No. 3, Summer 2011).

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- At the Port of Halifax, American Feeder Lines announced the launch of a new feeder service between Halifax, Portland (Maine) and Boston (Massachusetts).²⁵

ST. LAWRENCE AND GREAT LAKES SEAWAY

Pursuant to the *Canada Marine Act* (CMA), the St. Lawrence Seaway was commercialized in 1998, with its operation transferred to the St. Lawrence Seaway Management Corporation (SLSMC), a not-for-profit corporation established by Seaway users and other interested parties. Under a 20-year agreement with the federal government—in force until March 31, 2018—the SLSMC manages and operates the Seaway and maintains, repairs, acquires and replaces Seaway assets, of which the federal government retains ownership. The SLSMC is authorized to charge tolls and generate other revenues to finance its activities, and is allowed to recover funds from the federal government to eliminate annual deficits. The CMA established a statutory appropriation for this purpose.

In 2010–11, the SLSMC's total revenue increased by 19.4% to \$66.0 million, compared to the previous year's total of \$55.2 million (see Table M14). Operating expenses for 2010–11 relating to the management and operation of the Seaway infrastructure amounted to \$67.0 million, an increase of 3.1% from the previous year. Asset renewal expenditures, representing the cost of maintenance and major repairs of locks, canals, bridges, buildings and other infrastructure assets excluding capital acquisitions, totalled \$49.3 million for 2010–11, compared to \$45.2 million in 2009–10. As for transiting tonnage, 2011 saw a 2.5% increase in volumes to reach 37.5 Mt (see Table M19).

SMALL CRAFT HARBOURS PROGRAM AT FISHERIES AND OCEANS CANADA

There were 923 small craft harbours and fishing harbours in Canada at the end of 2011 (see Table M2). Within Fisheries and Oceans Canada (DFO), the Small Craft Harbours (SCH) Program operates and maintains a national system of harbours to provide commercial fishers and recreational boaters with safe and accessible facilities. SCH's mandate is to keep harbours critical to

the fishing industry open and in good repair. Over time, the objective is to retain a network of approximately 750 core, locally managed fishing harbours. All non-core harbours (i.e. recreational harbours and fishing harbours with low or no activity) are planned for divestiture.

FISHING HARBOURS

In the late 1980s the Harbour Authority concept was introduced, which devolved responsibility for day-to-day management and operation of core commercial fishing harbours to local, not-for-profit, incorporated entities—called Harbour Authorities—controlled by local harbour users and operating under lease agreements with DFO. As of December 31, 2011, Harbour Authorities managed 684 core fishing harbours across Canada, about 91% of the SCH Program target. Non-core fishing harbours (i.e. those with low or no activity) were targeted for divestiture further to Program Review decisions in the mid-1990s. These divestitures have had minimal impact on the commercial fishing industry and continue to be operated according to their original purpose; they are also kept safe and publicly accessible for at least five years. To date, 377 fishing harbours have been divested.

RECREATIONAL HARBOURS

Over time, the SCH Program intends to divest all recreational harbours in its inventory. Since 1994–95, 690 (or 82%) of SCH recreational harbours have been divested. The SCH disposal strategy, approved by Treasury Board in 1995, permits disposals at a consideration of \$1.00, subject to conditions including a requirement to maintain public access for at least five years. Prior to transfer, where a harbour must first be refurbished, SCH is authorized to make reasonable repairs and conduct environmental clean-up or provide an equivalent financial incentive under the SCH Divestiture Grant Program to recipients. This is to facilitate harbour disposal and ensure that facilities are transferred in a safe condition. Recipients are mainly municipalities, local non-profit organizations, First Nations or other federal departments. In the absence of an interested public body, the facilities are offered at market value to the general public. As a last resort, if neither public nor private interest in the facilities exists, they are demolished. Tables M3 to M5 summarize,

25 Association of Canadian Port Authorities. 2011. *ACPA Manifest* (Volume 8, No. 3, Summer 2011).

by region, the status of the SCH recreational harbour divestiture program, the recipients of harbours divested and the type of management of the remaining harbour sites in the SCH inventory.

INTERNATIONAL SHIPPING IN CANADA

While land transport dominates Canada–U.S. trade, Canada relies heavily on a competitive international shipping industry to transport its trade with countries other than the United States. Every year, ships registered in foreign countries carry approximately 99.9% of Canada’s deep-sea (non-U.S.) cargo. As Canadians increasingly seek trading opportunities beyond the traditional U.S. market—particularly with newly emerging economies—Canada’s reliance on international shipping markets may affect the make-up of the foreign partners with which it trades, as reliance on international shipping markets (i.e., foreign-owned and registered shipping) may facilitate or present a barrier to diversifying Canada’s international trade. Dependency on the international market runs the risk of a shortage of ships or sudden spikes in freight or charter rates, which affect the cost of getting Canada’s goods to market and the country’s competitiveness against other suppliers that own a greater portion of their shipping/logistics chains.

International shipping is essentially comprised of three cargo-based markets: dry bulk shipping; tanker or liquid bulk shipping (tanker market); and container shipping (liner shipping market). Each market is further

MOVING LOW VALUE, RESOURCE COMMODITIES FROM THE PRAIRIES TO MARKET

Container availability in the Prairie provinces is a function of shipping line profitability. Shippers in the Prairie provinces are often challenged to attract a sufficient number of empty containers to move their goods to market.

The most important factor driving apparent container shortages in these provinces is the low potential profit available to shipping lines. Most of the exports produced in the Prairie provinces are resource commodities that are low value relative to their weight and volume. This low value limits exporters’ ability to absorb higher transportation costs. During times of congestion, shipping lines have the financial incentive to focus on providing transportation services to those shippers able to pay more for container availability.

Container shortages in the Prairie provinces can also occur when demand is insufficient to support balanced traffic flows. This can occur when the number of loaded containers imported into a community is insufficient to meet the demand of local exporters hoping to use these containers to move their goods to market. To bridge the gap between demand and supply, containers have to be repositioned from other locations where there is a surplus of empty containers.

divided into segments based on vessel size and trade route served. Indices unique to each market segment track freight rates, or prices charged by ocean carriers, and generally reflect the balance between demand for the goods being carried and supply of ships available to carry them. However, the freight rate is rarely an all-inclusive price and is subject to various fees and surcharges.

Freight rate indices generally trended upward in the period immediately preceding the 2008 global financial crisis, and then collapsed in the fourth quarter of 2008. Indices saw modest gains in 2009 as recovery took hold, with relatively stable prices through much of 2010. However, 2011 has generally shown mixed results, with some shipping markets experiencing declines in freight rates due to oversupply of ships, despite industry efforts to reduce supply even as demand for cargo continued to increase, albeit at levels well below 2008 peak demand.

Ocean shipping costs in the dry bulk sector play a pivotal role in the success of Canada’s resource exports. The Baltic Exchange Dry Bulk Index, a measure of charter costs for classes of dry bulk ships, hit a high of 11,459 points in the second quarter of 2008 before plummeting to a low of 666 points in the fourth quarter of 2008. The index recovered to a high of 4,291 points and then hovered from 2,163 to 4,643 points through to the third quarter of 2010. The index started 2011 at 1,621 points and closed the year at 1,738 points.

Tanker charter costs affect the profitability of Canada’s exports and imports of crude petroleum and refined products. Tanker charter costs declined by roughly 50% in 2009 from their most recent peak levels in 2008, and continued to decline into 2011. According to Fearnleys, an international shipping consultant, the average time charter rate for a modern Very Large Crude Carrier (VLCC) declined from an average daily rate of U.S.\$90,000 in July 2008 down to \$18,000 in September 2011. VLCCs are tanker ships of 200,000–350,000 deadweight tonnage (DWT—where DWT is a measure of the total weight a ship can safely carry) that generally carry only crude oil. Similarly for clean product tankers, Fearnleys data show that average daily charter rates for an 80,000 DWT tanker peaked at \$30,500 in October 2008 and fell to \$14,625 by September 2011.

CANADA’S DOMESTIC SHIPPING INDUSTRY

For Canada’s large commercial vessels, 2011 saw positive outcomes stemming from a culmination of many efforts and events throughout the previous four-year period. Of particular interest was the gradual renewing of part of Canada’s ageing fleet of commercial and government vessels.

In previous years, renewal of commercial vessels had been impeded by numerous factors such as costs and duties. The situation changed considerably in 2010 as the global economic downturn led to cancelled ship orders and competitive shipbuilding prices, a strong Canadian dollar, low interest rates, and decreased steel prices. In addition, the Government of Canada waived the 25% tariff on certain foreign-built vessels. Together, these factors have encouraged and accelerated the replacement of Canada's ageing vessels with cleaner, safer and more efficient vessels, often with greater capacity.

As a result, 2011 was a strong year in terms of new Canadian vessels entering into service, with more additions to the Canadian fleet expected in the years to come. This, in turn, is resulting in social, environmental and economic benefits for Canada and its people, while positioning the country's marine transportation system to be more competitive and sustainable.

It should be noted that foreign participation in Canada's coasting trade has remained low, ranging from a low of 1.2% to a high of 11.1% of total tonnage carried between 2000 and 2010. The majority of vessels temporarily imported under a coasting trade licence are tankers and special-purpose vessels for offshore activities. Some cargo vessels are also imported temporarily for use in the east coast (Atlantic and St. Lawrence Seaway regions).

FERRY SERVICES

A ferry is defined as a boat or ship that carries passengers, vehicles or cargo across water. Ferry services are offered on regular, frequent and return basis. Ferries represent a form of transportation and are part of the transport system for many waterside cities and islands. In Canada, ferry service offerings are not limited to provinces and territories with large lakes and lengths of shoreline. Most provinces propose seasonal ferry services in their regions, as ferries permit point-to-point transit at much lower capital costs than bridges or tunnels. Many cable ferries are operated on lakes and rivers in Canada.

Marine Atlantic, a Crown corporation, offers commercial and passenger ferry services between the provinces of Newfoundland and Labrador and Nova Scotia. It operates a year-round, constitutionally mandated service between Port-aux-Basques, Newfoundland and Labrador and North Sydney, Nova Scotia and a seasonal, non-constitutionally mandated service between Argentia, Newfoundland and Labrador and North Sydney.

In addition, there are a number of privately and publicly owned intra-provincial, inter-provincial and Canada-U.S. ferry operations serving Canada as shown in Table M17, including:

- BC Ferries, a former Crown corporation commercialized in 2003, is the largest passenger ferry line in North America and one of the largest in the world. With a fleet of 35 vessels, it operates on 25 routes, serving 47 terminals and provides all major passenger and vehicle services on the west coast, carrying travellers between mainland British Columbia and Vancouver Island as well as other islands (e.g., the Gulf Islands and the Queen Charlotte Islands) along the coast of British Columbia.
- Black Ball Ferry Line provides year-round daily ferry service linking Victoria with Port Angeles, Washington.
- The Yukon, the Northwest Territories and the Prairie provinces all operate ferries as part of their highway network; these services cross small bodies of water.
- Washington State Ferries offers daily spring to fall service between Sidney, British Columbia, the San Juan Islands and Anacortes, Washington.
- Société des traversiers du Québec (STQ), a Quebec Crown corporation, operates five ferry services on the St. Lawrence and Saguenay rivers with a fleet of 12 ships.
- Compagnie de Gestion de Matane (COGEMA), a Canadian National Railway (CN) subsidiary, operates the only rail ferry in Canada, between the Quebec ports of Baie-Comeau and Matane, with possible freight interchange with CN at Rivière-du-Loup.
- Relais Nordik, a service offered by the Desgagnes Group from April to January, links Rimouski and Sept-Îles with 10 villages on the Lower North Shore of Anticosti Island, between Havre St-Pierre and Blanc Sablon. Seven of these villages have no road access.
- Coastal Transport Limited, based in Saint John, New Brunswick, offers daily ferry trips to Grand Manan Island from the ferry terminal in Blacks Harbour, New Brunswick.
- C.T.M.A. Traversier Ltée, a division of CTMA Group, operates a passenger and vehicle ferry service between Cap-aux-Meules, Îles-de-la-Madeleine, Quebec and Souris, Prince Edward Island between April and January, as well as a reduced winter ferry service in February and March. The federal government has provided financial support for this service since 1971 towards operating deficits as well as to cover the cost of maintenance and repairing Transport Canada's assets used in the delivery of this ferry service (one vessel and two terminal facilities).

- Bay Ferries Limited operates a passenger and vehicle ferry service between Saint John, New Brunswick and Digby, Nova Scotia, using a Transport Canada-owned vessel and two terminal facilities. The operator receives funding from the federal government toward operating deficits as well as to cover the cost of maintenance and repairs of Transport Canada's assets used in the delivery of this ferry service.
- Northumberland Ferries Limited operates a passenger and vehicle ferry service between Wood Islands, Prince Edward Island and Caribou, Nova Scotia, using Transport Canada-owned ferry terminal facilities and two vessels, for eight months of the year (May to December). The federal government has been providing financial support for this service since 1941.
- Labrador Marine operates a wintertime ferry service between Corner Brook, Newfoundland and Labrador and Blanc Sablon, Quebec to complement its 10-month service between St. Barbe, Newfoundland and Labrador and Blanc-Sablon. The Corner Brook–Blanc Sablon service became a permanent year-round service after the successful completion of pilot projects in 2010 and 2011, as well as a \$1.3-million contribution from the Government of Newfoundland and Labrador.

Numerous inter-provincial ferry and coastal services are operated along Canada's east coast. Provinces offer intra-provincial ferry services; some operate these as components of their highway networks (i.e., as links within their highway systems). Intra-provincial ferries that are river crossings are affected by fluctuating water levels. The provinces of New Brunswick, Manitoba, Saskatchewan, Alberta and both the Northwest and Yukon Territories do not charge a fee on ferries they operate (with one exception: the Wollaston ferry service in Saskatchewan) nor does British Columbia for inland ferry services that are designated as part of its highway network. All other provincially operated ferry services do charge a fee.

Finally, several ferries are used as extensions of public transit in major cities, such as:

- Metro Transit in Halifax, used between terminals in downtown Halifax, Dartmouth and Woodside to ease traffic on bridges;
- Quebec-Levis ferry in Québec City, operated by the Société des traversiers du Quebec;
- Toronto Island Ferry, which runs routes to Hanlan Point, Ward's Island and Centre Island from the dock at Bay Street and Queen's Quay;

- Translink, which operates SeaBus ferries between public transit bus hubs at Lonsdale Quay in North Vancouver and Waterfront in Vancouver, where commuters can connect with the Skytrain or the West Coast Express commuter rail; and,
- Aquabus Ferries Ltd operates a small, water-taxi like service serving eight locations on Vancouver's False Creek. Its 12-passenger ferries are the smallest in Canada.

ACCESSIBILITY AND FERRY SERVICES

The Terminal Code of Compliance is a code of best practices in accessible transportation applicable to airport terminals and some rail and ferry terminals, mainly those under federal jurisdiction. In the Terminal Code Compliance Report of 2010, the Canadian Transportation Agency reported that, as it applies to ferry terminals, both Marine Atlantic Inc. and Northumberland and Bay Ferries have achieved full compliance. Non-federally regulated ferry services may have also achieved a level of accessibility in compliance with the Code, but these were not assessed. Ferry operators voluntarily offer free attendant fare for daily, but not overnight, passage.

The Quebec Société des traversiers continues to work on the recommendations emanating from the Kéroul Report of 2007 and is looking at improving how its Quebec-Levis ferry connects with Paratransit in Québec City.

ACCESSIBILITY AT MARINE ATLANTIC

Prior to going into service in March 2011, Marine Atlantic's two newest vessels, MV Blue Puttees and MV Highlanders, were modified to add adapted cabins, tactile signage, audible notification of deck level in elevators and visual alarms.

SHORTSEA SHIPPING IN QUEBEC

Shortsea shipping—the movement of cargo and passengers by sea but without directly crossing an ocean—from a sustainable development perspective, can contribute to improving air quality, lighten road traffic congestion and cut down on noise pollution. Quebec's Shortsea Shipping Roundtable aims to promote marine transportation within the province and between Quebec and the rest of North America. The province plans to act as a clearinghouse for information and expertise, and to promote the integration of maritime transport in domestic and continental transport

lines. This roundtable deals with the transport of both goods and passengers. Shortsea shipping services in Quebec include the operation of public and private ferries, the provision of maritime services to isolated communities, the inter-regional maritime movement of petroleum, oils and lubricants, the delivery of de-icing salt, and new multi-modal services.

An example of this type of service is when Groupe Océan transported woodchips by barge along the North Shore to the Kruger paper mill establishment in Trois-Rivières between April 2005 and June 2007. This initiative permitted the elimination of 18,000 heavy-truck trips per year along highways 138 and 40. It also resulted in decreased use of the ferry running between Baie-Sainte-Catherine and Tadoussac. This transportation operation replaced trucking for nine months a year, until the closure of the Ragueneau and Forestville Kruger sawmills in the summer of 2007. Through this initiative, the Kruger company reduced its transportation costs, an estimated \$350,000 was saved per year in road surface maintenance costs, and GHG emissions were reduced by 9,000 tonnes per year. The initiative also decreased road hazards, given the decline in the number of required heavy-truck trips.

For nearly a year, the St. Lawrence Ship Operators, in cooperation with Transports Quebec and Hydro-Quebec, headed a feasibility study on shipping goods to the major North Shore shipyards. Diverting a portion of transport from door-to-door trucking to a truck-ship-truck solution proved beneficial—and a realistic option from technical, logistical, economic and social perspectives. The study's final report presents a concrete business case for implementing maritime transport services to the North Shore region through a third-party logistics company, bringing together several ship operators and a partner trucking company. However, a number of logistic, economic and social challenges remain, including industry leadership and cooperation among various modes of transportation. The introduction of financial incentives may incite private investment, which could make shortsea shipping a viable long-term solution for Quebec.

Across the country, a number of other shortsea shipping activities are taking place, particularly in the St. Lawrence and Great Lakes Seaway, off the coast of British Columbia and in the North.

7.5 ENVIRONMENT

CANADA'S ENVIRONMENTAL ROLE AT THE INTERNATIONAL MARITIME ORGANIZATION (IMO)

Canada joined Norway and other countries at the IMO in July 2011 to bring about the first international standards for energy efficiency that aim to reduce GHG emissions from the shipping industry. Beginning in 2013, new ships will be assigned a measure of carbon efficiency—the Energy Efficiency Design Index (EEDI), which includes target efficiencies for new ships. All ships will also be required to have a Shipboard Energy Efficiency Management plan onboard that outlines actions a ship is taking to increase its energy efficiency. Canada contributed funding towards a study commissioned by the IMO Secretariat to examine market-based measures to encourage reductions in GHG emissions that are currently under consideration for the shipping industry. Canada has been a leader in developing international measures to control the movement of aquatic invasive species from ships' ballast water. Canada also played a key role in IMO's Expert Group on Market-Based Measures and participated in discussions that led to the adoption of new IMO standards for ships to manage garbage and nutrients that may be present in sewage.

AIR POLLUTION

EMISSION CONTROL AREA

In March 2009, Canada and the U.S., with support from France on behalf of Saint Pierre and Miquelon, submitted a joint proposal to the International Maritime Organization for the establishment of an Emission Control Area (ECA) on the east and west coasts.

In March 2010, the Parties to International Convention for the Prevention of Pollution from Ships Annex VI (MARPOL Annex VI) voted to adopt the North American ECA. The ECA is the largest of its kind, spanning from the baselines of the territorial sea, south of 60° north latitude, out to the 200 nautical mile limit of the Exclusive Economic Zone. The ECA sets new emission standards to reduce ships' air emissions, enhance environmental protection and provide substantial benefits to human health. Effective August 1, 2012, sulphur content in marine fuels will be limited to 1% and to 0.1% after 2015, thereby delivering a 96% reduction of sulphur oxide emissions from ships.

Alternatively, ships may use emission control systems that deliver equivalent performance and continue to burn higher-sulphur fuels. Ship engines built after 2016 will also be subject to enhanced emission controls for nitrogen oxides. These regulations are expected to help reduce air pollution, smog and acid rain and benefit human health in coastal areas as well as further inland. To bring the ECA into effect, Transport Canada is developing regulations under the *Canada Shipping Act, 2001*, which are expected to be in force by the fall of 2012.

Transport Canada has committed funding on research and development projects that facilitate marine emissions reductions of both GHG and air pollutants. These initiatives align with the IMO MARPOL Annex VI and the adoption of the North American Emission Control area. They also support the development of standards and best practices to further reduce marine air emissions.

GREAT LAKES REQUIREMENTS FOR LOW-SULPHUR FUEL

Transport Canada is developing air emissions regulations under the *Canada Shipping Act, 2001* for commercial marine vessels operating on internal waters of the Great Lakes and Saint Lawrence Seaway system. Under the proposed approach, Canadian shipowners must meet a gradually decreasing sulphur content in fuel used on average across their fleet, from 2012 to 2019. These regulations are being advanced as industry makes efforts to renew and modernize Canada's domestic fleet. Starting in 2020, individual vessels will be required to meet Emission Control Area level standards. The standards can be met by using low-sulphur distillate fuels (such as marine diesel), alternative fuels (such as liquid natural gas), emission control technologies, on-board procedures, or a combination of these that achieves a performance equivalent to using fuel with the prescribed sulphur content. These regulations are expected to be released in coordination with the ECA.

MARINE SHORE POWER

Marine shore power is a technology that allows ships to plug into the local electrical grid to power their vessels while at port, thereby avoiding the use of auxiliary engines that consume fuel and produce GHG and air pollutant emissions.

Canadian ports face barriers to adoption of this technology, including the initial capital cost of these installations, the lack of Canadian experience with this technology, and the complexity of contractual

arrangements with partners (e.g. utilities, provincial and/or municipal governments) governing access to city electrical grids and power lines. Additionally, the benefits of shore power are shared among many stakeholders, making the business case for investment by the port challenging.

The federal government's Shore Power Technology for Ports program was designed to mitigate barriers to adoption of marine shore power technology facing Canadian port stakeholders. The program is aimed primarily at Canadian port authorities, but any stakeholder can build a business case and submit an application.

PORT EMISSIONS

The National Port Inventory project will result in a detailed, activity-based inventory of air emissions associated with both marine and land-based port-related operations for all 17 CPAs. This includes a GHG and CAC emissions assessment related to the use or activity of all equipment from four major source groups comprising marine vessels, cargo handling equipment (CHE), rail locomotives and motor carriers. The inventory will include the activities throughout the entire Port jurisdiction of the designated Canadian Port Authorities (CPA), including:

- A detailed inventory of emissions in 2010 associated with CPA's marine and landside operations
- Quantification of emission reduction measures currently in place and planned for the future
- Forecast of the 2010 emission inventory in five-year increments through 2025 (e.g. 2015, 2020 and 2025)

Emissions will be compiled using Transport Canada's Port Emissions Inventory Model (database tool) and Guide for inventories of CAC and GHG emissions in the ports. Results will be made public, and will allow CPAs to show environmental leadership and reach a higher level of environmental performance. The subsequent data analyses and model development outputs from this project available will allow Transport Canada to better inform discussions related to the policies and legislation aimed at reducing energy use and emissions related to marine transportation, including providing an emission baseline for the Marine Shore Power Program.

A similar approach in 2009 focused on the port of Montreal showed that marine vessels had the most fuel consumption, with 24.8 million litres, followed by CHE at 7.1 million litres. The report²⁶ also showed the emission levels of 10 air contaminants by source.

26 See http://www.tc.gc.ca/media/documents/Quebec-eng/rapport_emission_mtl_e.pdf

ECOACTION PROGRAM AT PORT OF METRO VANCOUVER (PMV)

PMV's EcoAction Program promotes attainable emissions reduction goals for ocean-going vessels that enter the Port, and rewards those who excel in environmental stewardship.

Vessels may qualify for one of three levels of harbor due rates based on implementing one of the emission reduction options within a given category. The reduced rates, Bronze, Silver and Gold, are designed to provide a wide variety of technology and fuel options to vessels in order to promote and build awareness around a number of alternative emission reduction practices.

As acknowledgement of and encouragement to shipping partners who advance the goal of bringing cleaner ships to Vancouver, the Port has introduced the newly established Blue Circle Award for participants in its EcoAction Program for Shipping, a recognition reserved for only the highest emissions reduction achievements.

More information is available at: <http://www.portmetrovancover.com/en/environment/initiatives/Air/EcoAction.aspx>

WATER POLLUTION

BALLAST WATER

The Government of Canada is committed to reducing the risk of aquatic species invasions from ships' ballast water. This environmental concern is particularly pronounced on the Great Lakes and St. Lawrence Seaway system, which serves as a critical transportation corridor for commodities such as iron ore, coal, minerals and grain. Accordingly, Canada has developed strong and effective ballast water regulations that recognize both the environmental and economic importance of these waters. Recognition that strong international rules are also needed to regulate the global fleet that carries North America's trade led to Canada's April 2010 ratification of the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004. This convention requires vessels to be equipped with treatment systems that effectively, reliably, and dramatically remove live organisms from ballast water under the challenging conditions found on active vessels.

In November 2010, Transport Canada published the Ballast Water Control and Management Regulations under the *Canada Shipping Act, 2001*. Today, all vessels entering the St. Lawrence Seaway from outside Canada's exclusive economic zone are inspected under a Canada–U.S. program before they enter the Great Lakes. This enforcement action ensures full compliance with exchange and flushing requirements, as ships must

either have met the regulatory requirements or take corrective action to meet these standards. Scientific research has demonstrated the effectiveness of this program, and in fact recommended it for other freshwater ecosystems around the world. No new non-native species attributed to ships' ballast water has been reported on the Great Lakes since 2006, which demonstrates the effectiveness of the regulations and the joint enforcement program.

In light of the patchwork of regulations described in section 7.3, Transport Canada has also been working closely with U.S. state and federal agencies to encourage uniform, science-based rules for managing ballast water to protect shared waters while providing a predictable regulatory regime for marine shipping.

NATIONAL AERIAL SURVEILLANCE PROGRAM

Transport Canada monitors ships transiting Canadian waters through its National Aerial Surveillance Program (NASP). The NASP conducts over-flights of vessels moving through Canadian waters on a routine basis. During these flyovers, crew members inspect vessels and their wakes for signs of potential pollution or other violations of the *Canadian Shipping Act, 2001*. In 2010–11, some 12,365 vessels were flown over during 2,506 patrol hours of surveillance (see Table EN7). Of these, 84 pollution incidents were detected.

The NASP has become a world leader in marine aerial reconnaissance. It has finalized upgrades to surveillance equipment onboard all three aircraft used in this program and enables the use of live streaming video. This will allow aircrews to link people on the ground with events being monitored by aircrews in real time.

INITIATIVES TO CONTAIN MARITIME POLLUTION

In 2010, the federal Commissioner of the Environment and Sustainable Development (CESD) tabled a report to the House of Commons concerning the federal government's management of oil and chemical spills from ships in Canadian waters and, more specifically, its state of preparedness to respond to such spills. In response to the report, key federal departments involved in marine emergency prevention and response activities created the Inter-departmental Marine Pollution Committee. Several sub-committees were also formed to address key recommendations, including a sub-committee on the management of hazardous and noxious substances as well as another on policy and legislation—both of which are chaired by Transport Canada.

Transport Canada is working with key federal departments and agencies to ensure that adequate, up-to-date data on the movement of hazardous and noxious substances by ships is available. This, in turn, will support the development of a national hazardous and noxious substances ship-source preparedness and response regime. National consultations will lead to the design of the proposed regime and to recommendations for the adoption of the IMO's Protocol on Preparedness, Response and Co-operation to Pollution Incidents by Hazardous and Noxious Substances (OPRC-HNS Protocol).

Another initiative underway is the Ice Navigation and Oil Detection Radar project, which will significantly enhance the ability to detect and track ice, oil and other targets using radar from both shipboard and fixed platforms. This technology will provide a unique capability in Arctic waters to improve the safety and the fuel efficiency of ships operating in a challenging environment, thus reducing their emissions. In addition, it assists in oil spill clean-up and enhances search and rescue response capabilities.

7.6 SAFETY

Qualified, well-trained seafarers are critical to safe marine operations. Currently, approximately 30,000 valid certificates have been issued by Transport Canada to seafarers who work in Canada. This includes 9,681 examinations conducted in 2011 to ensure nautical officers, marine engineers and other disciplines are competent to carry out their required duties (see Table M31).

A well-maintained domestic vessel fleet is also essential for safe marine operations. For large vessels (greater than 15 gross tons), 54 types of vessel-specific certificates exist—the majority of which directly support safe operations, while the remainder encourage protection of the environment. Each certificate is time-based and requires inspection of the vessel by a Marine Inspector or recognized organization in order to be issued or maintained. Transport Canada conducts inspections and issues over 5,500 certificates per year.

SAFETY STATISTICS

CANADIAN REGISTERED VESSELS

The past two decades have witnessed an average yearly decline of 5% in recorded marine accidents involving Canadian registered vessels as shown in Table S14. Marine accident statistics include both shipping

accidents and accidents aboard ships. In 2011, the steady downward trend continued with 274 reported accidents (247 shipping accidents and 27 accidents aboard ship). This 2011 accident figure represents a 7.7% decline from 2010 (297), and was 24.1% lower than the 2006–2010 five-year average. Please see Tables S1, S14 and S15.

There were 11 fatal Canadian vessel accidents resulting in 12 fatalities in 2011, a decrease compared to the previous five-year average of 17 fatalities. The majority of fatalities in 2011 (75%) resulted from accidents aboard ship, which included persons falling overboard.

Of the 274 Canadian vessels involved in shipping accidents in 2011, fishing vessels represented nearly 43%, while all other non-pleasure craft accounted for almost 53% (see Table S16 and S17). Pleasure craft comprised the remaining 4%, and these accidents are recorded when involved with non-pleasure craft or when engaged in a commercial activity at the time of the occurrence (e.g., charters).

Based on forecast movement data, the 2011 Canadian vessel accident rate of 19.5 (available only for non-pleasure craft—excluding fishing—of over 15 gross tonnes) has increased from the 2010 rate of 18.0 but remained below the previous five-year average (20.7).

Some 22 Canadian vessels confirmed total losses due to a shipping accident in 2011, down 27.2% from the previous five-year average of 30.2%. The greatest proportion of losses in 2011 was found in fishing vessels, at 95.5%.

FOREIGN FLAG VESSELS

In 2011, 48 accidents occurred that solely involved one or more foreign flag vessels—down from the previous five-year average of 59.2. These accidents resulted in three fatalities and no confirmed vessel losses. For more details on marine accidents, including a regional breakdown of occurrences, see Tables S14 to S17.

RECREATIONAL BOATS

Boating is by far the most frequent type of activity leading to water-related injury and fatality in Canada, accounting for more than 3,000 deaths in Canada from 1991 to 2008. In 86% of the cases, the boating activity was recreational and 95% of the deaths resulted from immersion including drowning, with or without cold exposure. For recreational boating, deaths associated with powerboats accounted for 58% of deaths and unpowered boats for 37%. The most frequent recreational boating activity was fishing, accounting for 37%

of immersion deaths. Males 15 and older accounted for about 90% of victims, continuing to make them the key target group for prevention. Failure to wear a flotation device was an equipment factor for up to 88% of victims, and for an even higher proportion of non-swimmers and those who had consumed alcohol. Finally, a key environmental factor for recreational boating immersion deaths in Canada is cold water, which has been associated with at least 35% of fatalities.²⁷ Figure S17A shows annual recreational boating fatalities.

In 2011, more than 100,000 new applications and transfers of licenses were issued from the Pleasure Craft Licensing Centre in Fredericton, New Brunswick. It should be noted that Canada has approximately 6 million recreational boaters in any given year.

ENSURING SAFE NAVIGATION

MARINE PILOTAGE

Marine transportation personnel face serious navigational challenges every day: dangerous weather, treacherous tides and currents, underwater hazards, congested waterways, and narrow channels. Opposite this list of hazards is the accumulated experience and knowledge of the marine pilot—mariners who use their knowledge of local waters to safely guide vessels to their destinations.

All four Pilotage Authorities experienced a surplus in 2011, resulting in a combined gain of approximately \$10 million. Table M11 shows the non-audited financial results of the four authorities in 2011.

Using the average number of assignments per pilot as an indicator, the overall efficiency of pilotage services in 2011 was slightly less than in 2010. Exceptions were the APA, where the average number of assignments per pilot remained the same, and the LPA and GLPA, where the average slightly increased. Variations between the authorities and from year to year are related to traffic levels. Table M16 shows the number of assignments for each pilotage authority as well as the total for all pilotage authorities in 2011.

NAVIGABLE WATERS PROTECTION

Through the administration of the *Navigable Waters Protection Act* (NWPA), Transport Canada assists in ensuring the public's right to navigate Canada's waters without obstruction. It reviews and approves works built

in, on, over, under, through or across navigable water in Canada prior to construction. Additionally, the Navigable Waters Protection Program (NWPP) ensures that appropriate navigation safety measures such as warning lights, buoys or other markers are used and maintained during the construction and long-term operation of the approved works. Transport Canada is also responsible for investigation and correction of obstructions to navigation caused by works or wrecked vessels. This can include ordering the relocation, removal or alteration of an obstruction. At the owner's expense, the program may also facilitate the relocation, removal or alteration of the obstruction.

As the Receiver of Wreck, the NWPP acts as the custodian of found and recovered wreckage while attempting to return the wreck to its proper owner. If an owner is not identified, the program may also determine a salvage award.

ARCTIC NAVIGATION

Global demand for raw materials, coupled with a continued decrease in Arctic sea ice during the summer melt season and the resulting improved marine access, make it highly plausible that Arctic marine activity will increase in the future. Shipping associated with the anticipated expansion of resource development activities (hydrocarbons, hard minerals and fisheries) and with regional trade is of concern to Arctic residents due to its potential for social, cultural and environmental impacts.

Every year for the past five years—since the lowest-ever summer-minimum Arctic ice coverage in 2007—one or more routes of Canada's Northwest Passage has been ice-free for a period of time in the summer. Should sea ice reduction continue, open water itself may become a resource in terms of providing an efficient, seasonal, and shorter global shipping route between major markets in Europe, Asia and North America.

In 2009, Canada expanded the range of its Arctic waters pollution protection for ships to 200 miles—the maximum permitted under international law. In 2010, it became mandatory for certain vessels to report before entering and when operating in Canadian Arctic waters, to ensure safe and efficient navigation as well as protection of the marine environment. A total 140 individual vessels reported to the Canadian Coast Guard Marine Communication and Traffic Services in 2010, and 135 vessels did so in 2011. Cruise ship traffic is relatively stable, at approximately 2,000 passengers on board seven cruise ships making 11 trips a year.

27 Transport Canada and The Canadian Red Cross Society (2011). *Boating Immersion and Trauma Deaths in Canada: 18 years of Research (1991–2008)*.

Given the challenges of responding to shipping emergencies in this vast, remote region, accident prevention becomes a priority. Work is underway at the International Maritime Organization to develop robust, mandatory international rules for polar shipping. Canada plans to harmonize its Arctic shipping rules, to the extent possible, with international requirements.

INTERNATIONAL STANDARDS

INTERNATIONAL MARITIME ORGANIZATION

The international nature of shipping and the vast number of administrations involved around the world requires international coordination in developing common safety standards. This is undertaken by the International Maritime Organization (IMO)—of which Canada is a founding member—which helps shape requirements for all vessels around the world. The IMO is a United Nations Specialized Agency that governs the world's maritime shipping activities. Canadians benefit from IMO participation through enhanced marine transportation systems at home; the Canadian marine industry gains by ensuring its voice is heard regarding requirements they must meet abroad.

HARMONIZED WORK WITH THE UNITED STATES

On February 4, 2011, Prime Minister Stephen Harper and President Barack Obama announced the creation of the Canada–United States Regulatory Cooperation Council (RCC) to increase regulatory transparency and coordination between the two countries. The Joint Action Plan under the RCC aims to align recreational boat manufacturing standards and develop a proposal for aligning monitoring and compliance regimes. For pleasure-craft manufacturers, harmonized standards will simplify the process of ensuring compliance to applicable standards for vessels that are exported. Harmonized standards will help regulators (Transport Canada and the United States Coast Guard) in compliance monitoring and will facilitate collaboration to enforce similar requirements and resolve potential non-compliance issues common to both countries.

Regulatory misalignments do exist between the United States and Canadian standards for life jackets and personal floatation devices. The Joint Action Plan aims to move to a common standard for life jackets, and considers developing mutual recognition arrangements for other marine safety equipment. Benefits of mutual recognition include increased competitiveness

for Canadian and U.S. manufacturers, improved efficiencies in approval processes, and broader choices for consumers. The new common standard is expected to increase wearability and promote innovation in the design of personal floatation devices.

PORT STATE CONTROL

Foreign vessels entering Canadian waters are boarded and inspected through the Port State Control (PSC) Program to ensure compliance with various international conventions. PSC programs are regional in nature; countries sharing common waters have grouped together under a Memorandum of Understanding (MOU) to ensure that vessels trading in their area are not sub-standard. Canada is signatory to two MOUs: the Paris MOU, which is made up of 22 European Union countries and 5 non-European countries, and the Tokyo MOU, comprising 18 Asia-Pacific countries. Canada and the other member countries play significant roles in the global elimination of sub-standard ships. Transport Canada Marine Safety inspectors are trained based on international requirements to carry out inspections on high-risk ships that come to Canadian ports.

TRANSPORTATION SAFETY BOARD

The Transportation Safety Board of Canada (TSB) is an independent agency created to advance transportation safety through the investigation of occurrences in the marine, pipeline, rail and air modes of transportation.

In 2010, the TSB released the TSB Watchlist, which identifies safety issues investigated by the TSB that pose the greatest risk to Canadians. The TSB Watchlist includes two main marine problems: the number of accidents involving loss of life on fishing vessels being too high, and emergency preparedness on large passenger ferries operating in Canada in need of improvement. Transport Canada considers these safety issues to be a priority and is engaged in an expedited regulatory development process. This entails the development of a project plan and process map for interim expedited responses to safety priorities and TSB recommendations, and engaging in web-based consultations on TSB Watchlist items.

The Canadian Marine Advisory Council established a working group on marine TSB recommendations. This working group, comprised of Transport Canada and industry representatives, held its first meeting at the November 2011 Canadian Marine Advisory Council meeting.

7.7 SECURITY

Canada enjoys one of the largest, safest and most secure marine transportation systems in the world. It is vital to the country's prosperity, connecting Canada to the international marine transportation system—and the global economy.

The *Marine Transportation Security Act* aims to protect the country and its citizens from marine-related security risks in a way that respects Canadian values. Transport Canada is responsible for carrying out the Act, working with partners to increase the level of protection against unlawful interference, terrorist attacks, or from elements of Canada's marine system being used as a means to attack the country's allies. Transport Canada oversees marine security policy, regulatory affairs and marine security operations and has functional authority over regional marine security operations.

REGULATIONS AND INITIATIVES

Interdepartmental Marine Security Working Group

The Interdepartmental Marine Security Working Group (IMSWG) was established in 2001 to ensure a whole-of-government approach to marine security. Chaired by Transport Canada and comprising 17 federal departments and agencies, the IMSWG coordinates federal responses to marine security issues, analyzes Canada's marine system for gaps, and addresses those gaps. The IMSWG also oversees the Marine Security Coordination Fund that supports one-time or limited projects that contribute to the coordination of marine security efforts.

In 2011, the IMSWG completed the Maritime Security Strategic Framework—a reference point for all departments and agencies of the Government of Canada with maritime security responsibilities. The Framework communicates a common understanding of the threat environment and gaps in current capabilities. It also emphasizes collaborative solutions to marine security challenges by leveraging existing capabilities. Ongoing and future efforts build on individual departments' and agencies' strengths and expertise to ensure efficient and effective use of available resources.

The Framework highlights five security activities—Marine Domain Awareness, Safeguarding, Responsiveness, Resilience, and Collaboration—through which current and future maritime security efforts are to be focused. It outlines specific action items and next steps in pursuit of security related to Canada's maritime domain.

MARINE TRANSPORTATION SECURITY REGULATIONS

Canada's Marine Transportation Security Regulations (MTSR) came into effect on July 1, 2004 to implement the International Maritime Organization's (IMO) International Ship and Port Facility Security (ISPS) Code. The IMO created the ISPS code in response to the events of September 11, 2001 to set out a framework of security measures to significantly enhance the deterrence, prevention and detection of acts that threaten security in the marine transportation sector. The aim of the MTSR is to prevent unlawful interference with marine transportation in Canada and to ensure that appropriate action is taken where that interference occurs or could occur.

Transport Canada has embarked on a long-term project to amend the MTSR. The amendments focus on responding to Canada's obligation to implement new IMO requirements, further harmonizing with the United States' regulatory regime, reducing industry's regulatory compliance and financial burdens, and addressing interpretation issues and regulatory gaps. Transport Canada held consultations with industry and other government departments across the country from 2008 to late 2010. It is expected that the amendments package will come into effect in late 2012.

Improvements to the Transportation Security Clearance Program (security screening)

The Marine Transportation Security Clearance Program (MTSCP) was introduced in December 2007. Its purpose is to reduce the risk of security threats by preventing unlawful interference with the marine transportation system by requiring background checks on workers who perform certain duties or who have access to certain restricted areas—primarily those responsible for the integrity of major Canadian ports and marine facilities.

The MTSCP is not a new government program; rather, it is an extension of the existing Transportation Security Clearance Program that has been in place at airports across Canada since the 1980s. It represents a risk-management strategy of the Government of Canada to address the modern threat environment and protect Canadians and their industries.

Supporting these security efforts, Transport Canada and the Royal Canadian Mounted Police signed an agreement in April 2009 on the sharing of sensitive law-enforcement information, including details on organized crime and criminal association. This new information-sharing agreement enables transportation security

clearance decisions to be based on more complete data from a broader range of intelligence sources.

OVERSIGHT AND ENFORCEMENT

Transport Canada conducts inspections, reviews and approves security plans, and works with stakeholders to assist them in meeting the requirements of the *Marine Transportation Security Act* and its regulations. The department also engages in promotional, educational and awareness activities to make sure the regulated community is aware of its legislative and regulatory responsibilities. If violations or non-compliance instances are found, the department uses a graduated enforcement approach—advising stakeholders when problems exist, equipping them with information, and providing opportunities to correct problems before further action is taken.

Maritime Commerce Resilience

Between 2007 and 2011, Transport Canada's Maritime Commerce Resilience (MCR) initiative worked with the Canada Port Authorities and other members of the Canadian marine community to strengthen Canada's supply chain. The MCR initiative promoted the integration of resiliency principles into an organization's operations and emergency management plans, ensuring that the organization's assets, dependencies and the supply chain have the ability to mitigate the potential impacts of a terrorist attack or other emergency. The MCR initiative also worked to minimize single points of failure in the Canadian maritime supply chain, reduce disruptions to the flow of goods and avoid systemic failures. Through the MCR initiative, a Critical Infrastructure Assessment tool was developed and provided to marine stakeholders to assess vulnerabilities in their supply chains and develop mitigating measures.

Transport Canada has launched MCR projects in Halifax, Hamilton, Montreal and Vancouver. In 2011, awareness and outreach initiatives were undertaken to expand and enhance the marine community's awareness of the importance of resilience planning.

Maritime domain awareness

Maritime domain awareness is having true and timely information about everything on, under, related to, adjacent to, or bordering a sea, ocean or other navigable waterway. This requires a coordinated effort within the federal government as well as with stakeholders and global partners. Transport Canada and its partners—including those in the IMSWG—work together to

reduce marine security risks and achieve greater maritime domain awareness. These efforts contribute to the security, safety, and prosperity of Canadians and the country's allies.

Canada's Marine Security Operations Centres (MSOCs) are an example of such interdepartmental integration. Located in Halifax, Victoria and the Niagara Peninsula, the MSOCs involve federal government departments and agencies responsible for marine security, asset support or maritime expertise. The MSOCs enable partner government departments and agencies to work together and share intelligence, surveillance and reconnaissance information through interagency staffing and collaboration. The MSOCs provide Canada with a marine security capability that is resourced, organized and equipped to ensure maritime domain awareness.

Waterside security

Due to the potential lack of clear understanding of roles and responsibilities in waterside security in Canadian ports, the Royal Canadian Mounted Police (RCMP) and Transport Canada conducted a detailed policy and legal analysis of jurisdictional boundaries, adequacy standards and federal-provincial mandates to clarify roles and responsibilities and better coordinate future activities. Both organizations are currently reviewing the analysis results and developing next steps.

HARMONIZATION AND INTERNATIONAL PARTNERSHIPS

Canada–United States Regulatory Cooperation Council

The Canada–United States Regulatory Cooperation Council includes several marine security initiatives, such as:

- Greater coordination and consultation between the U.S. Coast Guard and Transport Canada in order to align regulatory requirements where possible.
- Aligning the Canadian definition of “Certain Dangerous Cargos” (CDCs) with that of the United States to ensure equal treatment for vessels carrying CDCs across the border.
- Incorporating a reference to Alternative Security Arrangements (ASA) in Canadian regulations, which would see the two countries agreeing to alternative security measures for unique or specific situations.
- Exploring the feasibility of developing an expanded Joint Initial Verification Program to address issues in partnership related to the safety and security of vessels entering the St. Lawrence Seaway.

- Investigating the feasibility of mutual recognition of regulatory oversight regimes for Canadian and United States' domestic fleets on the Great Lakes and St. Lawrence Seaway.

BEYOND THE BORDER WORKING GROUP

Canada and the United States have also created a Beyond the Border Working Group (BBWG) composed of representatives from federal departments and agencies, including Transport Canada. The BBWG facilitated the development of the Perimeter Security and Economic Competitiveness Action Plan announced in December 2011.

The Action Plan includes three initiatives in which the Marine Security Program is actively involved:

1. **Enhance domain awareness in the maritime environment.** Taking a common approach to threat assessment based on the principle that a threat to either country represents a threat to both.
2. **Develop a joint strategy to address risks associated with shipments arriving from offshore, based on informed risk management.** This is key to establishing a harmonized approach to screening inbound cargo arriving from offshore, which will result in increased security and expedited movement of secure cargo across the Canada–United States border—under the principle of “cleared once, accepted twice”.
3. **Collaborate at the regional level between countries to facilitate maritime commerce recovery following an emergency.** This is intended to mitigate the impacts of disruption on communities and the economy by managing traffic in the event of an emergency.

BI-NATIONAL AND OTHER INTERNATIONAL PARTNERSHIPS

United States

Transport Canada has engaged the United States Coast Guard through the Bi-National Marine Security Working Group, established to enhance coordination of marine security matters of common interest and to ensure a consistent approach to international maritime security. Both participants recognize the continued need to evolve their efforts to include collaboration and

coordination of operations and regulatory/policy development in support of a shared vision for security and economic competitiveness.

Transport Canada has also worked with the United States on international marine security efforts through the IMO, the G8 and the Asia Pacific Economic Cooperation Forum. Canada's Marine Security Program has close relations with the United States Coast Guard, Department of Homeland Security, Customs and Border Protection and the United States Navy. These joint efforts reflect Canada's role as a maritime nation and help maintain and improve U.S. and international confidence in Canada's marine transportation system. These initiatives also ensure that Canada is able to move products and people across great distances to world markets effectively and efficiently.

Under the Joint Inspection Verification Program, Transport Canada has invited the United States Coast Guard to observe Transport Canada inspectors conducting pre-clearance ISPS²⁸-compliance verifications on international vessels prior to their first entry of the season into the St. Lawrence Seaway/Great Lakes System. These verifications are not full ISPS-verification examinations but pre-clearance exams designed to give the United States Coast Guard reasonable assurance that a vessel is in substantial compliance with the ISPS/MTSR requirements before entering United States waters and ports. This program strives to reduce duplication of efforts by reducing the number of subsequent inspections of ships entering the system.

International Maritime Organization

The IMO focuses on the improvement of safety at sea and the prevention of pollution from ships. The IMO is also responsible for international aspects of liability and compensation and the facilitation of maritime traffic. At the September 2011 meeting of the IMO Trade Facilitation Committee, Canada agreed to co-chair, along with the United States, a Correspondence Group to develop guidance relating to measures that would facilitate trade recovery. Over the coming year, Transport Canada will draw and consolidate best practices from its experience in MCR planning over the past four years, as well as continue to consult with government, industry partners and the international community in developing these international best practices.

28 International Ship and Port Facility Security Code.

Anti-crime capacity building

Through the Department of Foreign Affairs and International Trade's Anti-Crime Capacity Building Program (ACCBP), Transport Canada participates in international efforts to increase countries' capacities to apply international standards—mainly the ISPS Code and other effective counter-terrorism and security measures. The ACCBP provides training, funding, equipment and other technical and legal support to enable other countries to prevent and respond to terrorist activity.

Transport Canada and the United States Coast Guard work with the Organization of American States/ Inter-American Committee Against Terrorism, under its Port Security Assistance Program, to increase maritime security capacity building (also funded by the ACCBP) throughout Latin America and the Caribbean. To date, nearly 2,500 port security officials have been trained in various aspects of maritime security, such as cruise ship facility security, customs and port facility coordination, and risk assessment. Transport Canada also has bilateral maritime security partnerships with Jamaica and Mexico to provide capacity building and enhanced mutual awareness and understanding.

SPECIAL EVENTS

Transport Canada regularly participates in Tall Ships events. Nova Scotia and the Great Lakes will host some of these events in 2012, and will require Transport Canada to establish exemption measures for facilities the ships interface with and to provide additional inspections for ships and facilities.

REGULATORY MANAGEMENT

Red Tape Reduction Initiative

Transport Canada is participating in the Government of Canada's Red Tape Reduction Initiative, which enables businesses and industry to identify regulatory irritants that have a clear detrimental effect on growth, competitiveness and innovation. The initiative aims to reduce administrative barriers and create a healthy climate for small businesses to further grow and succeed in Canada. As part of this initiative, Transport Canada is working towards introducing amendments to the Marine Transportation Security Regulations to clarify that regulated Canadian-flagged vessels on domestic voyages may interface with either regulated or unregulated ports and marine facilities, with a view to increasing business competitiveness.

Increased investment in railway networks. Improved rail safety and security. Strategic partnerships to share track and expand reach, and industry-wide efforts to reduce greenhouse gas emissions. Canada's rail transportation industry is moving full steam ahead in support of the country's economic growth.

8.1 OVERVIEW OF RAIL TRANSPORTATION

With more than 46,000 kilometres of tracks (see Addendum Table RA1), the rail transport industry is an important element of Canada's transportation system. In Canada, the rail transport industry generates approximately \$10 billion per year—95% of which comes from rail freight operations and approximately 5% from commuter, intercity and tourist passenger rail services in major urban centres, corridors and regions.

The North American rail industry is highly integrated. Companies operating on integrated rail networks build track to a standard gauge, and tracks are maintained to similar standards. Loaded rail cars are usually pulled by locomotives owned and operated by the track owner, but North American integration allows railways to interchange or hand off cars and locomotives that meet industry standards to other railways to complete a journey.

Canadian National Railway (CN) and Canadian Pacific Railway (CPR) are the two dominant *freight* rail operators in Canada and are both Class I railways, meaning their revenues exceeded \$250 million in the past two years. Of total Canadian rail transport industry revenues, CN accounts for over 50% and CPR for approximately 35%. Together, CN and CPR represent more than 95% of Canada's annual rail tonne-kilometres, more than 75% of the industry's tracks, and three-quarters of overall tonnage carried by the rail sector. For Canada, these two firms serve as important supply chain links for Canada's key trade corridors and gateways. CN crosses Canada from the Atlantic Ocean to the Pacific Ocean and follows the Mississippi River to the Gulf of Mexico, linking customers in Canada, the U.S. and Mexico. This has been made possible through various

CN acquisitions—Illinois Central in 1999; Wisconsin Central in 2001; and Great Lakes Transportation in 2004—as well as a 2004 partnership agreement with BC Rail. CN generates annual freight revenues in Canada on the order of \$5.5 billion, and employs 22,000 people here and abroad. Meanwhile, CPR operates 22,500 route-kilometres in six provinces and 13 States, generates almost \$4 billion in annual revenues in Canada; it has roughly 15,000 employees system-wide.

Shortline railways are a fundamental component of the country's rail network, feeding and delivering traffic to and from mainline railways, originating more than 20% of all CN and CPR's freight carload traffic, and moving billions of tonne-kilometres back and forth from Class I railways.

Passenger railways include intercity rail operators, urban rail transit railways and heritage railways. In 2009, intercity passenger rail traffic totalled 4.5 million passengers and approximately 1.4 billion passenger-kilometres. VIA Rail Canada—a Crown corporation established in 1977 that now operates close to 500 trains weekly serving more than 450 communities across 12,500 kilometres of rail network—is Canada's dominant intercity rail passenger service operator, with annual passenger revenues of \$260 to \$280 million. It is also a Class I railway. This is complemented by about \$260 million in annual operating subsidies as well as substantial capital funding. Remote communities benefit from subsidized intercity passenger rail services provided by carriers such as Tshuettin Rail Transportation Inc. between Sept-Iles and Schefferville, while cross-border passenger rail service connections are made possible in Vancouver through Amtrak's Cascades service, in Niagara Falls through Amtrak's Empire service, and in Montreal through Amtrak's Adirondack service.

A number of *tourism* rail services are offered throughout the country and include Rocky Mountaineer, Alberta Prairie Railway Excursions, Great Canadian Railtour Company Ltd., South Simcoe Railway, and Steam Train HCW. Commuter rail service is provided by TransLink in Metro Vancouver, GO Transit in the Greater Toronto and Hamilton Area, and Agence métropolitaine de transport (*Metropolitan Transportation Agency*) in the Greater Montreal area.

8.2 2011 YEAR IN REVIEW

ECONOMIC FRAMEWORK AND INFRASTRUCTURE

- In 2011, Canadian railways carried more than 313 million tonnes of freight, up 14.9% from 2010 (see Table RA9).
- Some 36 shortline and regional railways operate in Canada. In 2010 they accounted for 22.2% of total kilometres of track (see Table RA1) and \$655 million in revenues (see Table RA4).
- In 2011, the railway industry in Canada alone employed 32,006 people, up 1% from the previous year (see Table RA5). Average employee annual compensation was \$76,554, up 2.8% from 2010.
- Labour agreements were reached in 2011 between Canadian National (CN) and the Canadian Auto Workers' (CAW) union, the United Steelworkers, and the Teamsters Canada Rail Conference (TCRC). In total, these recent agreements now cover approximately 8,575 CN employees. Canadian Pacific Railway (CPR) also reached labour agreements with CAW that cover its mechanical services employees, and VIA Rail reached a labour agreement with TCRC that covers its locomotive engineers. Table EC54 shows that in 2011, only one work stoppages occurred in the rail industry and it impacted 109 workers.
- In March 2011, Metrolinx purchased a section of CN's Kingston Subdivision in eastern Toronto for \$299 million. The rail line encompasses the two- and three-track rail corridor east of Union Station to a junction near Whites Road in Pickering, Ontario, where the line then connects with GO Transit's separate rail right-of-way. With this purchase, Metrolinx now owns 61% of the rail corridors within which GO Transit operates.
- System-wide, CN earned \$9.0 billion in operating revenues in 2011. This represents an 8.8% increase over 2010 revenues of \$8.3 billion. Operating expenses increased 8.7%, from 5.3 billion in 2010 to 5.7 billion in 2011. Fuel represented the largest increase in operating expenses, rising 34.7%, from \$1.0 billion in 2010 to \$1.4 billion. Expenses in labour and fringe benefits increased 3.9%, from \$1.7 billion 2010 to \$1.8 billion in 2011. Tables EC71 and RA4 provides combined financial results for the Canadian portion of CN and CPR's operations.
- CN made several infrastructure investments in 2011, including the construction of a new logistics park in Calgary, \$35 million to improve infrastructure and facility capacity in Alberta, and improvements to its Brampton Intermodal Terminal. These investments by CN are part of a larger \$1.7 billion in capital spending in 2011, which included \$1 billion for track investment, \$500 million on facilities, such as distribution centres and information technology, and \$200 million on fleet improvements, including new fuel-efficient locomotives and new freight cars.
- System-wide, CPR earned \$5.0 billion in revenues in 2011, representing a 4.1% increase over the \$4.9 billion earned in 2010. Operating expenses increased 8.9%, from \$3.9 billion in 2010 to 4.2 billion in 2011. Fuel and materials represented the largest increase in operating expenses, rising by 33.0 and 13.6%, respectively.
- CPR announced plans to expand its crude oil transload facility at Estevan, Saskatchewan, serving the Bekken Formation in Saskatchewan, to better handle the expected 70,000 annual carloads in the future. Also, as part of its three-year program to improve 1,400 kilometres of its North Main Line between Winnipeg and Edmonton, CPR enhanced 250 kilometres of track. These investments by CPR are part of a larger billion-dollar capital investment plan for 2011, which included \$680 million for track infrastructure, \$200 million for volume growth, productivity initiatives and network enhancements, \$80 million to upgrade its information technology systems and \$40 million principally in train control and other regulated capital.
- In December 2011, CPR announced its intent to further develop its long-train strategy, which aims to increase intercontinental train length by 11% by 2013. CPR's intermodal trains have grown in length to 12,000 feet—an increase of 40% since 2008.
- In 2010, VIA Rail Canada reported revenues of \$274.4 million and a loss of \$261.5 million. The federal government provided \$261.5 million in operating funding and \$268.6 in capital funding.

- In 2010, VIA Rail Canada, experienced a 1.3% decrease in passenger-miles (see Table RA30), while increases in the average fare resulted in a 3.2% increase in passenger revenues.
- VIA Rail completed \$300-million infrastructure upgrades in its Montreal–Ottawa–Toronto corridor, and opened a new \$750,000 station in Smiths Falls, Ontario.
- VIA Rail also announced a series of new marketing-oriented initiatives and service agreements to improve customer service and productivity. These include new partnerships with GO Transit in Toronto and bus services in western Canada to integrate travel connections, improvements to on-board customer Internet access through Wi-Fi, and the use of new social media forums such as Twitter and Facebook.
- There were 13 commuter rail lines operating in Canada and serving the Montreal, Toronto and Vancouver metropolitan areas. In 2010, they carried 64.3 million passengers (see Table RA31).
- Under the framework of the Regulatory Cooperation Council, a joint Canada-U.S. action plan was announced in December 2011 to align regulatory approaches between the two countries. The action plan involves 29 initiatives, including a commitment to work together to reduce GHG emissions from locomotives.
- A Memorandum of Understanding (MOU) on coordination of efforts related to noise and vibration complaints and road, utility or private crossings was signed with the Canadian Transport Agency in September 2011. The purpose of this MOU is to set out the responsibilities and understandings between the participants with respect to railway noise and vibration complaints and opening and closing of road, utility and private crossings.

SAFETY

ENVIRONMENT

- In 2010, railways consumed 1.9 billion litres of fuel, up 9.2% from the previous year (see Table RA6). This increase was driven by a 13.8% increase in tonne-kilometres carried as the economy was recovering from the previous year's recession.
- In 2011, CN and CPR announced plans to improve their locomotive fleet fuel efficiencies and lower emissions by purchasing new locomotives and rebuilding some of their existing fleets.
- In February 2011, Transport Canada completed preliminary consultations on the development of locomotive air pollutant emission regulations. Six consultation meetings were held in Ottawa, Montreal, Vancouver and Detroit.
- In 2008¹, greenhouse gas (GHG) emissions from the rail sector were 7.1 Mt CO₂e. Rail emissions accounted for 4% of domestic GHG emissions from transportation, and less than 1% of total Canadian emissions² (see Table EN4).
- In 2009, rail accounted for only 9% of all transportation-related NO_x emissions and 6% of PM_{2.5} emissions, but contributed about 2% of other transportation-related air pollutants³ (see Table EN6).
- In 2011, 1,023 railway accidents took place in Canada (see Tables S1 to S5) causing 71 fatalities. Both of these figures are significantly lower than those reported in 2010 (1075 accidents and 81 fatalities).
- Bill S-4, the *Safer Railways Act*, was introduced in the Senate on October 6, 2011. The Bill received Senate approval with one minor amendment on December 7, 2011.
- In keeping with the Rail Safety Strategic Plan 2010–2015, Transport Canada launched the first phase of its national data collection system in 2011 and made significant progress on its implementation of risk-based planning and quality management procedures. Transport Canada also expanded its training program for regional safety inspectors.
- Transport Canada invested nearly \$14 million under the Grade Crossing Improvement Program (see Table G3) to make safety improvements at 810 railway crossings across the country.
- CPR and Parks Canada hosted a symposium to reduce railway and bear conflicts in Jasper National Park. CPR will invest up to a million dollars in research aimed to reduce these collisions. Both organizations have already collaborated on a number of initiatives, including on-track structures such as peg boards that discourage bears from using the tracks as an escape path, strategic vegetation management and supporting fencing structures with electro-mats.

1 The year for which the latest data is available.

2 Environment Canada (2011). *Canada's Emissions Trends*.

3 Environment Canada (2011). *National Pollutant Release Inventory*.

SECURITY

- Transport Canada continued efforts to enhance the security of rail and urban transit systems through collaborative efforts with industry and the development of additional Codes of Practice.
- Prime Minister Harper and President Obama announced a Beyond the Border Declaration in 2011, which included action items that will help enhance the efficiency and security of Canada's supply chains—including Canada's rail corridors.

8.3 2007–11 RECAP

ECONOMIC FRAMEWORK AND INFRASTRUCTURE

FREIGHT RAILWAY PERFORMANCE

Canadian freight railway performance, in terms of volume, reflected the trends in the overall economy between 2007 and 2011. Canadian railways carried a total of 353.3 million tonnes of freight in 2007, which was a slight decrease from 357.4 million tonnes in 2006. In mid-2008, at the onset of the financial downturn, total tonnage carried by Canadian railways decreased to 336.64 million tonnes. By 2009, the total had decreased to 278.9 million tonnes of freight—a decline of nearly 57.8 million tonnes from the already depressed level of 2008. This decline of 17.2% per cent took annual freight carriage to its lowest point since 1998. As the economy began to show signs of recovery in 2010, total tonnage carried by Canadian railways rose again to 313.5 million tonnes of freight in 2011 (see Table RA9).

Between 2007 and 2011, CN saw its revenues increase by 14.3% (or 3.6% on average annually), going from \$7.9 billion to \$9 billion. Net income followed suit, with an average increase of 3.5% per year during that period. Meanwhile, at CPR, revenues increased by 7.3% during that period, going from \$4.7 billion to \$5.2 billion. However, net income actually declined during the period, dropping from \$946.2 million to \$570 million.

Despite the varying volumes and fluctuations in revenues since 2007, Canadian railways have consistently increased investment in their networks. Collectively, railways increased their \$2.1-billion capital investment in 2009 to \$2.3 billion in 2010—an increase of 9.5%. In 2011, Canadian railways increased their collective investment to \$2.7 billion, a 17.4% increase from 2010. This consistent capital investment is intended to

improve the overall efficiency, reliability and fluidity of the rail network.

Canada's transportation policy outlined in the *Canada Transportation Act* emphasizes a strong reliance on competition and market forces. The Act also contains a number of shipper protection provisions that were strengthened through amendments in Bill C-8, which received Royal Assent on February 28, 2008.

Following these amendments to the Act, in 2008 the federal government announced the terms of reference for the Rail Freight Service Review that set out the following objectives:

- conduct a review of the rail-based logistics chain;
- identify problems and issues with railway service; and
- make recommendations on how to address these problems and issues, including commercial and, if necessary, regulatory solutions.

The federal government received the review's Final Report in December 2010, and has begun implementing its response, as announced on March 18, 2011. More information on the Rail Freight Service Review is available in section 8.4

THE PASSENGER RAIL PICTURE

In passenger rail, VIA Rail Canada operated essentially the same network of services over the 2007–2011 period, but did temporarily suspend its Victoria–Courtenay service in March 2011 due to poor track conditions. In 2011, VIA increased its number of Montreal–Toronto trains by combining three westbound and two eastbound Montreal–Ottawa and Ottawa–Toronto trains to operate through Ottawa.

VIA's revenues reflected trends in the overall economy. Revenues increased between 2007 and 2008, rising from \$285.6 million to \$299.2 million, and then fell in 2009 to \$264.9 million due to reduced demand associated with the global financial crisis. Revenues began to rise in 2010 as the economy recovered, increasing to \$274.4 million. Operating costs grew because of rising fuel prices and compensation increases driven by the need to resume pension contributions. Over the 2007–2010 period, costs rose from \$486.2 million in 2007 to \$513.4 million in 2008, \$526.1 million in 2009 and \$535.9 million in 2010. Please see Tables RA4 and EC71 for more details.

Capital investment rose considerably. In October 2007, the federal government approved a program to inject \$691 million into VIA, of which \$516 million was

earmarked for capital improvements. Capital expenditures in 2007 totalled \$12.4 million. In 2009, as part of the Economic Action Plan implemented by the Government of Canada to stimulate the economy, VIA received an additional \$407 million in capital. In 2011, capital expenditures totalled \$208 million. Most investments were concentrated on the Quebec-Windsor Corridor, which accounts for 75% of VIA's revenues and 91% of its ridership. The greatest portion was directed towards equipment, stations and infrastructure in that corridor, with the goal of improving service by reducing trip times and increasing frequencies.

ENVIRONMENT

Freight rail GHG emissions increased from 6.6 Mt to 6.9 Mt between 1990 and 2008, equivalent to 4%, for a yearly average increase of 0.2% per year. Due to locomotive efficiency improvements, total GHG emissions remained fairly stable while total tonne-kilometres travelled grew significantly. Freight rail GHG emissions are forecast to increase by 15% (0.9% annually), from 6.0 Mt to 6.9 Mt from 2005 to 2020⁴ (see Figure EN12), as a result of increased rail traffic. The GHG emission intensity of freight and passenger rail improved significantly from 1990 to 2008, by 24% and 26% respectively (see Figure EN13).

FREIGHT-RELATED RAIL GHG EMISSIONS

From 1990–2009, rail particulate matter (PM_{2.5}) emissions increased by approximately 1,000 tonnes, while SO_x emissions fell by almost 3,000 tonnes, NO_x emissions decreased by 14,722 tonnes, VOC emissions increased by approximately 600 tonnes and CO emissions fell by 5,582 tonnes (see Figure EN14).

In a 2006 Notice of Intent, the Government of Canada announced its intent to develop locomotive air emissions regulations. Locomotive emissions regulations are being developed by Transport Canada under the Railway Safety Act in two phases, recognizing the high degree of integration of the North American railway industry:

- regulations aligned with those in the U.S. are being developed to limit the release of air pollutant emissions from the rail sector; and
- regulations to limit the release of GHG emissions will be developed within a North American context.

In May 2007, a Memorandum of Understanding (MOU) to reduce railway air emissions was signed between Transport Canada, Environment Canada and the Railway Association of Canada. The MOU covered the period from 2006 to 2010 and identified commitments of Canadian railway companies to reduce GHG and criteria air contaminants (CAC) emissions on a voluntary basis. These measures were agreed upon as an interim step to a regulatory regime. As part of the MOU, an annual Locomotive Emission Monitoring report is produced by the Railway Association of Canada.

SAFETY

A four-member panel appointed in 2007 by the Minister of Transport to conduct a comprehensive review of the *Railway Safety Act* (RSA) published its final report entitled *Stronger Ties: A Shared Commitment to Railway Safety*. The report was preceded by a year of national consultations, and presented 56 recommendations to improve rail safety. It was tabled in the House of Commons in March 2008.

During the same period, the Standing Committee on Transport, Infrastructure and Communities launched a national study on railway safety in Canada. The Committee accepted the findings of the RSA review report and tabled its own report in the House of Commons in May 2008 with 14 additional recommendations to improve rail safety. Work is underway with stakeholders to implement the two reports' recommendations; some will require legislative changes.

Since the launch of the review, Canada's three Class I railways have made significant progress in upgrading their safety systems and safety performance. CN, CPR and VIA Rail have all increased their levels of consultation and communication with the regulator, enhanced their focus on safety management systems, launched a variety of new safety initiatives related to operations and infrastructure, and are working towards the development of a strong safety culture at all levels of their organizations. These endeavours have paid off. Since 2007, train accidents have decreased by 23% and passenger train accidents have decreased by 19%.

Since 2007, Transport Canada's number of railway safety inspectors has increased and inspector training has grown. Risk-based planning and quality management procedures have been implemented, capacity for data management and analysis improved, consultation

4 Environment Canada (2011). *Canada's Emissions Trends*.

and communication initiatives with industry expanded, and research and development of new safety technologies sponsored. As well, Transport Canada continued its efforts to harmonize regulatory requirements with the U.S., and furthered the implementation of safety management systems in the rail industry. A suite of safety management system guides for large and small railways was published, which aimed to enhance safety culture in the rail industry.

SECURITY

Transport Canada continued to collaborate with the railway industry and encourage the adoption of appropriate security measures designed to enhance the security of Canada's transportation systems. In 2007, Transport Canada revised an existing, 10-year-old MOU with the Railway Association of Canada (RAC) established to enhance security of the railways represented by RAC. The MOU outlined specific requirements for railway security that both parties were expected to abide by.

Since 2007, Transport Canada has also been developing voluntary security standards, or Codes of Practice (CoPs), through the Steering Committee for Rail and Urban Transit Security Standards Development formed that year. The Committee includes Transport Canada, major rail and transit operators, RAC and the Canadian Urban Transit Association. To date, four Codes of Practice have been completed:

- Developing and Maintaining Security Plans for Rail and Transit Operations
- Conducting Security Risk Assessments of Rail and Transit Operations
- Conducting Security Exercises for Rail and Transit Operations
- Employee Training and Awareness for Rail and Urban Transit Security

The CoPs serve as useful tools to enhance the security of rail and urban transit in Canada; operators have adopted the CoPs on a voluntary basis. Transport Canada intends to continue developing and promoting CoPs to enhance the security of transit, rail and intercity buses in Canada.

Under the *Railway Safety Act*, the Minister of Transport is granted a number of powers to enhance the security of Canadian rail operations. Several of these provisions have been used successfully to enhance the security of special events. In January 2010, Transport Canada enhanced railway security for the 2010 Olympic Winter

Games by establishing security rules for federally regulated railway companies operating in the Olympic region. These rules, developed in close consultation with the affected railway companies, included requirements to implement security controls related to access, physical security, monitoring, communications and coordination, response to security incidents, employee training, and public awareness. In June 2010, Transport Canada enhanced railway security for the G8 and G20 Summits by establishing security measures for federally regulated railway companies operating in Huntsville, Ontario and Toronto, Ontario.

8.4 ECONOMIC FRAMEWORK AND INFRASTRUCTURE

CLASS I FREIGHT RAILWAYS

In 2011, Canada's two Class I freight railways—CN and CPR—collectively spent more than \$2.7 billion on capital programs for track and roadway, buildings, rolling stock and information systems. CN invested approximately \$1.7 billion in track improvements, rolling stock and better facilities. Meanwhile, CPR announced approximately \$1 billion in capital investment for 2011 to increase capacity and enhance network redundancy. These investments aim to improve rail service by enabling CPR to carry additional traffic more reliably and by ensuring a more resilient network when faced with severe weather disruptions. The proposed investment includes the purchase of 91 new locomotives and the hiring of 1,800 new employees.

Both railways continue to develop longer trains to enhance network velocity and productivity while reducing labour costs and increasing fuel efficiency. This strategy has required significant capital investment in locomotive upgrades and siding extensions to ensure sufficient capacity within the rail network. As a result of the railways' continued investment, the average number of cars per train has increased from 73 in 2001 to 92 in 2010.

The 14% increase in volume from 2009 to 2010 can be attributed to intermodal traffic that increased by 3.75 million tonnes, representing an increase of nearly 11.6%. Tables RA28 and RA29 provide more detail on intermodal rail volumes. Bulk commodities also increased significantly, including a 38.2% increase in coal and a 6.1% increase in forest products. This was offset by 4.3% decline in grain volumes. Tables RA17 to RA20 provide more information on commodities transported by rail.

In 2010, Class I railway revenues accounted for 93.8% of total revenues in the railway sector. The largest increases in rail sector revenues in 2010 were mainly the result of significant gains in bulk goods (+8.7%) and intermodal transportation (+6%). In 2010, CN and CPR collectively employed approximately 29,193 people (see Table RA5).

Since 2010, CN and CPR have signed agreements with shippers and other stakeholders designed to establish, measure and improve various performance and service measures. CPR signed agreements with the Montreal Port Authority, the Vancouver Fraser Port Authority (Port of Metro Vancouver), Teck Coal Ltd., DP World Vancouver, TSI Terminals⁵, CSX and Delaware & Hudson Railway. CN signed agreements with the Halifax Port Authority, the Montreal Port Authority, the Port of Metro Vancouver, Prince Rupert Port Authority, the Port of Quebec, TSI Terminals, Viterra, Maher Terminals (Prince Rupert), Ridley Terminals (Prince Rupert), Coalspur, Agri-food Central, Raymont Logistics, Squamish Terminals and Western Coal Corporation.

SHORTLINE FREIGHT RAILWAYS

A total of 37 shortline railways operated in Canada in 2011. In 2010, shortline railways accounted for 10,169 kilometres of track, representing approximately 22.2% of total track kilometres in Canada. Big Sky Rail opened on September 22, 2011 in Saskatchewan; the shortline railway operates in the southwest of the province on 354 km of track purchased from CN. These shortline operations will contribute to moving grain from southwestern Saskatchewan for export. Big Sky Rail is a partnership that includes Mobil Grain Ltd.—which has been hauling grain cars with locomotives on the shortline track since September 6, 2011—and West Central Road & Rail, which has five grain-loading facilities along the shortline. Both have an equity position in Big Sky.

In 2010, shortline railways carried a total of 73.9 million tonnes of freight. This is an increase of nearly 11.5 million tonnes from 62.5 in 2009—or 18.3%. During the 2002–2010 period, shortline railway revenues decreased by 3.7% per year, on average. Shortline railway revenues accounted for 6.2% of total revenues in the railway sector in 2010. In that same year, shortline railways employed approximately 2,813 people.

RAIL FREIGHT SERVICE REVIEW

The Rail Freight Service Review was launched in 2008 to identify ways to improve the efficiency, effectiveness and reliability of Canada's rail-based logistics system. The review used quantitative analysis to reach a better understanding of the nature and extent of problems within the logistics chain, as well as a three-person panel that consulted extensively and received written submissions from stakeholders across the system. The panel submitted its final report to the Minister of State (Transport) in December 2010.

On March 18, 2011 the federal government announced its response to the Rail Freight Service Review, indicating its acceptance of the Panel's commercial approach and its intention to implement a number of measures to improve the performance of the entire rail supply chain. On October 31, the government announced the appointment of an independent facilitator, Mr. Jim Dinning, to lead a six-month facilitation process for developing a template for a service agreement and streamlined commercial dispute resolution process between railways and stakeholders. In support of these commercial measures, the federal government also intends to table a bill that will give shippers the right to a service agreement with the railways, and to provide a process for establishing agreements when commercial negotiations fail.

VIA RAIL CANADA

VIA operates a national network of services in eight contiguous provinces. Its services fall into three categories: Quebec–Windsor Corridor, Transcontinental, and Regional and Remote. The Quebec–Windsor Corridor is a major focus: multiple daily trips are offered between all Corridor cities. Two transcontinental trains operate six round trips per week between Montreal and Halifax, and three round trips per week between Toronto and Vancouver via Winnipeg and Edmonton. The transcontinental trains account for 22% of VIA's revenues and 6% of its ridership.

Seven regional and remote services are operated Canada. Two regional routes serve Matapedia–Gaspé and Victoria–Courtenay, while remote services run from Montreal–Jonquiere, Montreal–Senneterre, Sudbury–White River, Winnipeg–Churchill, and Jasper–Prince Rupert. These seven services account for 2% of VIA's revenues and 3% of its passengers.

5 TSI operates the Deltaport and Vanterm container terminals at the port of Metro Vancouver. It handles about 70% of containers in Vancouver, making it the largest container operator in Canada.

In 2011, VIA operated up to 497 trains weekly on 12,500 kilometres of track. Most of this network (83%) is owned by Canada's major freight railways (CN: 79%, and CPR: 4%). Shortlines own approximately 15%, and VIA owns the remaining 2%. VIA has Train Service Agreements with the major and shortline freight railways that define VIA's access to rail infrastructure. Shortline infrastructure is maintained to reflect the freight market along the rail line, which does not demand the same level of track quality as passenger rail service. As a result, VIA's services on these routes operate at slower speeds, thus impacting its on-time performance over which it does not have full control.

Two VIA Rail stations—Montreal Central Station and Quebec Station—allow for level-entry boarding for persons using mobility aids. VIA Rail uses wheelchair lifts at 48 different locations across Canada. As part of its Capital Investment Program, VIA is upgrading and modernizing more than 50 of its passenger stations across Canada. For example, at the Belleville, Oshawa and Cobourg stations, an overhead footbridge has been constructed with an elevator on either side of the tracks to facilitate access.

As part of a program to modernize rail passenger services, VIA is currently undertaking a major overhaul of its fleet of rail cars, which includes extensive changes to improve accessibility. Improvements are being made to Renaissance cars to address the 14 mobility obstacles identified by the Canadian Transportation Agency under the Passenger Rail Car Accessibility Code of Practice. The work being carried out by VIA includes modifications to washrooms, the coach seating area and sleeping car rooms to better accommodate passengers who are mobility impaired.

VIA RAIL'S ACCESSIBILITY POLICY

VIA Rail Canada offers a free fare to the attendant of a person with a disability who requires assistance with meeting his/her personal needs. In order for a working guide dog or certified service animal to have adequate space, VIA Rail also provides the passenger with a second seat free of charge. If the size of a seat is not adequate for a passenger's size, or if a passenger has a disability for which one seat is not sufficiently comfortable, VIA will offer two side-by-side seats with the second seat at a reduced price. More information on VIA's policies on accessibility is available at <http://www.viarail.ca/en/useful-info/special-needs/reduced-mobility>

VIA is incorporating the accessible coach bathroom design from its Renaissance Cars into the Light Rapid and Comfortable (LRC) and Rail Diesel Car (RDC) fleets, which will greatly enhance their accessibility. VIA is also rebuilding some of the sleeping cars used on the western transcontinental train. As part of this project, provision is made to have one accessible sleeping car room on the train, which is currently not wheelchair accessible. Other accessibility features of the overhauled LRC and RDC cars include the provision of a number of seats with fold-up armrests and enhanced space for service animals.

HIGH SPEED RAIL

A feasibility study for a high speed rail service (HSR) in the Quebec City–Windsor Corridor was conducted on behalf of Transport Canada, the Ministry of Transportation of Ontario and the Ministry of Transportation of Quebec by EcoTrain, a group of international consulting firms led by Dessau and comprising Deutsche Bahn International, KPMG, MMM Group, and Wilbur Smith Associates. The joint study included an assessment of high-speed train technologies, potential routings, traffic forecasts, and financial and economic (cost-benefit) analyses. The study also evaluated socioeconomic, environmental and transportation system impacts of two HSR technologies based on speeds of 200 kilometres per hour (km/h) using diesel traction and 300 km/h using electric traction. It further identified potential routes to accommodate each of the 200 and 300 km/h technologies including stations at Quebec City, Trois-Rivières, Montreal, Ottawa, Kingston, Toronto, London and Windsor.

The financial analysis considered a government financing case (wholly public) and a partly private sector-funded case (private sector). The total development costs in 2009 dollars for the full Quebec City–Windsor Corridor are estimated to be between \$18.9 billion for the 200 km/h technology and \$21.3 billion for the 300 km/h technology. Developing the section between Montreal–Ottawa–Toronto could cost between \$9.1 for 200 km/h and \$11 billion for 300 km/h. The main findings from the financial analysis for both the public and private sector cases for the full Quebec City–Windsor Corridor indicate that while the project could cover all operating costs, governments would need to contribute significantly to the project development cost and receive no financial return on investment.

6 See <http://www.tc.gc.ca/eng/policy/acg-acgb-high-speed-rail-2956.htm>

COMMUTER RAIL

Commuter rail provides service between outlying municipalities and a downtown rail station, and typically focuses on capturing work trips. In this respect, commuter rail differs from other forms of urban transit, which typically promotes mobility throughout an urban area with more diverse origins and destinations. Given that the origins of most commuters using such systems are inter-urban, commuter rail in Canada's larger cities is operated by provincially created transportation agencies.

Examples of such provincial agencies include the Agence métropolitaine de transport (AMT, or Metropolitan Transportation Agency) in the Montreal area, the GO Transit division of Metrolinx in Ontario, and Translink in British Columbia, which operates the West Coast Express.

In Montreal, the provincial government is financing the construction of the *Train de l'Est* (Eastern train) to connect downtown Montreal to Mascouche on the North Shore of the St. Lawrence. The project was initially budgeted for \$300 million, an amount that has since been revised upwards. The province also provided \$159 million of the \$236 million necessary to buy 10 new Bombardier bi-modal (diesel/electric) locomotives to be used for commuter trains using the Mount-Royal tunnel.

In the Greater Toronto and Hamilton Area, the Government of Ontario plans to invest over \$11.7 billion in its MoveOntario 2020 project, which includes the *Big Move* regional transportation plan for the region. This plan calls for the construction of 902 kilometres of new or improved rapid transit. While not completely dedicated to commuter rail, *Big Move* has drafted initial plans that include important capacity expansion, three rail extensions and up to five new rail lines. Finally, the governments of Canada and Ontario each contributed \$150,000 for a preliminary engineering study to revive commuter train service between Peterborough and Toronto's Union Station, 120 kilometres away.

At the federal level, as part of its commitment to reduce greenhouse gas (GHG) emissions, ease urban congestion and promote mobility options for Canadians, the Government of Canada has made significant investments in commuter rail, in partnership with provincial governments. In the Greater Toronto Area, the federal government has committed \$250 million since 2008 to expand and upgrade commuter rail facilities in the region, including corridor upgrades and track construction for GO Transit as well as increased park-and-ride facilities at stations. The federal government has also

provided \$146 million in funding for the revitalization of Union Station, the busiest commuter hub in Canada, to increase passenger flow and station capacity. In Montréal, P3 Canada has partnered with the AMT and the Government of Quebec to construct a train maintenance facility for commuter trains. P3 Canada will provide \$25 million in funding for the project. In Vancouver, the federal government provided over \$9 million in funding through the Building Canada Fund for the West Coast Express commuter service. Funding was used to purchase seven new rail cars, lengthen station platforms and install security cameras.

AIR-RAIL LINKS

Air-rail links are rail lines that connect major airports to a downtown rail station or hub in order to improve accessibility to airports and improve intermodal connections. These links may take the form of either a dedicated rail line or an extension of an existing urban rail transit system to service an airport. Because air-rail links contribute to the overall efficiency of the transportation system, reduce congestion and improve intermodal connections, the federal and provincial governments have committed significant funding to various air-rail links.

In Vancouver, the federal government provided \$450 million, British Columbia provided \$435 million, Translink (the provincial agency responsible for transit in the Lower Mainland) provided \$334 million, the Vancouver Airport Authority provided \$300 million, and the City of Vancouver provided \$29 million to build the Canada Line, a 19.2-kilometre urban transit rail link between Richmond, the Vancouver International Airport and Waterfront Station in Downtown Vancouver. The project was delivered through a public-private partnership with SNC-Lavalin and has been in operation since 2009. It has already exceeded ridership projections, with over 110,000 riders a day in 2011.

In Toronto, the Union Station–Pearson Airport link will provide a fast, efficient connection between the busiest passenger rail and air hubs in the country. Construction on this project is expected to begin in the spring of 2012 and be completed in time for the 2015 Pan American Games. The project is expected to cost between \$300 to 400 million, including \$128 million to build the rail spur to the airport. The federal government, through the Canada Strategic Infrastructure Fund, will provide \$68.7 million to upgrade the Georgetown rail corridor, which will be used by both the air-rail link and GO Transit commuter trains. The province of Ontario, through Metrolinx, is funding the balance.

In Montreal, the airport authority, Aéroports de Montréal (ADM), has proposed the construction of a rail shuttle service between downtown Montreal and Montreal-Trudeau Airport to speed-up the journey to and from downtown. Under current circumstances, adding trains on the western part of the island is a challenge, as tracks between downtown and Dorval are already operating at capacity. ADM aims to increase rail capacity by adding new tracks for a rail shuttle—the Aerotrains. All three levels of government and ADM are currently studying the project.

TOURIST TRAINS

Tourist trains are a growing sector of passenger rail and generally operate in the spring, summer and fall months. Most trips are one to two hours, although some can encompass one or two days.

The oldest tourist train operation in Canada is the Algoma Central Railway, now a subsidiary of Canadian National, which began promoting same-day return trips from Sault Ste Marie to Canyon, Ontario in the 1960s. The train was completely re-equipped with rebuilt passenger cars and locomotives in 2011.

The Ontario Northland Railway began to operate its Polar Bear Express tourist train between Cochrane and Moosonee, Ontario in the 1960s. More recently, the railway introduced a fall foliage excursion between North Bay and Temagami. The Ontario government announced a \$10-million refurbishment program, to be carried out in 2012.

In southern Ontario, the South Simcoe Railway operates steam train excursions out of Tottenham, while the York-Durham Railway operates diesel trips between Uxbridge and Stouffville. Also in this area, Waterloo Central operates steam train excursions from Waterloo, and Port Stanley Terminal Rail operates diesel trips out of Port Stanley.

In Quebec, the Orford Express provides gourmet dinner train service out of Sherbrooke. A new service, the Train Le Massif of Charlevoix, began service from Quebec City to the Charlevoix region in 2011. The train is scheduled to operate various itineraries year-round—a first for this sector.

Rocky Mountaineer Railtours operates two-day excursions from Vancouver to Jasper and Banff. The Canadian Pacific Railway operates the Royal Canadian Pacific, providing steam and diesel excursions on multiple day trips in Alberta and British Columbia.

Steam train excursions are operated in western Canada by Prairie Dog Central Railway from Winnipeg, Alberta Prairie Railway from Stettler, Kettle Valley Steam Railway from Summerland, Kamloops Heritage Railway from Kamloops, and Alberni Pacific Railway from Port Alberni. The Omega Heritage Railway Association will begin excursions out of Omega, Saskatchewan in 2012.

The White Pass & Yukon Railway, which carries more than 300,000 passengers from Skagway, Alaska into the Yukon through the historic White Pass, is the busiest tourist railway and the only international tourist train in North America. The company has constructed new passenger cars and rebuilt its locomotive fleet to handle this market.

8.5 ENVIRONMENT

REGULATING LOCOMOTIVE EMISSIONS

Almost all locomotives used by North American railway companies are built to meet U.S. emissions standards. The principal locomotive air pollutant emissions are NO_x, PM, SO_x, VOC and CO. The main GHGs linked to locomotive emissions are carbon dioxide, methane and nitrous oxide.

JURISDICTION OF ENVIRONMENT AND RAIL TRANSPORTATION

The framework of environment-related legislation governing the railway industry is shared among federal authorities—mainly Transport Canada and Environment Canada—and with provincial ministries. Within this framework, numerous pieces of environmental legislation focus on protecting air, water, soil, wildlife, and the public interest.

The *Railway Safety Act* provides the legislative basis for developing regulations governing rail safety, security and some aspects of environmental impacts of rail operations in Canada. The *Railway Safety Act* provides authority for the Governor in Council to make regulations concerning the release of pollutants into the environment from the operation of railway equipment by federally regulated railway companies.

Under the *Canadian Environmental Protection Act*, Environment Canada sets regulations for dealing with spills on federally regulated railway rights-of-way.

Provinces have jurisdiction for provincially regulated railways. Provinces are also responsible for their municipalities through various regulatory instruments that govern planning and development, emergency services, and environmental protection. Provinces have jurisdiction over spills and environmental incidents on provincial lands, including environmental response, clean-up and remediation.

In 2000, the U.S. Environmental Protection Agency (EPA) implemented air pollutant emissions regulations for the rail sector, and updated and revised them in 2008. These regulations ensure that locomotives built for sale in the U.S. meet strict emissions standards for NO_x, PM, hydrocarbons and CO.

Transport Canada is developing regulations under the *Railway Safety Act* that align with U.S. EPA regulations, applicable in the Canadian context. While Canadian and U.S. approaches to regulation will differ slightly due to differences in legislation (the U.S. regulates manufacturers of engines while Canada regulates rail operators), the environmental outcome will be similar.

In February 2011, Transport Canada completed preliminary consultations on the development of locomotive criteria air contaminant emission regulations. Six consultation meetings were held in Ottawa, Montreal, Vancouver and Detroit. A total of 16 formal written submissions were received. Canadian railway companies and their association, the Railway Association of Canada, as well as other stakeholders identified the alignment of Canadian and U.S. regulatory requirements as an important priority.

In addition to regulations for air pollutant emissions, regulators in both Canada and the U.S. have committed to address GHG emissions from locomotives as part of the Joint Action Plan for the Canada-United States Regulatory Cooperation Council.

Locomotive emissions monitoring

Under the terms of the 2006–2010 MOU, a Locomotive Emissions Monitoring (LEM) report is published annually by the Railway Association of Canada.⁷ LEM reports demonstrate the progress achieved by railway operators towards meeting 2010 GHG efficiency-based targets set out in the MOU, as well as air pollutant emissions-related commitments.

The 2009 LEM report summarized GHG emission intensities by category of railway line-haul operation achieved in 2009, compared with annual levels from 2006, 2007 and 2008 and with 2010 MOU targets, as shown in Table RA-29. This table shows that most targets for 2010 were achieved in 2009.

Overall fuel consumed by railway operations in Canada increased from 1,770 million litres in 2009 to 1,932 million litres in 2010. This 9.2% increase in fuel consumption was largely attributable to a 13.9% increase in revenue tonne-kilometres and offset by improvements in energy efficiency (see Tables RA6 and RA7).

RAILWAY ENVIRONMENTAL INITIATIVES

Since 1995, Canadian railways have taken measures to reduce locomotive emissions under two Memoranda of Understanding. The first MOU was between the Railway Association of Canada (on behalf of the Canadian railways) and Environment Canada, and was in effect from 1995 to 2005. The second was between the Railway Association of Canada, Environment Canada and Transport Canada. It covered the period 2006–2010 and identified Canadian railway company commitments to reduce GHG and air pollutant emissions on a voluntary basis.

Canada's Class I freight railways invest in the economic and environmental sustainability of their railway operations through fleet renewal programs, technology improvements, and adoption of best practices. Both of Canada's Class I freight railways have fleet renewal programs in place to rebuild or replace less efficient locomotives with newer, more fuel-efficient models. New locomotives are built to a higher environmental standard and emit fewer GHG and CAC than older locomotives. Canada's Class I freight railways have continued to deploy new operational measures and technology aimed at reducing locomotive emissions. Initiatives to reduce fuel consumption and emissions include improvements to equipment, operations, technology and infrastructure.

Examples of various initiatives include:

Equipment

- Locomotive fleet renewal—progressive renewal of fleets that are compliant with U.S. EPA emissions standards.
- Distributed power—placing a remote-controlled locomotive within or at the end of a freight train, which provides greater optimum locomotive power assignment and better air distribution for braking, particularly effective when combined with the running of longer trains.

Operations

- Crew training and incentives—training programs that boost awareness of the importance of fuel conservation practices.
- Manual shut-down of locomotive engines—idle shut-down policies in place for locomotives not equipped with anti-idling systems.
- “Block” consolidation of cars with similar destinations—joining cars headed the same way reduces delays and increases fluidity at rail yards and terminals.

⁷ For more information, visit www.railcan.ca/publications/emissions

RESEARCH IN ENVIRONMENTAL IMPROVEMENTS FOR RAIL TRANSPORTATION

Government, industry and academic stakeholders continue to work collaboratively and conduct research to facilitate improvements to rolling stock (e.g. developing and testing novel engine concepts), infrastructure interface (e.g. developing new rail materials) and operational improvements (e.g. examining alternative fuels and fuel sources). Current rail research activities also include improvements to measurement, monitoring and verification methodologies in support of rail emission reductions. Currently, Transport Canada's Transportation Development Centre is undertaking a technology and infrastructure scan to make recommendations on promising emission reduction technologies and research opportunities in this area, to inform regulations and a five year research agenda for future policy development.

Technology

- Anti-idling technologies—these include, for example, automatic stop/start devices that help railways conserve fuel and reduce emissions by automatically shutting down locomotives at rest.
- Low-idling engines—those that idle at a reduced speed when a train is coasting.
- Rail lubrication systems—solutions to reduce friction between the rail and freight cars, thus requiring less engine effort to maintain speed.

Infrastructure

- Improved track structures—enhancements aimed at reducing friction caused by various track features (e.g. sharp curves and uneven roadbeds), as well as investment in double tracking and siding extensions, which lead to efficiency improvements.
- Rail lubrication—trackside flange lubricators and locomotive-mounted wheel flange lubricators to reduce fuel consumption.
- Co-production—sharing of tracks to allow for faster and more efficient operations.

The combined effect of these initiatives and technologies has enabled Canada's Class I freight railways to improve fuel efficiency by approximately 7.3% (CN) and 4.1% (CPR), increasing both the economic and environmental efficiency of rail operations and contributing to the long-term sustainability of Canada's rail freight industry.

8.6 SAFETY

RAILWAY SAFETY ACT REVIEW

In 2007, following a series of high-profile derailments in Quebec, Alberta and British Columbia, the Minister of Transport appointed an independent panel to review the existing *Railway Safety Act* (RSA) and make recommendations for improving both the Act and railway safety in general.

Over one year, the panel gathered input from a full spectrum of stakeholders, including railway companies and their associations, railway unions, shippers, suppliers, other national organizations, other levels of government including municipalities, and the public. These extensive consultations resulted in a final report, *Stronger Ties: A Shared Commitment to Railway Safety*, which included more than 50 recommendations for improving safety in the rail industry. As a result of this report, the federal government introduced the *Safer Railways Act (S-4)* in the Senate on October 6, 2011 to amend the RSA. It was approved on December 7, 2011, and tabled in the House of Commons the following day.

SAFETY MANAGEMENT SYSTEMS

Significant progress has been made over the past several years in the implementation of safety management systems (SMS). In response to *Railway Safety Act* Review recommendations, an SMS working group was formed to improve implementation of SMS throughout the rail industry. This working group—consisting of representatives from Transport Canada, the rail industry and railway unions—updated and published an SMS Guide, which provides tools and resources that detail how to implement SMS. Included are an accepted definition of safety culture, a safety culture checklist, a list of best practices for small railways, and guidance on how to integrate the 12 principles of an SMS required by section 2 of the *Railway SMS Regulations*.

JURISDICTION OF RAIL SAFETY

Railways that cross provincial boundaries are under federal jurisdiction. For these railways—including CN, CPR and VIA, and more than 50 shortline railways—safety is governed by the *Railway Safety Act*.

Transport Canada also has agreements with seven provinces to provide inspection services for railways under provincial jurisdiction.

12 PRINCIPLES OF RAILWAY SMS

1. Railway safety policy and targets are communicated to employees.
2. Authorities, responsibilities and accountabilities for safety are clearly defined at all levels in the railway.
3. Employees and unions are involved in developing a railway's SMS.
4. Systems are in place to identify applicable safety regulations, exemptions and compliance.
5. A process is established for identifying safety issues and evaluating and classifying risk.
6. Risk control strategies exist.
7. Systems are set up for accident and incident reporting, investigation, analysis and corrective action.
8. Systems are in place to ensure employee training and compliance with all safety requirements.
9. Data is collection and analyzed to assess the safety performance of the railway company.
10. Procedures are followed for internal safety audits, reviews, monitoring and evaluations of SMS.
11. Systems are created for monitoring management-approved corrective actions resulting from SMS process and procedures.
12. Documentation describing the systems for each component of the SMS is consolidated.

In 2011, Transport Canada completed work on improving training for Transport Canada SMS auditors to enhance their capacity to assess the safety performance of railway companies.

SAFETY PERFORMANCE DATA

The number of railway accidents has been declining steadily in Canada over the past decade (see Table S1 and Figure S2). From a high of 1,475 in 2005, the number of railway accidents is now down to 1,023, while fatalities were down to 71 in 2011, from a high of 103 in 2005. Most importantly, the accident rate—the number of accidents per million train miles—has been on a downward slope, decreasing from 16 in 2001 to 11 in 2011.

Between 2007 and 2011, crossing collisions were down 22.5% to reach 169 in 2011, while trespassing accidents were down a third to 67 in 2011 (see Tables S3 and S5). Main track derailments, however, have been on the upswing, after sharp declines in 2008 and 2009. In 2011, they reached 103, still one third below levels reported in 2007.

TRANSPORTATION SAFETY BOARD

Transport Canada has made progress on the Transportation Safety Board's (TSB) list of issues and related recommendations.

With respect to the auditing and enforcement oversight of railway safety management systems, guidelines and tools have been developed to assist railways with SMS implementation.

In February 2011, Transport Canada began a Canada-wide study of long-train operations. Phase I preliminary results have been submitted and are under review by Transport Canada, with the objective of developing guidelines for train marshalling and handling.

On November 11, 2011, revisions to Track Safety Rules were approved; these will come into effect on May 25, 2012. The revised rules include significant changes to rail testing requirements (based on tonnage and class of track) and address "poor rail surface" concerns.

Of all TSB recommendations (131), 84% have been fully addressed according to TSB's assessment.

HARMONIZATION

In terms of harmonizing rail safety regulations with other nations, Canada's biggest partner is the U.S. However, in 2011, Canada began working with Mexico to ensure harmonization across North America. Key activities in 2011 were as follows:

- The creation of the Canada-U.S. Regulatory Cooperation Council (RCC) was announced in early 2011. The mandate of the Council is to better align the regulatory approaches of both countries. Work was initiated towards the development of a Joint Action Plan to advance the goals of the RCC.
- On December 7, 2011 an initial Joint Action Plan was released, outlining initiatives where Canada and the U.S. intend to seek greater alignment in their regulatory approaches over the next two years. Two initiatives were identified: the alignment of rail safety standards and the establishment of a joint mechanism to conduct periodic reviews of regulations.
- Acknowledging that rail sustains domestic and international trade—a major role for both countries' economies—the RCC determined that harmonization of regulatory regimes in the rail sector would enhance the efficiency, safety and reliability of this vital mode of transportation.

- Transport Canada and the Federal Railroad Administration (FRA) collaborated in the RCC Rail Safety Bilateral Working Group, tasked with the harmonization of the two countries' rail regulatory regimes.

OUTREACH

Transport Canada's Rail Safety Outreach program continued its work in education and awareness in 2011. Based on RSA Review recommendations, the target audience for the Outreach program is expanding, as the program widens its focus from public education and awareness of trespassing and crossing safety to also include a broad range of rail safety issues for all stakeholders. To that effect, Transport Canada has hired Outreach officers in each region of the country to target as many stakeholders as possible. Transport Canada also provides funding to the Railway Association of Canada for Operation Lifesaver, which enables the Association to create products designed to raise the general public's awareness of rail safety.

INNOVATION

A research project—led by Transport Canada and involving rail industry stakeholders—is underway to investigate factors that influence track-related failures, with the aim of developing tools, methods and technologies to improve track performance. This research also aims to determine more effective and efficient techniques to monitor and identify track-related defects and potential failure conditions on a network-wide basis.

Transport Canada also conducts regular rail-related research to strengthen the safety of Canada's rail sector. Research results are instrumental in providing science-based evidence to inform forward-looking policies, regulations, standards and codes to improve the safety of the Canadian transportation sector. Much of this research is conducted in a collaborative manner through the Railway Research Advisory Board (RRAB)—an industry/government committee mandated to advance the safety of Canada's rail industry. The financial contribution from the federal government is leveraged by at least a 50% contribution from industry.

Sample projects include:

- Visual Behaviour and Conspicuity/Effectiveness of Grade Crossing Elements
- Investigation of Intrusion and Obstacle Detection Systems for Rural and Low Density Rail Grade Crossings
- The first volume of a report on a decision support tool for prioritizing safety improvement programs at high-risk grade crossings

8.7 SECURITY

Several action items in the joint Canada-U.S. Perimeter Security Declaration involve rail security elements, including the Integrated Inbound Cargo action item, which strives to streamline the movement of in-transit cargo to and from the U.S. This activity will include pilot projects led by the Canada Border Services Agency and U.S. Customs and Border Protection, and supported by Transport Canada. One of these preliminary projects will examine the inbound movement of goods along the Prince Rupert–Fort Frances corridor that crosses Western Canada.

One million kilometres of roads. Challenges unique to Canada. Balancing the need to invest with the realities of fiscal constraints. 2007–2011 saw a variety of steps taken to support Canada’s competitiveness in a global economy—and to make its roads safer for all Canadians.

9.1 OVERVIEW OF ROAD TRANSPORTATION

Canada has more than a million kilometres of (two-lane equivalent) roads, roughly 38,000 of which make up the National Highway System (NHS). Please see Addendum Table RO1 for more information. Road transportation is the most important mode for passenger and freight transportation, local (intra-city) and intercity transportation, intra-provincial transportation activities, and trade between Canada and the United States (in terms of value transported).

Canada’s road network is shared by a wealth of different users, including 20 million light vehicles, 750,000 medium and heavy trucks, 15,000 public transit buses, motorcoaches and motorcycles in addition to pedestrians, cyclists and rollerbladers (see tables RO3, RO4, RO5, RO8, RO11, and RO26).

Canada faces many challenges relating to its road transportation infrastructure. Some are unique to the country—such as its extensive land mass and often harsh climate, its high degree of urbanization, and its high level of trade dependency—and some are shared by others, including an aging road and highway infrastructure, limited finances, issues of road safety, and environmental considerations. These challenges increase pressure for more federal, provincial and municipal spending at a time when economic and financial circumstances are forcing all governments to consider new and innovative ways to fund transportation infrastructure.

Given the challenges ahead—including maintaining an efficient road transportation system to support Canada’s competitiveness in a global economy—the need for investment will undoubtedly continue. In coming years, however, government spending at all levels is likely to

be limited given current fiscal situations and competition for funding from social sectors such as health and education.

9.2 2011 YEAR IN REVIEW

ECONOMIC FRAMEWORK AND INFRASTRUCTURE

- Canadian for-hire carriers moved 225 billion tonne-kilometres of freight in 2010, up 8.1% from 2009. Roughly 139 billion tonne-kilometres (61.5%) were carried in the domestic sector and 87 in the international sector (see Table RO17).
- By value, road continues to be the dominant mode of transportation for moving goods between Canada and the U.S. In 2011, 45.1% (\$149 billion) of exports and 73.5% (\$162 billion) of imports were transported between the two countries by truck, representing 56.5% of overall Canada-U.S. trade and 42.7% of all trade between Canada and the world (see Tables EC6, EC7 and EC11).
- The total value of Canada-U.S. trade (inbound and outbound) increased more than 9%, with nearly 82% of Canadian road-based exports to the U.S passing through border crossings in Ontario and Quebec (see Table EC-10).
- At the end of 2010¹ (latest available information), the NHS encompassed 38,069 kilometres of key highway linkages vital to Canada’s economy and the mobility of Canadians (see Table RO1). While an expansion was approved by the Council of Ministers following a review of the NHS in 2005, the system of roadways has not grown significantly since.

¹ The 2010 National Highway System Condition Report, prepared jointly by the federal/provincial/territorial NHS Review Task Force on behalf of the Council of Ministers Responsible for Transportation and Highway Safety.

- 2009 is the most recent year for which road motor vehicle fleet information is available. For that year, the composition of the motor vehicle fleet was as follows: 19.7 million cars, light trucks and vans; and 755,000 heavy trucks (gross weight of at least 4.5 tonnes). In 2009 the light vehicle fleet generated an estimated total of 303 billion kilometres, 3.2% more than in 2008, while the heavy truck fleet was responsible for an estimated 30 billion kilometres (5% less than in 2008 due to the recession). With close to 20 million light passenger vehicles and more than 22 million licensed drivers, this leads to a ratio of more than one car per household in Canada. Tables RO3 to RO9 provide more information on Canada's motor vehicle fleet.
- 90% of consumer expenditures on transportation go to private transportation while the remaining 10% is spent on public transportation. Vehicle purchases and expenses account for 88% of Canadian household spending on transportation (see Table EC-76).
- More than 90% of domestic intercity travel is by car, which can be explained by the fact that most (88%) domestic intercity trips are intra-provincial and over short and medium distances.
- 55.47 million cars and 10.54 million trucks crossed the Canada-U.S. border, an increase of 8% in car traffic from 2010 and less than a 1% increase in truck traffic. Traffic volumes as a whole were 7% higher than 2010 levels (see Tables RO19 and RO20).
- Public transit continues to grow across the country, with new major mass-transit infrastructure projects planned in Montreal, Ottawa, Toronto, Edmonton and Vancouver, and active transportation is becoming more popular, due in part to the introduction of bicycle-sharing programs in Montreal, Ottawa and Toronto.
- In 2010, bus industry revenues (including government contributions) were estimated at \$14.3 billion, a 4.6% increase from the previous year. The public transit sector accounted for 52.5% of total bus industry revenues, excluding government contributions (see Table RO21).
- The provinces continued to respond to a 2010 federal/provincial/territorial task force report recommending that jurisdictions relax the regulatory controls on intercity carriers.

- In Manitoba, an agreement to subsidize Greyhound services was extended until March 31, 2012. The subsidy is for \$3.12 million for fiscal year 2010–11 and \$3.9 million for fiscal year 2011–12.
- For its part, Alberta deregulated intercity bus service on October 1, 2011.
- Several other provinces are evaluating their options, while service abandonments² continue to be moderate. Greyhound, the major carrier, abandoned 12 low-density corridors and reduced service frequency in others, but early indications of possible replacement services emerging were positive.
- In December 2011, Acadian bus services in New Brunswick and Prince Edward Island were halted by a strike, and Groupe Orléans (owner of Acadian) announced that its French parent Kéolis had acquired the remaining 25% interest in the company effective December 31, 2011, making Orléans a wholly-owned subsidiary.

ENVIRONMENT

- In 2009³ greenhouse gas (GHG) emissions from road transportation were 141 Mt CO₂e (carbon dioxide equivalent). Road transportation accounted for 82.5% of domestic GHG emissions from transportation, and 19% of total Canadian emissions (see Figure EN15).
- On-road freight accounted for 63.7 Mt CO₂e, representing 37% of Canadian transportation emissions in 2008, while on-road passenger transportation accounted for 77.2 Mt CO₂e, representing 45% of Canadian transportation emissions (see Figure EN16).
- Road freight transportation's share of transportation air pollutant emissions accounted for 7% of PM_{2.5} (particulate matter less than 2.5 microns in diameter) emissions, less than 1% of SO_x (sulfur oxide) emissions, 20% of NO_x (nitrogen oxide) emissions, 3% of VOC (volatile organic compound) emissions and 2% of CO (carbon monoxide) emissions in 2009.
- Road passenger transportation's share of 2009 transportation air pollutant emissions accounted for 2% of PM_{2.5} emissions, 2% of SO_x emissions, 16% of NO_x emissions, 40% of VOC emissions and 55% of CO emissions.

² Service abandonment means bus routes that were discontinued.

³ The year for which the latest data is available.

- Under the Passenger Vehicle and Light Truck Greenhouse Gas Emission Regulations—which are aligned with U.S. regulations—the Canadian government began regulating cars and light trucks from model years 2011 to 2016.
- In November 2011, Environment Canada published a discussion document on the proposed regulatory approach for GHG emissions from passenger vehicles and light trucks with model years 2017 to 2025⁴ for a 30-day comment period.

SAFETY

- The *Motor Vehicle Safety Act* was amended in 2011 to allow used vehicles to be imported from Mexico, a change tied to a North American Free Trade Agreement commitment. The Act was also amended to allow residents of Canada to bring rental vehicles across the border from the United States into Canada for a period of 30 days or fewer for non-commercial purposes (non-Canadians were already able to bring rental vehicles into Canada).
- The Road Safety Vision 2010 (RSV 2010), Canada's national road safety plan, was replaced by the Road Safety Strategy 2015. With this long-term vision, the Canadian Council of Motor Transport Administrators (CCMTA) hopes to make Canadian roads the safest in the world. Key elements of the new strategy include adoption of a more holistic approach to road safety; establishment of a framework of best practice strategies for use by all stakeholders; and measurement of progress at the national level using the most appropriate rate-based casualty (e.g., fatalities or serious injuries) measures.
- The United Nations has declared 2011–2020 the Decade of Action for Road Safety, the objective being to stabilize and then reduce the forecasted level of road traffic fatalities around the world. If current trends prevail, road fatalities will become the fifth leading cause of death in the world. Canada was one of the sponsoring countries for this initiative, which is coordinated by the World Health Organization.
- 2011 was the Year of Road Safety in Canada, and several actions and initiatives were introduced to improve road safety and to support the United Nations'

Decade of Action for Road Safety and Canada's Road Safety Strategy 2015.

SECURITY

- A number of action items in the joint Canada-U.S. Perimeter Security Declaration will involve road security elements, including the Integrated Inbound Cargo action item, which strives to streamline the movement of in-transit cargo to and from the U.S. This action item will include pilot projects led by the Canada Border Services Agency and U.S. Customs and Border Protection and supported by Transport Canada. One of these pilot projects will examine the inbound movement of goods by truck from the Port of Montreal to the U.S. border

9.3 2007–11 RECAP

ECONOMIC FRAMEWORK AND INFRASTRUCTURE

A variety of transportation vehicles of different sizes and configurations use the Canadian road network, including automobiles, buses, motorcycles and trucks. Vehicles sharing the roads are used for private or commercial passenger or freight transportation activities.

TRUCKING

For-hire trucking activity has increased, and in 2011⁵ its real gross domestic product (GDP) was 6.3% higher than in 2006. Activity slowed during the economic downturn of 2008–2009 (in 2009 it was 5% lower than in 2006) but grew strongly in 2010–2011⁶. Employment has been slow to recover: in January 2011, for-hire trucking employed 2.9% fewer workers than in January 2006.⁷

The decrease in for-hire trucking activity was evident in both domestic and trans-border traffic, although less severe in the trans-border sector. In 2009⁸ the tonne-kilometres of domestic traffic was 6.3% lower than 2006, compared to a 4.4% decrease in trans-border traffic.

4 <http://www.ec.gc.ca/lcpe-cepa/default.asp?lang=En&n=F24B936F-1>

5 For 2011, the value is the third-quarter GDP annualized and seasonally adjusted.

6 GDP from SC # 15-001; employment from SC # 72-002.

7 Owner-operators working under contract for for-hire carriers are not reported as employees. Actual employment (employees plus owner-operators) may show a different trend, depending on the owner-operator numbers.

8 Tonne-km data from Transport Canada's 2009 Annual Report Addendum, Table RO17.

INTERCITY BUSES

Until 2009, the commercial intercity bus industry and the regulatory regime under which it operated appeared stable and indicated modest growth. In return for continuing service on low-density routes, the commercial intercity industry of most Canadian provinces operated under rules that protected carriers from competition in higher-density markets. Charter and tour operators were largely deregulated and operated under a different set of regulations.

In reality, however, low-density rural and small community services were catering to markets on the decline due to more people owning cars and aging populations with fewer travel needs. Bus parcel express services were a source of revenue for many routes, sometimes ensuring profitability, but these have gradually faced increasing competition from the courier industry, reducing the viability of intercity bus services to smaller communities.

In 2009, Greyhound Canada—the largest Canadian intercity carrier—informed the federal government and the provinces and territories where it operated that it was losing money on its low-density routes, and that without financial support or changes to the regulatory regime, it would not be able to maintain current service levels. In the same year, Groupe Orléans sought permission from regulators in Nova Scotia and New Brunswick to reduce service on routes driven by its subsidiary, Acadian. Similar developments were observed across Canada to some extent, with the exceptions of Newfoundland and Labrador and Nunavut.⁹

In response to these developments, Canada's federal, provincial and territorial governments established a task force on intercity bus services. A report released in September 2010 recommended that individual provinces adjust their regulatory regimes to make it easier for carriers to make service changes and for new, alternative and replacement services to enter the market.

Establishment of the task force led to bilateral discussions between carriers and provinces, even as the task force was working. In Manitoba, for example, Greyhound negotiated an agreement with the province in 2010 under which it would continue service in return for a subsidy. In several other provinces, carriers continued to work through the regulatory process.

The industry's financial position appears improved, but pressure on regulating provinces to relax controls will continue to be a major theme in Canadian bus regulation in the immediate term.

Curbside intercity bus service is a niche market in Canada and the United States. Generally, companies in this sector sell tickets on the Internet; use an airline pricing model; pick customers up at various downtown curbside locations; and provide more amenities than standard bus services (for example, reserved premium seating, Wi-Fi and snack bars). Coach Canada and MegaBus have entered this market, operating between Buffalo and Toronto and between Toronto and Montreal. To serve commuters, Ontario's GO Transit has recently expanded into intercity markets such as Kitchener, St. Catharines and Peterborough via bus and/or rail service.

ROADS

Since 2006–2007, close to \$17.4 billion has been invested in the NHS by all levels of government, with amounts increasing from \$2.3 billion in 2006–2007 to \$4 billion in 2010/2011, peaking at \$4.5 billion in 2009–2010.¹⁰ These investments from 2006–2010 have been used to extend the NHS with pavement rated in good condition by 12% (2,600 km), and to decrease the length of pavement in poor condition by 22% (800 km). During this same period, the length of unpaved NHS decreased by more than 24% (800 km).

The NHS also has more than 8,700 bridges, 60% of which are more than 30 years old. Due to increased government investments, however, the number of bridges less than 10 years old increased by 16% between 2006 and 2010, from 896 to 1,223. In contrast, aging infrastructure remains an issue as the number of bridges 50 years or older went from 870 to 1,318 between 2006 and 2010, an increase of more than 50%. Since 2007, almost 700 bridges on the NHS have either been rebuilt or have undergone major rehabilitation.

Between 2005 and 2008 (latest available data), total travel on the NHS increased by more than 6% (from 119 to 127 billion vehicle-kilometres), while truck travel increased by approximately 9% (from 18 to 19.6 billion vehicle-kilometres). Almost 93% of car travel and 95% of truck travel in Canada occurred on the Core National Highway System.¹¹

9 There is no intercity bus service in Nunavut.

10 The 2010 National Highway System Condition Report prepared jointly by the federal/provincial/territorial NHS Task Force on behalf of the Council of Ministers Responsible for Transportation and Highway Safety.

11 Core routes are a subset of the National Highway System and pertain to key interprovincial and international corridor routes, including links to intermodal facilities or major border crossings.

While the number of collisions on the NHS remained relatively stable between 2005 and 2008, the number of injuries per year decreased 10% and fatalities by about 30% over the same period.

Observing 2005–2008 trends, the injury rate for the NHS is considerably lower—approximately 50% lower—than for Canada’s road network as a whole. While the fatality rate for the Core National Highway System is lower than for all roads in Canada, fatality rates on the Feeder and Northern and Remote National Highway Systems are higher than the Canadian average.

LAND BORDER CROSSINGS

The value of two-way trade between Canada and the U.S. using NHS border crossings decreased by about 18% between 2006 and 2010, while the value of tourism crossing the borders saw a modest growth of 2% over the same period.

Current challenges at the border are a result of balancing trade with increased security in a post-9/11 world. The perceived difficulty of importing and exporting goods is mainly related to increased paperwork, border delays, costs and regulatory requirements. Some industries, such as computer and electronic products and aerospace, have been affected more than others.¹²

PUBLIC TRANSIT

Since 2007, public transit has experienced an upswing in ridership and activity. Those five years were marked with the opening of a new SkyTrain line, the CanadaLine in Vancouver and expansion of Montreal’s subway into Laval. Toronto and Montreal both placed important orders to renew part of their subway’s rolling stock, with Toronto’s new Bombardier trains starting to come into service in July 2011. Calgary saw an expansion of its C-Train network with the opening of the McKnight (2007) and Crowfoot (2009) stations. Two additional stations are planned to open in 2012.

Meanwhile, there has been an increased connectivity between public transit and airports, to the benefit of travellers, meeters and greeters, and airport employees. Vancouver’s CanadaLine, as well as Calgary’s Route 300 Bus Rapid Transit and Montreal’s 747 bus line, are all examples of new direct public transit access to airports

inaugurated during that five-year span. They join other existing services, such as Ottawa’s 97 Transitway bus line, between the airport, downtown and Bells Corners, Toronto’s 197 Rocket connecting Pearson International Airport with Kipling Station, and Winnipeg Transit’s bus routes 15 and 20, which both travel between the airport and downtown. Edmonton International Airport is expected to have a bus rapid transit service in place in the spring of 2012.

ENVIRONMENT

Between 1990 and 2008, GHG emissions from light-duty vehicles (LDVs) increased by approximately 14 Mt CO₂e—approximately 1% per year or 21% overall—from 71.7 Mt CO₂e to 86 Mt CO₂e. This can be attributed to population growth and increased passenger activity as well as a shift towards less efficient light trucks and sport utility vehicles. From 1990 to 2009, the share of total emissions generated by air pollutant emissions from light-duty vehicles declined, in general. Between 1990 and 2009, PM_{2.5} emissions fell by around 2,600 tonnes, SO_x emissions by 11,443 tonnes, and NO_x and VOC emissions by approximately 366,000 tonnes and 411 thousand tonnes, respectively; carbon monoxide also fell by around 5 Mt.

Between 2008 and 2020, GHG emissions from LDVs are forecast to decline by 0.6% annually, representing a drop from 86 Mt CO₂e in 2008 to 80 Mt CO₂e in 2020. Implementation of both the Passenger Automobile and Light Truck Greenhouse Gas Emission Regulations for model years 2011 to 2016 and the Renewable Fuels Regulations account for most of the expected decline. However, this estimate does not take into account the planned 2017 to 2025 model year GHG emission regulations. Without GHG emissions regulation for LDVs, total emissions from LDVs would rise over the same period from 86 Mt CO₂e to 89 Mt CO₂e. Also during the 2008–2020 period, GDP is expected to grow by 1.9% and population by 0.9% per year—or 25% and 12% overall, respectively.

From 1990 to 2008, GHG emissions from medium- and heavy-duty vehicles (M/HDV) increased by approximately 27 Mt at an average of 3.9% per year—or 96% overall—increasing from approximately 28 to 55 Mt. This can be explained in part by the growing share of freight being moved by trucks.

¹² Statistics Canada (2008). *Canada-U.S Border Survey*.

H DVs contribute primarily to NO_x emissions and only marginally to other air pollutant emissions. All HDV-related air pollutant emissions fell significantly from 1990 to 2009 period: PM_{2.5} emissions by 13,196 tonnes; SO_x emissions by 21,079 tonnes; NO_x and VOCs by 88,496 tonnes and 43,302 tonnes, respectively; and CO emissions by 695,934 tonnes.

Starting with model year 2007, HDV engines were required to meet the 2007–2010 emission standards in the On-Road Vehicle and Engine Emission Regulations that fall under the *Canadian Environmental Protection Act 1999*. These are aligned with U.S. regulations. On May 21, 2010, Canada and the United States each announced that they would regulate GHG emissions from new on-road HDVs, with the proposed Canadian regulations also being harmonized with those of the U.S.

On October 25, 2010, the U.S. released proposed regulations to reduce GHG emissions from new on-road HDVs of 2014 and later model-years. On the same day, the Government of Canada released an initial consultation document to seek early stakeholder views.

SAFETY

Road Safety Vision 2010 (RSV 2010) was Canada’s national road safety plan from January 2002 to December 2010, and the overall quantitative target of the plan was to reduce during this period the average number of road users killed or seriously injured in traffic collisions by 30% or more. The provinces and territories engaged in a number of initiatives to raise awareness and improve road safety in their jurisdictions. A mid-term review of RSV 2010 prompted most jurisdictions to develop new initiatives or increase their efforts in three major road safety areas: drinking and driving, non-use of seat belts, and speeding/aggressive driving. A summary report of RSV 2010’s progress will be completed once final road-safety data from all provinces and territories becomes available.

Since 2008, Canada has held the annual National Day of Remembrance for Road Crash Victims on the Wednesday following the third Sunday in November. This day helps Canadians remember and pay their respects to those who have died or been affected by road crashes, and reminds Canadians of the importance

of driving safely.

Between 2007 and 2011 some 2,157 vehicle recalls were announced¹³, or on average 431 per year. 2010 alone saw a record 468 recalls.

SECURITY

Increased security requirements at the border have led to complaints about longer wait times. Both Canada and the U.S. have responded in a number of ways, including upgrading and adjusting infrastructure; increasing staffing levels; implementing technological solutions; rebalancing finite resources; and initiating programs to expedite low-risk goods and travellers. Efforts continue to be made to standardize and improve the collection and dissemination of border wait times.

9.4 ECONOMIC FRAMEWORK AND INFRASTRUCTURE

TRUCKING

The trucking industry, which includes 56,800 firms, consists of for-hire¹⁴ carriers, private¹⁵ carriers, owner-operators¹⁶ and courier¹⁷ firms. Another trucking category of “other” includes all trucks used for purposes other than hauling freight commercially—for example, a construction company using trucks for hauling heavy machinery to a job site.

Fleet size, equipment type, geographic scope of operations, service type and type of freight carried all differentiate trucking firms. Results from Statistics Canada’s 2010 Annual Trucking Survey¹⁸ show that the national fleet in 2010 included 121,000 road tractors, 61,000 other power units and 302,000 non-powered units such as trailers, vans and flat beds.

Trucking firms employed 201,000 persons in 2010, including 128,000 salaried drivers, and an additional 54,000 owner-operators.

The Annual Trucking Survey also indicated that the trucking industry reported \$40.8 billion in operating revenue in 2010, a 4.9% increase from 2009. Operating expenses were up 4.6% to \$37.9 billion. The increase

13 This includes tires and car seats, although the number of recalls for these products is very low.

14 For-hire means hauling freight for compensation.

15 Companies hauling their own freight.

16 Individuals who own and operate their own trucks and operate as independent for-hire truckers, hauling trailers for other carriers or directly for a shipper.

17 Couriers operate trucks for delivering same-day, overnight or later letters and parcels.

18 see CANSIM tables 403-0008 to 403-0015 at <http://www5.statcan.gc.ca/cansim/a03?lang=eng&pattern=403-0008..403-0015&p2=31>

in operating expenses was led by vehicle fuel expenses (up 12.2%), followed by insurance premiums (up 5.9%) and salaries, wages and benefits (up 5.6%). The industry's operating margin increased 10.0% to \$2.9 billion.

The 4,800 largest businesses (those with annual operating revenue of \$1.3 million or more) recorded a 6.0% increase in operating revenue and a 4.5% rise in operating expenses, while the remaining smaller firms reported a 2% increase in revenues and a 4.7% growth in expenditures.

Long-distance trucking firms reported \$26.7 billion in operating revenue, up 3.0%, while local trucking businesses reported revenues of \$14.1 billion, up 8.8% in a year. Domestic freight movements accounted for 77% of total revenues, with the remainder split almost evenly between transborder import and export movements.

Pressures that have shaped the trucking industry recently will continue for at least several more years. To remain competitive, truck carriers must continue to find operational efficiencies to offset rising input costs, as tightening environmental regulations will likely lead to more expensive trucks, fuel costs will continue to climb, and higher environmental, safety and technical standards will require improved equipment and procedures. Increasingly stringent safety and security requirements may shrink the pool of potential drivers, which is problematic as recruiting and retaining qualified drivers is already difficult when demand for trucking is strong. Road congestion in urban areas is growing and creating delays for freight originating, terminating

or moving through these areas. The trans-border trucking industry continues to face challenges associated with the increased security measures implemented after 9/11—measures that often result in border delays and additional regulatory requirements that increase industry costs. While these factors are challenging, carriers have a history of thriving by adapting to changing circumstances.

In 2011, some large trucking firms continued to consolidate their business activities through acquisitions and mergers. For example, TransForce Inc., which owns Canada's largest truck fleet, continued to increase and diversify its business activities in 2011 mostly through acquisitions in the package and courier business. TransForce acquired the Canadian operations of DHL in spring 2011. It is expected that TransForce will continue to grow, as the company is looking for more acquisitions south of the border.

LONG COMBINATION VEHICLES

In Canada, any combination of vehicles more than 25 metres in overall length is considered to be a Long Combination Vehicle (LCV). The LCV truck configuration was introduced more than 25 years ago in Nova Scotia, New Brunswick and Ontario; as a result, LCVs are now allowed on some roads in all provinces/territories except Newfoundland and Labrador, Prince Edward Island, the Yukon and Nunavut. The federal-provincial-territorial memorandum that defines Canada's nationally accepted trucks was amended three times¹⁹, introducing, among other things, an exemption for a "boat tail" aerodynamic device up to two feet long (when measuring the length of a truck), an exemption for an auxiliary power unit (when measuring the weight of a truck), and an increase in the maximum weight permitted on a wide-base single tire to match U.S. levels. Common configurations of LCVs observed in Canada include a tractor pulling:

- two long trailers 48' (14.6 m) or 53' (16.2 m), called *Turnpike Doubles*;
- one long 48' or 53' (14.6 m or 16.2 m) trailer (14.63 m or 16.15 m) and one short 28' or 28.5' (8.5 m or 8.7 m) trailer, called *Rocky Mountain Doubles*; or
- three short 28' or 28.5' (8.5 m or 8.7 m) trailers, called *Triples*.

JURISDICTION OF TRUCKING IN CANADA

Trucking is mainly under provincial and territorial jurisdiction. Interprovincial and international trucking services fall under federal jurisdiction, while operations run solely within one jurisdiction fall under that jurisdiction's authority. Contrary to other modes of freight transportation, the federal government's role in trucking is limited when it comes to regulation and policy. This stems from the fact that most roads used by trucks are owned and maintained by provincial, territorial or local governments, and that in 1954 the federal government delegated its responsibility under the *Motor Vehicle Safety Act* for regulating extra-provincial truck operators to the provinces. The federal government has an interest in trucking vehicle standards under the *Motor Vehicle Safety Act*, in the transportation of dangerous goods, and with respect to its responsibility for international road border crossings with the United States.

19 In 2008, 2009 and 2011.

While triple trailers are still common in the United States, their popularity has decreased in Canada. The LCV configuration currently observed is primarily Turnpike Doubles, used only on divided four-lane highways and found in British Columbia, Alberta, Saskatchewan, Manitoba, Ontario, Quebec, New Brunswick and Nova Scotia. Rocky Mountain Doubles are used on both divided four-lane routes and some designated two-lane highways in British Columbia, Alberta, Saskatchewan, Manitoba and the Northwest Territories. While still legal in Quebec, they are not a popular choice.

LCV permits specify the conditions under which LCVs are allowed to operate; for example, with a set of equipment upgrades²⁰; highways on which they can be driven; time of day/of year they can be driven²¹; weather conditions; stringent driver qualifications; and speed restrictions. The completion of continuous four-lane highways across the Prairies and within New Brunswick and Nova Scotia has increased the attractiveness and feasibility of longer distance, interprovincial LCV operations. Provincial and territorial governments are working to harmonize conditions contained in special permits issued for the operation of LCVs.

INTERCITY BUSES

Approximately 1,500 bus service operators currently exist in Canada. Bus transportation industry groupings include urban transit systems, interurban and rural bus transportation (scheduled intercity), school and employee bus transportation; charter buses; other ground passenger transportation (shuttle); and scenic/sightseeing transportation. Urban transit is the largest segment²² of the bus transportation industry, followed by the school bus segment, intercity bus operations and the charter/tour bus segment.

The commercial bus industry consists of several somewhat distinct markets, the two most important being intercity and charter/tour. The intercity and charter/tour markets have different passenger bases and service patterns. Intercity operators predominantly use motor coaches, and while many charter carriers do as well, they also use smaller buses and a range of specialized equipment.

Intercity scheduled bus operators are competing with air and passenger rail transportation in markets where bus is a reasonable alternative; competition with transit is confined to the longer-distance commuter market surrounding larger cities.

In most of Canada, the intercity bus passenger base is heavily weighted towards youth, the elderly and the economically disadvantaged. In 2010, a survey conducted for the Canadian Bus Association—which represents the major carriers—established that 30% of its riders were students and children, while another 25% were older than 55. Almost 40% were from households with an annual income of less than \$25,000, and less than 40% had access to a car on the day of the survey. Surveys from the 1990s and earlier show comparable results.

On the surface, both intercity and charter operators serve discretionary travel markets. This is especially true for charters, where tourism is a major source of revenues—particularly for high-end coach charters and for urban tour bus operators on a seasonal basis. Most riders use intercity bus travel for personal reasons (for example, visiting friends and family). Much of this casual travel is also seen in personal automobile use, reflecting the fact that many bus travellers do not have access to a car. On the charter side, market fluctuations tend to directly echo the state of the economy; the intercity market is steadier, but the passenger base is static or shrinking.

The challenge for operators in the intercity market is to attract a wider spectrum of users to expand the market. However, the industry has been slow to reinvent itself, even in markets like the United States where it has been deregulated since the early 1980s.

In recent years, some see the rapid growth of curbside bus service in the United States as a sign of industry regeneration. This service typically operates between downtown city pairs, relies on web-based ticket sales, and—as the name suggests—does not use fixed bus terminals. In the U.S. it has had some success in attracting business travel, and in some markets it has built a routine client base. However, it is unclear how large the potential market may be for this type of service.

20 Engine retarder or driveline retarder (hydraulic type) with minimum rated retardation horsepower capacity; a maximum gross weight-to-power ratio of 150 kg per one horsepower; adequate gearing and powering of the power unit to be able to maintain speeds on level ground; and an anti-lock braking (ABS) system.

21 Operating restrictions in or through urban areas during rush hours, at the start and end of long weekends.

22 The term “segment” refers to the main activity of a company. The industry can also be looked at in terms of lines of activities. So a company can be in more than one line of bus activities (urban transit, school bus, intercity operations, charter and tour operations); its segment will be its main line of activity, i.e., the one generating the largest share of its total revenues.

The curbside concept is already familiar in some Canadian markets (e.g., MegaBus service between Montreal and Toronto), but the application is likely to be limited as it requires large-population city pairs—of which Canada has few—and minimal economic regulation to work successfully. In Canada, the expansion of curbside bus services is constrained by entry control in most of the country, making it difficult for new players to enter the intercity bus market. However, the situation may change in some provinces; for example, a federal/provincial/territorial task force report in 2011 recommended that jurisdictions relax regulatory controls on intercity carriers. In October, Alberta became the first large province to completely deregulate its intercity bus service. Other provinces are also evaluating their options and may move towards a more deregulated regime.

The intercity bus industry has taken concrete steps to improve vehicle accessibility for those who are mobility challenged. An intercity bus working group consisting of the Canadian Bus Association, Motor Coach Canada, l'Association des propriétaires d'autobus du Québec, Greyhound Canada and Orléans Express recently collaborated to update the Intercity Bus Code of Practice. The Code establishes the standards for accessible intercity bus services for persons with disabilities, and contains new accessibility provisions that include the following: confirmation of reservations for accessible services; public announcements and signage; courtesy seating on buses and in terminals; relieving areas for service animals; carriage of mobility scooters as baggage; the use of lifts and ramps; boarding and disembarking at flag stops; accessibility of websites; and consultation with persons with disabilities.

Greyhound Canada has designed a ramp to help bus operators load heavy mobility aids such as scooters into the baggage compartment. There is also a growing trend of intercity bus operators using low-floor buses, which allow level boarding entry and eliminate the need for wheelchair lifts. Intercity bus operators also offer free transportation for personal care attendants accompanying persons with disabilities.

INFRASTRUCTURE

Canada has more than one million kilometres of two-lane equivalent roads, 40% of which is paved; a subset of these roads has been designated as the National Highway System (NHS)—a network that is important from a national, regional and northern and remote perspective.

The vast majority of Canadian highways, including the NHS, fall under provincial, territorial or municipal jurisdiction, so these governments are mainly responsible for the planning, design, construction, operation, maintenance and financing of the road network, including placing tolls on roads and highways within their jurisdictions. Highways running through national parks as well as a section of the Alaska Highway are the exceptions to this. While more than 95% of the NHS is owned and operated by provincial and territorial authorities, NHS highways through national parks and a section of the Alaska Highway account for another 3%; the remaining 2% fall under municipal jurisdictions.

As of 2010, the NHS encompassed more than 38,069 km of key highway linkages that are vital to both the economy and mobility of Canadians, and is comprised of three categories of routes, each defined by specific criteria that can be used to assess route eligibility:

- **Core Routes:** key interprovincial and international corridor routes (including links to intermodal facilities and important border crossings).
- **Feeder Routes:** key linkages to Core Routes from population and economic centres (including links to intermodal facilities and important border crossings).
- **Northern and Remote Routes:** key linkages to Core and Feeder routes that provide the primary means of access to northern and remote areas, economic activities and resources.

Compared to other developed nations, highway and bridge tolls in Canada are limited; at the end of 2011, the country had 15 bridges, one international border crossing tunnel and three road segments that were tolled (see Addendum Table RO2A). In addition to a small handful of domestic bridges, all international bridge crossings between Canada and the United States are tolled; domestic toll bridges include Confederation Bridge (between Prince Edward Island and New Brunswick) and two in the greater Halifax region. A notable example of a toll road is Highway 407 (owned and operated by a private consortium) in the Greater Toronto Area (GTA).

Over the last 20 years, the largest share of transportation infrastructure funding has been for new construction, while only a small portion has gone toward rehabilitation work. In the case of highways and roads, new construction consistently accounted for about 80% of investment budgets, leaving 20% for road network rehabilitation.²³ The distribution of funding for bridges and overpasses was similar to that for highways and

23 Statistics Canada. <http://www.statcan.gc.ca/pub/11-621-m/11-621-m2008067-eng.htm#t1> and <http://www.statcan.gc.ca/pub/11-621-m/11-621-m2006035-eng.htm>

roads during the 1990s, although rehabilitation of these assets has consumed a larger share in recent years—up to 30%.

The federal government invests in highway and road infrastructure through federal funds administered by Transport Canada and Infrastructure Canada. All land border crossings and most international bridges are owned or operated by the federal government directly or indirectly via Crown corporations or operating authorities. The Canadian government (through the Federal Bridge Corporation Limited, FBCL) also owns and maintains several strategic assets in Quebec. FBCL also oversees and manages the Canadian portions of several international bridges, including the Thousands Islands Bridge, the Seaway International Bridge and the Sault Ste. Marie International Bridge.

The rest of Canada's road network, basically its vast majority, is under provincial, territorial and municipal jurisdictions, and the federal government's policy role is limited to promoting road safety and developing strategic highway and infrastructure policies that support the best possible transportation system. Over the years the Government of Canada has provided cost-shared funding for constructing and expanding portions of the NHS and some local roads through various funding programs.

The role of provincial and municipal governments is to build, maintain and operate highways, roads and streets. In areas of provincial and municipal jurisdiction, public asset ownership has expanded as road and highway networks have grown; public spending has increased accordingly to support this network. For example, in 1996 the length of public roads (both paved and unpaved) was estimated at 900,000 km, while in 2008 it was estimated at 1,042,300 km, representing a 15.8% growth. Together, all levels of government spent \$28.9 billion on roads and highways in 2009–10, almost 80% more than just five years ago.

After several years of heightened spending to meet transportation needs and to counter the effects of the economic crisis, governments across Canada, including the federal government, have turned their attention to managing or reducing deficits. Limited government spending will intensify competition between various sectors (e.g., transportation, health, education and environment) for increasingly scarce resources. In addition to public sector deficits and debt, the economic downturn has also constrained the availability of private capital to fund transportation projects.

Many jurisdictions are beginning to investigate or consider alternative means of financing public infrastructure—including roads and highways—such as tolls, other user charges and public-private partnerships.

FEDERAL BRIDGES

The *Constitution Act* gave provincial and territorial governments jurisdiction over infrastructure works such as highways and—by extension—bridges, with the exception of international or interprovincial structures. Despite these constitutional provisions, the federal government has an inventory of some 500 highway-related bridges open to the public, representing a very small subset (approximately 1%) of all bridges in Canada. These bridges are the responsibility of four federal departments/agencies: Public Works and Government Services Canada, Parks Canada Agency, the National Capital Commission (which owns and operates its own structures) and Transport Canada, whose portfolio of bridges is managed by Crown corporations or shared governance regimes (FBCL, Blue Water Bridge Canada, Buffalo and Fort Erie Public Bridge Authority [Peace Bridge Authority] and the St. Lawrence Seaway Management Corporation).

The FBCL, together with its three subsidiaries—the Jacques Cartier and Champlain Bridges Incorporated, the Seaway International Bridge Corporation, Ltd. and St. Mary's River Bridge Company—owns, manages and operates several important bridges in Ontario and Quebec. In 2011–12 the FBCL was responsible for more than \$216 million in operating and capital funding used on major multi-year projects such as the Sault Ste. Marie customs plaza rehabilitation; the new low-level North Channel Bridge in Cornwall; the Honoré Mercier Bridge rehabilitation in Montreal; the third year of the major repair program of the Champlain Bridge in Montreal; and the first of a three year safety repair and asset preservation program in Montreal on Highway 15, the Bonaventure Expressway, the Jacques Cartier Bridge, the Honoré Mercier Bridge, the Melocheville Tunnel and the Champlain Bridge Ice Control Structure.

On October 5, 2011, the Government of Canada announced that it will proceed with the construction of a new bridge over the St. Lawrence in the vicinity of the current Champlain Bridge in the Montreal area. The existing six-lane bridge is 50 years old and is the busiest bridge in Canada, with estimated annual totals of 11 million public transit commuters, 60 million trips and \$20 billion of international trade crossing the bridge. Over the coming months, the government will hold important discussions with partners to determine the most effective and efficient way of moving this project forward.

Further upstream from the existing Champlain Bridge will be a new bridge over the St. Lawrence Seaway constructed as part of the Highway 30 completion project. This \$2.5-billion project will be financed by the Government of Quebec (\$1.84 billion) and the federal government (\$704.5 million), and will act as a bypass

around the Island of Montreal, helping reduce road congestion. The new highway will facilitate access to markets in Ontario, the Maritimes and the U.S. by improving connections between Highways 10, 15, 20, 30, 40 and 540.

The western part of the project involves building a four-lane divided highway (a two-lane carriageway in either direction) over a span of 42 km between Vaudreuil-Dorion and Châteauguay; it also includes a 1,860-metre bridge over the St. Lawrence River and a 2.55-km bridge across the St. Lawrence Seaway at the Beauharnois Canal. The western part of the project is being built under a public-private partnership between Quebec and Nouvelle Autoroute 30, S.E.N.C., a private partner, an arrangement chosen for several reasons, including cost, construction timetable and risk management.

The federal contribution to the project, which will cover the cost of the bridge, is the largest contribution ever made by the federal government to a road infrastructure project. This funding is managed through a contribution agreement under the Building Canada Fund signed on March 24, 2011 with the Government of Quebec.

Construction on the western part of the project began in February 2009, and it is expected that the 42-km stretch will open in December 2012, completing the work on Highway 30 between Vaudreuil-Dorion and Candiac.

Another bridge project spearheaded by the federal government is the construction of a new bridge in the Windsor-Detroit area. The Ambassador Bridge, which links Windsor to Detroit, sees 25% of all Canada-U.S. trade, making it—and is the busiest commercial land border crossing in North America. Hundreds of thousands of Canadian jobs depend on the ability of manufacturers and shippers to efficiently move goods at this critical corridor. Trade moving through the Windsor-Detroit gateway is expected to continue increasing well into the future. A secure and efficient Windsor linkage is and will remain vital to the current and future economies of both countries.

The Detroit River International Crossing (DRIC) project, referred to in Michigan as the New International Trade Crossing (NITC)—has been in development by Transport Canada for more than a decade. Following one of the most extensive transportation environmental

assessments ever undertaken in Canada, the project received environmental clearances in both Canada and the United States as well as the support of communities, private sector users and governments in both countries.

The project includes a new six-lane bridge; the 11-km Windsor-Essex Parkway (connecting Highway 401 to the new bridge); state-of-the-art inspection plazas on both sides of the border; and highway connections to U.S. interstates 75 and 94 in Michigan. The new DRIC/NITC crossing will serve to handle the anticipated growth in trade and volumes of trade traffic that will be using the Windsor-Detroit crossing.

Construction of the Windsor-Essex Parkway began in 2011, with the Government of Canada—which is partnering with the Ontario government on this project—funding up to 50% of the eligible capital costs.

The new crossing will be publicly owned and is expected to be built using a public-private partnership (P3). Given the importance of this new crossing to the economic security and future prosperity of both Canada and the U.S., the federal government has indicated to Michigan that it is prepared to increase its financial participation in this project, up to a maximum of US\$550 million; this increased financial participation is for project components in Michigan that would not be funded by the P3 or the U.S. government.

In Canada, all non-bridge international crossings are built, owned and operated by the Canada Border Services Agency (CBSA). Where bridges or tunnels form part of the crossing and a toll or other charge is payable, the owner or operator of the bridge or tunnel is responsible for the construction and maintenance of CBSA inspection facilities associated with the crossing, free of charge.²⁴

LAND BORDER CROSSINGS

In 2011, 10 of the 20 largest border crossings in Canada recorded higher truck traffic from the previous year, while truck activity at Canada's busiest border crossing, the Ambassador Bridge, decreased by 2.0% from the previous year.

24 Section 6 of the *Canada Customs Act* (R.S.C. 1985.c.1 [2nd Supp.]).

Nearly 73% of Canada-U.S. trade (by value) carried by trucks took place at six border crossings: Windsor (Ambassador Bridge), Fort Erie (Peace Bridge/Queenston-Lewiston Bridge (combined)), Sarnia (Bluewater Bridge), as well as Lacolle, QC, Emerson, MB, and Pacific Highway, BC (see Table EC10). The top 10 border crossings process more than 91.5% of truck traffic. The composition of goods carried by truck varies by region and by border crossing, but the top five imports and exports carried by truck in 2011 were: machinery and electrical equipment (29.5% of imports and 19.7% of exports); other manufactured and miscellaneous goods (16.4% of imports and 20.1% of exports); plastics and chemical products (11.4% of both imports exports); automobiles and other related materials (19.2% of imports and 17.7% of exports); and agricultural and food products (9.3% of imports and 11.8% of exports) (see Table RO18).

URBAN TRANSPORTATION

Lower-mainland British Columbia

Vancouver 2010 Winter Olympic Games legacy

The Vancouver 2010 Winter Olympic Games were the largest and logistically most complicated event ever held in Metro Vancouver. An estimated 5,500 athletes and officials from more than 80 countries, 10,000 media members, 25,000 volunteers and 1.6 million event ticket holders travelled between different Olympic sites and created additional demand on the road system. Olympic Lanes were implemented to support Games-related traffic demand, which consequently took away road capacity for general traffic. Several roads were closed due to security reasons and some corridors were converted to dedicated pedestrian-only lanes, which further reduced road capacity. As a result, the road capacity to and from downtown core was reduced by up to 50%.

In preparation, the Olympic and Paralympic Transportation Team (OPTT) was formed to develop an integrated transportation plan for the event. The OPTT was a multi-disciplinary team consisting of the Vancouver Organizing Committee (VANOC), the City of Vancouver, Resort Municipality of Whistler, TransLink, BC Transit, B.C. Ministry of Transportation and Infrastructure, Vancouver Integrated Security Unit, City of Richmond, District of West Vancouver and Transport Canada.

Prior to the Games, and after months of planning, the OPTT released its 2010 Olympic Integrated Transportation Plan with the goal of reducing vehicle traffic to the downtown core by at least 30%. Measures taken include: (1) discouraging use of private vehicles; (2) increasing public transit service in Metro Vancouver and the Sea to Sky region; (3) using dedicated pedestrian corridors along key routes to move people; (4) extending parking restrictions; (5) introducing curbside stopping and turning restrictions; (6) prohibiting spectator parking at venues; and (7) offering free secure bicycle parking at venues.

During the Games, TransLink reported a large increase in transit ridership: bus ridership increased by 34%, and ridership for the SeaBus and Canada Line doubled, while ridership on the Expo and Millennium Lines SkyTrain increased by 54%, and West Coast Express by 78%.²⁵

After the Games, the City of Vancouver highlighted the success of the Plan with the following figures that further demonstrated the willingness of Vancouverites to use alternate modes of transportation rather than private vehicles:

- The transportation network accommodated 44% more person trips to and from downtown.
- Walking, cycling and transit to downtown more than doubled over 24 hours.
- Vehicle trips to and from the downtown core decreased by 29%.
- Average vehicle occupancy to and from the downtown core increased by 14% over 24 hours.
- Almost 80% of spectators at downtown venues walked, cycled or took transit.
- More than 350,000 people used the downtown pedestrian corridors during business days.²⁶

Wanting to leave Vancouver with a lasting legacy of transportation, many of the initiatives implemented during the games have been continuously pursued by the agencies comprising the OPTT. For example, the City of Vancouver has established a permanent screen line count program for vehicles, bicycles and pedestrians in and out of the downtown core, as part of the City's continued effort to monitor transportation usage by mode

25 TransLink (2010). *Moving the World: Record numbers ride transit in Olympic Week 1*. 20 Feb 2010. <http://www.translink.ca/en/About-Us/Media/2010/February/Moving-the-World-record-numbers-ride-transit-in-Olympic-Week-1.aspx>

26 City of Vancouver (2010). *2010 Winter Games: Transportation*. 17 November 2010. <http://vancouver.ca/2010games/transportation.htm>

FARE CARDS

Rechargeable fare cards are not a new concept in public transit, but their use has substantially increased in the past few years. The *Société de transport de l'Outaouais* was the first transit operator to introduce the cards in Canada in 1998. In 2008, Montreal introduced the OPUS card, which let riders carry multiple fares on a single card. In 2009, Metrolinx introduced the PRESTO fare card and began rolling it out to eight transit authorities across the GTHA. In addition, PRESTO is accepted at 12 Toronto subway stations and should be accepted throughout the Toronto Transit Commission network by 2015, in time for the Pan-American Games. Translink in Vancouver plans to introduce a smart card named Compass in 2013 as part of its \$171-million electronic faregate project; Compass will work on buses, the SkyTrain, the SeaBus as well as West Coast Express commuter trains. The faregate project will receive \$30 million in federal funding and \$40 million in provincial funding.

and to collect data to support its ongoing transportation planning purposes. This data could assist in policy decision-making, and promote innovative initiatives to encourage sustainable travel. Furthermore, TransLink—the region's transportation authority—is continuing its efforts to reduce overall traffic with TravelSmart, a program that helps businesses and residents of Metro Vancouver make smarter travel choices and reduce single-vehicle-occupancy trips. TravelSmart includes an Employer Pass Program, ridesharing, car sharing, bicycling, walking and telework. TransLink also works in partnership with ticket sales and distribution companies to include transit fares at a discounted rate within the price of event tickets.

Other initiatives currently under review by the OPTT agencies for implementation include extending bus lane hours and the public bike system. Extending bus lane hours will help ensure faster and more reliable travel time for a longer portion of the day, while extending the public bike system would provide an alternative to driving and could reduce congestion. During the Games, much expanded transit services and a large fleet of high-quality, public-use bicycles were extremely popular with the general public.

Growing population, growing urban transit demand in Metro Vancouver

According to BC Stats, the Metro Vancouver region grew to 2.37 million people in 2010, a 7.98% increase from the 2.19 million reported in 2006—a rapid population growth that has led to increased demand on the transit network.²⁷

TransLink recorded a large increase in transit use from 2006 to 2010. The number of boardings—defined as each time a person boards a transit vehicle—for the West Coast Express increased 21.7%, from 2.29 million in 2006 to 2.78 million in 2010. The West Coast Express is the interregional community railway that links Metro Vancouver with Mission, Maple Ridge, Pitt Meadows, Port Coquitlam and Port Moody. In 2010, the Expo and Millennium Lines recorded more than 79.2 million boardings, a 14.1% increase from 2006. The Expo, Millennium and Canada Lines comprise the automated light rapid transit system; the Expo Line links Vancouver, Burnaby, New Westminister and Surrey, while the Millennium Line shares its tracks from Vancouver to New Westminister, then continues along its own route through North Burnaby and East Vancouver. The Canada Line also registered 38.4 million boardings in 2010, reaching this level of ridership three years before originally forecast. The Canada Line connects Vancouver, Richmond and the Vancouver International Airport (see map).



The population of Metro Vancouver is expected to grow to 3.4 million by 2041, with the greatest increases expected in Surrey, Burnaby, Coquitlam and Vancouver.²⁸ The \$1.4-billion Provincial Transit Plan announced in 2008 included plans for new transit routes in Metro Vancouver. Construction on the Evergreen Line—a project jointly funded by the Government of Canada (up to \$416.7 million), the Government of British Columbia (\$410 million) and TransLink (\$400 million)—will begin in summer 2012, with full operation scheduled for 2016. The University of British Columbia and Surrey Lines (refer to the dotted lines on the map above) remain in the conceptual evaluation stage.

27 Greater Vancouver Regional District (2007). *2006 Census Bulletin #1: Population and Dwelling Counts*.

28 Metro Vancouver (2009). *Metro Vancouver 2040—Backgrounder. Metro Vancouver Residential Growth Projections*. <http://www.metrovancouver.org/planning/development/strategy/RGSMBackgroundersNew/RGSMetro2040ResidentialGrowth.pdf>

Southern Ontario

The safe, secure, clean and efficient movement of goods in Ontario—most notably in southern Ontario—is of critical importance to industry stakeholders and all levels of government due to the significant volume of goods moving throughout this area. With this in mind, considerations relating to linkages between the movement of goods, transportation infrastructure, congestion and environmental impacts were at the forefront of government, industry and public examinations in 2011.

Local municipalities with responsibilities for providing the infrastructure that services goods-movement transportation hubs are examining their land-use planning and transportation master plans to find ways to better facilitate movement of goods via all modes. Nevertheless, truck transportation remains the main mode of freight transportation used in this region. Many municipalities continue to actively develop and budget for various timely and strategic investments in fields such as signalling, roadway improvements, policy harmonization and route maps, all with the aim of supporting the movement of goods.

In 2011, the Ontario government maintained its strategy of planning for further improvements to its 400-series highways and studying key corridors—including those in the Greater Toronto Area West, Niagara and South Simcoe areas—with the objective of facilitating more efficient inter- and intra-provincial movement of goods.

Discussions with industry and all levels of government have also led to changes in weight and dimension restrictions, limits on how many hours drivers can work, vehicle speed limitations, and the introduction of long combination vehicles (LCVs), which consists of a truck tractor pulling two or three trailers.

The Regional Municipality of Peel, with its heavy concentration of jobs in goods-movement transport, warehousing, and related industries, has established a Goods Movement Task Force. All levels of government and the private sector are participating to develop options for the Regional Council to consider to address issues and opportunities pertaining to the movement of goods in and around the GTHA.

Greater Toronto and Hamilton Area (GTHA)

Gridlock in larger urban centres remained a key economic, transportation and environmental issue for Ontario in 2011, most notably in the GTHA. The Government of

Ontario, both independently and in collaboration with a number of municipalities—and in some instances with federal funding support—continued to address the issue, actively advancing local transit planning and investments, and researching ways to improve the efficiency of people and goods movement in the region.

At the provincial level, Metrolinx—the provincial agency responsible for transportation planning in the Greater Toronto and Hamilton Area (GTHA)—released its GTHA Urban Freight Study in 2011, which proposed a number of actions to improve the efficiency of goods movement in the region. Metrolinx also launched a related study with input from academia and other levels of government to advance the collection of goods-movement data in the region.

With the involvement of Metrolinx—the provincial government-mandated regional transportation agency—and its operating division, GO Transit rapid transit bus lanes are being developed on selected arterial roads in the Regional Municipality of York and the City of Mississauga.

In Toronto, the province and the Mayor agreed to a revised transit plan with the province (via Metrolinx) being responsible for developing the Eglinton Light Rail Transit line, and the City being responsible for developing an extension of the Sheppard subway line—for which the Mayor is hoping to attract private investment to cover much of the costs.

Metrolinx, via its operating division GO Transit, continued to acquire additional rail corridors in 2011 and now owns approximately 61% of the track on which it operates. Metrolinx also continued to develop an Investment Strategy, which must be tabled by June 2013, aimed at identifying a stable and predictable capital and operating revenue stream to support full implementation of its Regional Transportation Plan, *The Big Move*.

Metrolinx also launched an exercise in 2011 that will refine *The Big Move* to reflect progress made since its 2008 release, and that will enable full integration of GO Transit's Strategic Plan, GO2020. Metrolinx is aiming to release *The Big Move 2.0* in 2012.

The Cities of Ottawa and Hamilton, as well as the Regional Municipality of Waterloo, continued planning for their respective intended light rail transit systems in 2011, while passenger rail services between Peterborough and Toronto remained under active study.

Montreal

Urban transit in the Montreal Metropolitan Area is shared amongst a provincial planning agency, the Metropolitan Transportation Agency (*Agence métropolitaine de transport* or AMT), three public transit corporations—the STM, STL and RTL serving respectively the island of Montreal, Laval and Longueuil and the South Shore—and 11 inter-municipal transportation councils serving the outer suburban area. The AMT manages the commuter rail network—which is operated by Canadian National Railway and Canadian Pacific Railway—as well as metropolitan terminals and some express services, while the Montreal Transit Corporation (*Société de transport de Montréal* or STM) operates Montreal's subway system, whose 68 stations serve Montreal, Laval and Longueuil.

A number of public transit projects are currently planned for the greater Montreal area. The Eastern Train (*Train de l'Est*) would see a new service offered from Central Station in Montreal to Mascouche on the North Shore of the Saint Lawrence. Construction for this project began in 2010 and current project costs are estimated at \$600 million. The AMT is studying a number of other projects, including a major track capacity increase on its Vaudreuil-Hudson Line, a project named the Western Train (*Train de l'Ouest*), as well as subway extensions in Montreal, Laval and Longueuil, in cooperation with local transit authorities. The STM, meanwhile, purchased 468 new subway cars for \$1.2 billion from Bombardier to replace 342 subway cars in use since the subway began operating in 1966. These new cars should be introduced into the network beginning in 2014. The STM is also looking at ways to increase its network capacity, be it through reintroduction of tramways on a number of routes in the central core or by developing priority measures for buses on 240 km of roadway.

ACTIVE TRANSPORTATION

Narrowly defined, active transportation is any form of human-powered transportation, including walking, cycling, travelling on mobility devices, rollerblading, skating, skateboarding, cross-country skiing and more. In a municipal context, active transportation plans and programs focus on specific trip purposes—such as trips to work, school or shopping—without neglecting recreational/tourist-related trips. Active transportation requires safe, secure infrastructure (such as trails/paths, sidewalks and even the side of roads) that are connected to activity centres in the community.

Active transportation goals pursued by Canadian municipalities include helping people and communities improve health, wellbeing and quality of life; increasing

VELO-CITY GLOBAL 2012

Vancouver will host the Velo-City Global 2012 conference from June 26th to 28th. This is one of the world's premier international cycling planning conferences. It is a chance to exchange and showcase measures to encourage cycling-friendly cities where the bicycle is part of both transportation and recreation. More information on the conference is available at www.velo-city2012.com.

accessibility and tourism potential; reducing travel costs, air pollution, GHG emissions, and surface areas dedicated to roads and car parking; using existing infrastructure more efficiently; and revitalizing urban centres.

All large municipalities in Canada have adopted pedestrian and cycling plans and strategies, some of which incorporate other modes of self-propelled transportation. Emphasis on active transportation connectivity has emerged, leading to cycling and public transit combination initiatives (e.g., “bike-and-ride” in Toronto and “rack & roll” in Ottawa and Saskatoon). The promotion of active transportation has led to special emphasis on on-road/off-road facilities for non-motorized movements within cities; for example, constructing new bike paths; road segregation that separates bicycle and car lanes; improved cycling access and parking at transit stations; and bicycle lockers and sheltered racks.

Across the country numerous projects are underway to increase the urban bike path network. Vancouver has more than 400 km of bike paths and cycling accounts for 4% of commuter trips, and in 2011 the city was the recipient of the Bill Curtis Technical Achievement Award from the Canadian Institute of Transportation Engineers—Vancouver Chapter. This award was in recognition of the Vancouver Downtown Separated Bike Lanes for outstanding transportation project achievement. Calgary also currently has more than 700 km of pedestrian and bicycle paths as part of its Pathway system, one of the largest in North America. The 2010 Pathway survey found that 95% of residents use the Pathway in one way or another, and in Toronto the Bikeway Network will eventually include more than 1,000 km of bike paths, making every Torontonian no more than a five-minute bike ride from the network. In Ottawa, the 2008 Cycling Plan proposed extending the 540 km of bike paths the city enjoys to 2,500 km within 20 years. In Quebec, the Green Road consists of more than 4,000 km of bike paths across most of the province and connects with the more than 650 km of bike paths in Montreal, while Halifax has a 98-km bicycle network, including 87 km of bike lanes.

ACCESSIBILITY IN PUBLIC TRANSIT

The Canadian Transportation Agency's mandate is—among other things—to ensure that the federal transportation system is accessible to all Canadians and that undue obstacles are removed. This includes municipal transit systems that cross provincial or international boundaries, such as OC Transpo in Ottawa/Gatineau. In a November 2007 decision, the Agency found that OC Transpo's failure to call out stops was an undue obstacle to persons requiring this due to a disability, and ordered OC Transpo to ensure that bus operators call out major and requested stops on all of its routes.

OC Transpo has since installed the Next Stop Announcement System, which announces each upcoming stop automatically in both official languages as the bus departs from the previous stop, while the Next Stop Display inside the bus visually displays the route number and destination, the upcoming stop and the time of day in a bilingual format.

URBAN CONGESTION

Cities are where most Canadians live and work, and where substantial economic activities occur. Canadian cities have experienced significant population and economic growth over recent years—trends that will continue into the foreseeable future.²⁹ However, the increasing importance of cities has resulted in some complex challenges, such as urban congestion, which results from overuse of road space.

Based on 2006 data, urban congestion in Canada's nine largest cities costs an estimated \$3.1–\$4.6 billion annually. This is a conservative estimate, as it only takes into account the costs related to time delays for drivers and to wasted fuel and GHG emissions.³⁰ Congestion negatively affects the movement of people and freight in urban areas; moving freight efficiently through urban areas is vital for Canada's competitiveness and prosperity. For businesses, urban areas are not only important markets for goods and services, but a significant portion of goods can reach their intended destinations only by travelling through major airports, marine terminals and intermodal facilities located in urban areas. The three largest Canadian cities—Toronto, Montreal

POOLED VEHICLES

Bicycles

Launched in May 2009, Bixi Montréal is Canada's largest bike-share system—an emerging active transportation initiative—with 5,000 bicycles at 405 stations. The Bixi design has since been exported to other cities: Bixi Toronto opened in May 2011 and is the second largest bike share in the country with 1,000 bicycles and 80 stations, and Capital Bixi serves Ottawa/Gatineau with 100 bikes and 10 stations.

Preceded by other bicycle-sharing initiatives in Toronto and Edmonton, Bixi's modular bicycle sharing system was developed at the request of the Montreal parking authority. Numerous bike-sharing systems have been tested in Europe and in the United States as well, with bicycle theft and vandalism standing out as important issues in this type of system.

Automobiles

Car sharing is becoming a more popular form of urban transportation with car-sharing companies now in most of Canada's large cities, providing service to thousands of individuals, families and companies. Communauto in Montreal is an example of socially and environmentally oriented firms offering a car-equivalent approach to the Bixi system—it proposes car sharing as a way to reduce car ownership and therefore automobile emissions. Communauto subscribers have access to a fleet of 1,100 gasoline-powered cars and 50 electrical cars they can rent at a small cost for half an hour, an hour, a day or a longer period of time. For its subscribers, Communauto has developed partnerships with car-pooling initiatives, and has negotiated discounts with VIA Rail and transit authorities. Communauto is present in Montreal, Laval, Longueuil, St-Lambert, St-Bruno, Sherbrooke, Québec City and Ottawa-Gatineau.

and Vancouver—account for more than one-third of Canada's GDP, demonstrating that urban freight movement is a significant contributor to the success of local, regional and national economies. When freight cannot travel efficiently to, from and within urban areas, economic, environmental and social impacts ensue.

Another way to decrease urban congestion is to reduce automobile dependency and encourage a shift to public transportation. While public transit is a provincial and municipal responsibility, the federal government has invested more than \$6.5 billion in transit infrastructure across Canada since 2002, through programs such as the Building Canada Fund (BCF) and the Gas Tax Fund. The federal government also helps mitigate the impacts of urban congestion by directly supporting

29 The percentage of citizens living in urban areas has continued to steadily increase. In the early years of the 19th century, 37% of Canada's population lived in urban areas, while in 2006, 80% of Canada's population lived in urbanized areas. Source: Statistics Canada (2006). *Census Snapshot of Canada — Urbanization*. (<http://www.statcan.gc.ca/pub/11-008-x/2007004/10313-eng.htm>)

30 Transport Canada (2009). *Updates to Costs of Congestion Studies – Final Report*.

activities that result in freight moving efficiently in urban areas. For example, the National Policy Framework for Strategic Gateways and Trade Corridors, released in 2007, was developed to advance the competitiveness of the Canadian economy by facilitating international trade. The Framework emphasizes an integrated approach to infrastructure that includes policy, regulatory and operational measures. The \$2.1-billion Gateways and Border Crossings Fund (GBCF) and the \$1-billion Asia-Pacific Gateway and Corridor Initiative (APGCI) provide federal funding for Gateway initiatives. Provinces and the private sector also contribute to these initiatives.

INTELLIGENT TRANSPORTATION SYSTEMS

Intelligent Transportation Systems (ITS) are a combination of innovative technologies, communications systems and management strategies that are applied to the transportation network to optimize operations. In doing so, they maximize benefits from existing infrastructure—increased efficiency, safety, security and environmental sustainability—and minimize the need for new capital investments. ITS is also used to manage fleets of transportation equipment, while real-time data generated by integrated ITS provides valuable and actionable operational information to system operators, private sector transportation providers and travellers.

A wide range of ITS has been deployed in Canada, and much more is planned. Illustrative examples of projects in which Transport Canada was a partner include:

- Traveller information—in Metro Vancouver, a new Regional Traffic Data System will produce real-time traffic flow information along the region's main roads and strategic highway corridors (including truck routes) and display it online, allowing drivers to avoid busy stretches and operators to manage congestion. This will complement the area's new Transportation Management Centre.
- Commercial vehicle operations—in British Columbia, the Weigh2Go system improves commercial vehicle safety with intelligent inspection stations, which remotely measure vehicle weight and credentials at highway speed.
- Supply-chain security/efficiency—the Canada-China Marine E-Tag Container Pilot Project will improve supply chain security and efficiency through the use of radio frequency identification (RFID) tags as well as GPS/satellite tracking and monitoring technologies.

AUTO21

AUTO21 is a Network of Centres of Excellence enhancing automotive research and development (R&D) by partnering with the private sector to support more than 200 researchers covering 40 universities and 220 industry partners across Canada. R&D efforts aim to advance automotive innovation in a variety of fields. Since 2001, AUTO21 has invested more than \$90 million in R&D, which has resulted in more than 100 patents, licences and commercialization agreements.

- Border efficiency—Transport Canada is working with partner agencies in Canada and the U.S. to improve border efficiency by installing sensors to measure and broadcast wait times at the busiest border crossings.

Recent years have seen a shift towards a more holistic approach in many countries, often known as Smart Corridor strategies. These ITS applications to transportation components of strategies allow a more complete capture of the strategies' potential benefits.

Based on collaboration among stakeholders, Smart Corridor strategies use advanced technologies to support integration across transport modes, improving overall corridor performance, reliability, safety and fuel use. Transport Canada is now implementing and developing Smart Corridor strategies in Canada's gateways and corridors. In the Asia-Pacific Gateway these efforts are quite advanced, and Transport Canada is leading efforts to integrate existing and planned systems.

9.5 ROAD TRANSPORTATION AND THE ENVIRONMENT

Road transportation can be seen in some respect to have a significantly higher environmental footprint than others modes. This is in part due to the smaller size of vehicles, which reduces fuel efficiency gains. However, this mode of transportation also presents a number of opportunities to reduce its environmental impact through alternative fuels, cleaner burning engines and technology.

JURISDICTION OF ENVIRONMENT AND ROAD TRANSPORTATION

Air pollutant and GHG emissions from new vehicles produced in or imported into Canada are regulated under *the Canadian Environmental Protection Act, 1999*. Provincial and territorial governments are responsible for the performance of the in-use fleet.

ROAD FUELS

Advancing the development of lower carbon-intensive alternative and renewable fuels is supported by the federal Renewable Fuel Strategy, which has four components:

1. increasing renewable fuel availability via regulation
2. supporting the expansion of industry production
3. assisting feedstock production in the agriculture sector
4. accelerating commercialization of new technologies

The government released its Renewable Fuels Regulations in two parts: the first (in September 2010) requires an average annual renewable fuel—fuel produced from renewable sources—content of 5% in gasoline starting December 15, 2010. The second, starting in July 2011, requires an average annual renewable fuel content of 2% in diesel fuel produced or imported for sale. Combined with complementary provincial regulations, these federal regulations are expected to lower annual GHG emissions by up to 4 Mt—the equivalent of taking one million vehicles off the road.

In 2007, the government also launched its ecoENERGY for Biofuels Program, which will invest up to \$1.5 billion to boost domestic production of renewable fuels such as ethanol and biodiesel. Administered by Natural Resources Canada, this initiative runs until March 31, 2017 and, based on production levels and other factors, provides operating incentives to those producing renewable alternatives to gasoline and diesel. The initiative will make investing in production facilities more attractive by partially offsetting the risk associated with fluctuating feedstock and fuel prices.

Also in 2007, the Minister of Agriculture and Agri-Foods launched the \$200-million ecoAGRICULTURE Biofuels Capital Initiative to provide repayable contributions to help farmers overcome the challenge of raising the capital necessary for constructing or expanding bio-fuel production facilities. The Biofuels Opportunities for Producers Initiative was also expanded to assist producers to develop business proposals and feasibility studies to expand biofuel production capacity.

Announced in the 2007 federal Budget and administered by Sustainable Development Technology Canada, the \$500-million NextGen Biofuels Fund supports the establishment of commercial-scale demonstration facilities producing next-generation renewable fuels and co-products. This fund is encouraging retention and growth of domestic technology expertise and innovation capacity for cellulosic ethanol and biodiesel production in Canada.

ELECTRIC VEHICLES

Together with industry, academia and various levels of government, Transport Canada has been actively engaged in research and development projects to overcome barriers to the widespread use of electric vehicle technologies in Canada's automotive sector. In fiscal year 2011–12, the department invested \$1.05 million in technologies to improve winter operations, increase safety and enhance efficiency in both the light- and heavy-duty sectors. Cross-modal applications have also been assessed to further reduce the energy and emissions footprint of the transportation sector as a whole.

Launched in 2010, the Natural Gas Use in the Canadian Transportation Sector Deployment Roadmap has brought together government and non-government organizations, industry and end-user stakeholders to discuss opportunities and challenges for the broader use of natural gas in the medium- to heavy-duty vehicle sector.

PASSENGER VEHICLE AND LIGHT TRUCK GREENHOUSE GAS EMISSION REGULATIONS

The Passenger Vehicle and Light Truck Greenhouse Gas Emission Regulations—which are aligned with U.S. regulations—apply to companies that manufacture or import new passenger automobiles and light trucks (2011 and subsequent model years) to sell in Canada.

Companies must comply with unique fleet average GHG emissions standards for passenger automobiles and light trucks for each model year; each company's unique fleet average standard is determined based on the size (i.e., footprint) and number of vehicles it sells of a given model year.

The fleet average GHG emissions standards become progressively more stringent with each new model year from 2012–2016; the regulations also establish separate limits for other tailpipe GHG emissions such as nitrous oxide (N₂O) and methane (CH₄).

The regulations also include provisions that recognize vehicle design improvements that reduce GHG emissions through approaches other than directly reducing tailpipe CO₂ emissions, including:

- technologies that reduce the impact of air conditioning system refrigerant leakage (e.g., hydrofluorocarbons);
- technologies that improve the efficiency of air conditioning systems; and
- other innovative technologies that reduce GHG emissions under conditions that are not captured by conventional emission testing procedures.

PROPOSED REGULATIONS FOR GREENHOUSE GAS EMISSIONS FROM MEDIUM- AND HEAVY-DUTY VEHICLES

The proposed Regulations to Limit Greenhouse Gas Emissions from New On-Road Heavy-Duty Vehicles and Engines would seek to reduce emissions and improve the fuel efficiency of the whole range of new on-road heavy-duty vehicles—from full-size pick-up trucks to tractor-trailers—and include a wide variety of vocational vehicles such as freight, delivery, service, cement, garbage and dump trucks and buses. The regulations would also promote implementing advanced technology vehicles such as hybrid and electric vehicles.

The proposed regulations would continue to build upon the policy of alignment of vehicle emission regulations with the United States given the integrated nature of the North American vehicle manufacturing industry.

These regulations would apply to those manufacturing and importing new on-road heavy-duty vehicles and engines to sell in Canada, but not to owners or operators of heavy-duty vehicles or engines. They would also establish GHG emissions standards that would be expressed as the quantity of GHG emissions emitted per unit of work delivered.

PROVINCIAL INITIATIVES ON SUSTAINABLE TRANSPORTATION

Nearly every province and territory has a climate change and air quality action plan that includes measures to reduce current and future GHG and air pollutant emissions from transportation. Some of these action plans include legally binding emissions reduction targets (established via provincial legislation or regulation).

Each action plan, and associated transportation measures, is tailored to the specific needs and challenges of the respective jurisdiction. Transportation measures include fiscal and tax incentives to facilitate the adoption of clean transportation technologies or practices, direct financial investments, as well as education and outreach programs. Select provincial measures include:

- British Columbia's revenue-neutral carbon tax on GHG emissions from fossil fuel combustion, which will increase fuel prices similar to motor fuel taxes and create incentives for fuel efficiency and lowering vehicles kilometres travelled;

- Ontario's Electric Vehicles Plan, featuring consumer rebates and charging infrastructure investments, is targeting to have one out of every 20 vehicles be electrically powered by 2020;
- Québec's "Blue Road" collaborative initiative with Robert Transport and Gaz Métro, which features tax incentives and fuelling infrastructure for liquefied natural gas-powered commercial trucks operating between Québec City and Toronto, will serve as a catalyst for future private sector investments in this area;
- Québec's 2011–2020 Action Plan for Electric Vehicles, featuring consumer rebates, charging infrastructure investments, education, outreach, and public transit and industry development incentives, aims to have up to 25% of all new light passenger vehicles sales to be electric vehicles by 2020;
- New Brunswick's Climate Change Action Plan, which includes the adoption of weigh-in-motion facilities and strategic highway infrastructure investments to improve the flow of goods and people as well as permitting more efficient long combination vehicles to operate on four-lane highways in the province.

ENVIRONMENTAL EMISSIONS FROM TRUCKING

Progress has been made in reducing the environmental impacts of trucks. Federal government regulations on air emissions from diesel engines were tightened in 2007 and again in 2010, and as a result, particulate matter, carbon monoxide and other combustion products are decreasing as new trucks displace older ones. Carriers are making technological improvements to reduce fuel consumption, such as installing devices that improve truck aerodynamics and using low-rolling resistance tires. GHG emissions are now decreasing for new and existing trucks equipped with these devices.

Changes to provincial/territorial regulations for vehicle weights and dimensions are facilitating carriers' adoption of more efficient equipment. Long Combination Vehicles (LCVs) were identified by the Canadian Council of Energy Ministers in *Moving Forward on Energy Efficiency in Canada* as one of four priority areas due to their potential to move light, bulky, freight-like food products, some automotive parts, and consumer goods more efficiently, and to therefore save on fuel consumption and reduce GHG emissions.

JURISDICTION OF ROAD SAFETY IN CANADA

Responsibility for road safety is divided between the federal and provincial/territorial governments, who in turn delegate some responsibilities to municipalities, such as speed limits on local roads.

Transport Canada sets and enforces safety standards required for new vehicles sold in Canada, including imported vehicles (new and used), and regulates federal jurisdiction motor carriers (e.g. hours of service regulations for commercial vehicle drivers of trucks and buses).

The provincial/territorial governments' *Highway Traffic Acts* or *Motor Vehicle Acts* regulate drivers and vehicle use, including driver licenses, vehicle loading, winter tire use, seat belt usage and speed limits.

In the wake of economic deregulation of the trucking industry in 1988, the National Safety Code (NSC) was developed with the provinces and territories to advance commercial motor carrier safety. NSC standards are adapted, administered and enforced by the provinces and territories, and address key safety aspects of commercial vehicle operations such as hours of service, cargo securement and issuance of safety fitness certificates. Federal, provincial and territorial regulations provide uniform and equitable treatment of motor carriers across Canada.

The Canadian Council of Motor Transport Administrators is a non-profit organization comprised of provincial, territorial and federal government representatives that seeks consensus on administration and operational matters dealing with licensing, registration and control of motor vehicle transportation and highway safety.

Between 2006 and 2010, fatalities decreased by 24.2% for all categories of road users. The biggest drops have been with bicyclists, drivers, and passengers—down 31.5, 27.3 and 22.9%, respectively. Motorcyclist fatalities were also down 17.0% during this period, while pedestrian fatalities dropped 17.8%.

Of the estimated 2,186 fatalities in 2010, speeding was cited as a contributing factor in about 25.0%, down from 27.4% in 2006. In an attempt to reduce the number of speed-related collisions, several jurisdictions have introduced serious penalties (including heavy fines and vehicle impoundment for street racing or travelling 50 km/hr or more above the posted speed limit).

ROAD SAFETY STRATEGY

Canada's third national road safety plan, Road Safety Strategy 2015 (RSS 2015), became effective January 1, 2011. The result of extensive consultations among government members and key road safety stakeholders, the new five-year strategy was endorsed by the Council of Ministers Responsible for Transportation and Highway Safety in September 2010.

RSS 2015 retained key branding elements of RSV 2010, namely the vision of achieving the safest roads in the world as well as the four strategic objectives of raising public awareness and commitment to road safety, improving public communication, cooperation and collaboration among all stakeholders, enhancing enforcement, and improving road safety information in support of research and evaluation.

However, RSS 2015 also differs from RSV 2010 and has adopted a more 'holistic' or 'safer systems' approach to reducing fatalities and serious injuries. Strategies and interventions guiding improvements for road users, road infrastructure and vehicles will be housed in a matrix of best practices that jurisdictions can adopt to address key road safety challenges or risk groups. These strategies would also help to decrease deaths and serious injuries due to traffic collisions in Canada.

The framework of best practices will be updated regularly as new, successful strategies are adapted from other countries or as existing strategies are evaluated and their effectiveness established. Hard targets will not be adopted at the national level, but may be adopted by provinces/territories if they wish. National progress will be measured using rate-based measures, such as deaths per number of registered vehicles or per number of people.

This flexibility is one of the key attributes of RSS 2015. The new strategy allows all jurisdictions to tailor and implement road safety strategies that are deemed

9.6 SAFETY

OVERVIEW

2010's estimated road casualty collisions decreased 0.6% from 2009, with fatalities dropping 1.0% and injuries decreasing 0.5% (see Table S7). Between 2006 and 2010, road casualty collisions decreased by 15.4%, from 145,115 to 122,820. During the same period, fatalities decreased from 2,884 to 2,186 (a decrease of 24.2%) and injuries dropped 15.4%, from 202,854 to 171,694. The average number of fatalities from 2006 to 2010 was 2,634—6.5% lower than the average number (2,817) in the previous five-year period (2001–2005). Overall, during the 10-year period, fatalities have dropped 20.7%, from 2,756 in the year 2001 to 2,186 in 2010. This occurred while the numbers of registered vehicles and drivers were steadily increasing.

Fatality rates per 10,000 registered motor vehicles dropped from 1.4 in 2006 to 1.0 in 2010. Following a similar trend, fatalities per billion vehicle-kilometres travelled dropped from 8.8 to 6.6, while fatalities per 100,000 licensed drivers dropped from 13.0 to 9.5. Fatalities per 100,000 people also dropped from 8.9 to 6.6.

feasible and that target their most critical road safety challenges. Jurisdictions will be primarily accountable within their respective operating environments. It is anticipated that customized strategies will be introduced to support unique road safety requirements and will collectively contribute to national reductions in fatalities and serious injuries.

ROAD SAFETY REGULATIONS

Canada continues working to align its motor vehicle regulations as much as possible with those of the U.S. while also considering specific Canadian conditions. Thirty-three amendments were published from 2007–2011, with two more planned for 2012, many of which align Canadian requirements more closely with those of the United States. In 2011, harmonization activities received added impetus and profile due to the Regulatory Cooperation Council announced by Prime Minister Harper and President Obama in February 2011.

In support of global harmonization of motor vehicle safety regulations, Canadian regulations also include the option to follow several United Nations regulations for alternative testing requirements. Transport Canada supports and participates in the development of harmonized vehicle regulations through the United Nations Economic Commission for Europe's World Forum for Harmonization of Vehicle Regulations, which includes the development of Global Technical Regulations (GTRs). To date, Transport Canada has aligned with GTRs addressing door locks and door retention components, motorcycle brake systems and electronic stability control systems.

IMPAIRED DRIVING

Of fatally injured drivers tested for alcohol in 2009, 37.6% had a positive blood alcohol concentration (BAC). While this is lower than the 38.7% in 2008, it was slightly higher than 2005's 36.5%. Of fatally injured drivers with a positive BAC in 2009, 14.1% had alcohol levels between 1 and 80 mg%; 26.1% had levels between 80 and 160 mg%; and 59.8% had alcohol levels greater than 160 mg%—more than twice the legal limit. Of all fatally injured drivers who were tested, 22.5% had a BAC that was more than twice the legal limit (160 mg%), 9.8% were between 80 and 160 mg%, and 5.3% were between 1 and 80 mg%. The balance (62.4%) did not test positive for alcohol (see Table S9).

One proven initiative authorized under the *Criminal Code of Canada* is the use of aftermarket breath alcohol ignition interlocks for convicted impaired drivers, which require drivers to provide a breath sample before being able to start their vehicles. If the convicted driver's alcohol level is above a preset limit, the vehicle will not start. These safety devices, purchased and installed at the vehicle owner's expense, allow convicted impaired drivers to use their vehicles, while ensuring, while ensuring they do not drive while impaired. Interlocks allow convicted individuals mobility while reducing the risk they may otherwise pose to the general road-using public.

Research has shown that these devices reduce the incidence of alcohol-impaired driving. All provinces now have alcohol interlock programs where drivers must first serve a driving suspension and qualify under provincial rules. A voluntary national standard has been created for ignition interlock technology, and more jurisdictions are introducing programs to increase its use; for example, before issuing a criminal conviction or for low (i.e., below criminal code level) BAC drivers. Preliminary research suggests that these programs can significantly reduce impaired driving by previously convicted drivers.

SEAT BELT USAGE

Seat belts save thousands of lives every year. An RSV 2010 sub-target was for at least 95% of Canadians to wear seat belts consistently. In 2009, 33.6% of fatally injured drivers and 36.3% of fatally injured passengers were not wearing seat belts (see Addendum Table S8). In comparison, 14.5% of seriously injured drivers and 23.3% of seriously injured passengers were not wearing seat belts.³¹

Transport Canada conducted an observational survey of daytime seat belt use in rural communities across Canada in September 2009, followed by a similar survey in urban communities in September 2010. The surveys showed that seat belt use was lower in rural areas (92%) than urban communities (95.8%). The rate was lower among occupants of light trucks (about 92%) than occupants of passenger cars (about 95%); it was also lower among male drivers (94.3%) than female drivers (96%). Only 93% of drivers aged 24 and under wore a seat belt, compared with 94.8% of drivers 25–49 and 96% of those 50 and over.³²

31 More details are available at <http://www.tc.gc.ca/eng/roadsafety/tp-tp3322-2009-1173.htm>

32 More information on these surveys, vehicle restraints and safety studies and programs are available at <http://www.tc.gc.ca/roadsafety/stats/menu.htm>

CHILD SEATS

Regulated child safety seat requirements have been updated to reflect the changing size and weight of children in Canada. The major changes include:

- a new testing requirement using a three-point seat belt to secure car seats in vehicles;
- adopting most U.S. testing parameters for dynamic testing of child seats;
- changing the definition of an infant from 9 kg to 10 kg (seat is designed to be rear-facing only);
- increasing the maximum allowable weight limit of child seats from 22 kg to 30 kg;
- introducing dynamic testing requirements for booster seats; and
- allowing harnesses to be certified for use on school buses by special needs children.

DEFECTS AND RECALLS

Motor vehicle and vehicle-related equipment recalls have increased over the past few decades. The industry and economy have evolved significantly over this time span, and while not appropriate to attribute this increase to a single reason, the following are contributing factors:

- more makes of vehicles are being imported and sold;
- more models of vehicles are being sold;
- increased technological complexity of vehicles;
- greater international commerce in vehicles with new entrants; and
- greater public awareness and web-based communications have made it easier and more convenient for the public to contact manufacturers and Transport Canada to report potential defects.

DRIVER DISTRACTION

Driving is a complex task that requires a high level of attention from the driver. In-vehicle information, entertainment and telecommunication devices are becoming increasingly popular with drivers, and vehicles are now often equipped with ports or wireless connections for portable devices. This connectivity allows drivers to make phone calls, send email and text messages, play

music, navigate, and access the Internet, as well as use a growing number of other applications. Consequently, distracted driving is an emerging road safety issue.

All 12 jurisdictions except Nunavut now have specific distracted driving legislation restricting the use of hand-held devices and other common distracters. Observational surveys are also being undertaken at the jurisdictional level to monitor the use of these technologies while driving.

Transport Canada has an ongoing driver distraction research program to better understand the safety implications of new technologies and to identify distraction countermeasures. The department is also working with the provinces and territories and other road safety stakeholders nationally and internationally to develop standards to reduce driver distraction.

MOTOR VEHICLE TEST CENTRE

Transport Canada's Motor Vehicle Test Centre (MVTC), located in Blainville, Quebec, has been modernized and expanded to allow motor coaches and school buses to be crash-tested, and moving-car-to-moving-car and rollover collisions to be carried out. Completed in March 2011, the modernized MVTC is the only vehicle test facility of its kind in North America and the only comprehensive vehicle safety test facility in Canada.

The project was funded through the Government of Canada's 2009 Economic Action Plan and represents the largest single investment in the MVTC since its construction more than 30 years ago. The modernization includes:

- a new 200-metre acceleration test track coupled with a 100-metre parallel track for high-speed and moving-car-to-moving-car frontal/rear crash testing at varying offsets;
- a new 100-metre test track installed at a 90-degree angle to the main track to carry out moving-car-to-moving-car perpendicular side impact crash tests and rollovers;
- a 100-metre adjustable track for moving-car-to-moving-car oblique side impact crash tests; and
- a new pedestrian laboratory to evaluate methods of protecting pedestrians from motorized vehicles.

The new facility is anticipated to play a major role in advancing motor vehicle safety and promoting the development of expertise in occupant and pedestrian safety.

ROAD CONSTRUCTION

Roundabouts have been recognized as an effective safety measure on roads around the world. Although fairly new in Canada, roundabouts are already proving their many benefits, such as eliminating left-hand turns in front of oncoming traffic, decreasing collisions, slowing vehicles within the intersection, improving traffic flow, and reducing vehicle emissions and fuel consumption. Canada—through the Transportation Association of Canada—has developed national rules of the road as well as uniform signs and pavement markings for single and multi-lane roundabouts. The department has also developed two educational brochures to inform the public on how roundabouts are to be used by motor vehicle drivers, pedestrians and bicyclists.

OUTREACH

Transport Canada, arrive alive DRIVE SOBER®, the Ontario Students Against Impaired Driving, and Student Life Education Company Inc. partnered to update the award-winning iDRIVE Road Stories DVD. Produced in 2009, the original 23-minute video was created to educate youth about safe and sober driving. In February-March 2011, the iDRIVE video was updated as a national version. The updated version features the latest information about new measures (provincial and federal) to address these issues, and was distributed to 3,400 high schools across Canada, with the exception of Ontario and Quebec. Ontario schools were offered the updated version or were welcome to use the existing version; Quebec schools had their own version of a similar video. More than 40 road safety partners, including driving schools, and the P.A.R.T.Y. (Prevent Alcohol and Risk Related Trauma in Youth) Program have incorporated the iDRIVE video into their programs.

In partnership with the Canadian Automobile Association (CAA) and Canadian Tire, Transport Canada launched the Winter Driving Campaign in November 2011 to encourage Canadians to get their vehicles ready for winter and practice safe winter driving techniques.

Another outreach program developed by Transport Canada and the Canadian Council of Motor Transport Administrators is the Leave the Phone Alone Campaign. Through web-based tools, it encourages drivers to pledge to not use hand-held devices while driving. More than 1,100 people to date have pledged to leave the phone alone while driving. The campaign has also been incorporated into a variety of educational programs across Canada, including driving schools, P.A.R.T.Y. Program and by the City of Ottawa.

THE TRANSPORTATION ASSOCIATION OF CANADA (TAC)

TAC is a national association with a mission to promote the provision of safe, secure, efficient, effective and environmentally and financially sustainable transportation services in support of Canada's social and economic goals. TAC is primarily focused on roadways and their strategic linkages and inter-relationships with other components of the transportation system. TAC has recently developed a number of guides and best practices that practitioners across Canada can use to improve Canadian road safety. These include guidelines for using chevron alignment signs; recommended practices for LED-embedded traffic signs, guidelines for selecting traffic sign sheeting that meets minimum retro-reflectivity levels; guidelines for the network screening of collision-prone locations; a winter road condition terminology guide to report driving conditions consistently; a synthesis of practices for median design; and uniform signs and pavement markings for multi-lane roundabouts.

The United Nations—with Canada as a sponsoring nation—has declared 2011–2020 the Decade of Action for Road Safety (the Decade). Its objective is to stabilize and then reduce the forecasted level of road traffic fatalities around the world, which are predicted to become the fifth leading cause of death (1.9 million by 2020 compared to 1.3 million today). For the Decade—which was launched May 11, 2011—member states, international agencies, civil society organizations, businesses and community leaders have been called upon to create action plans to help achieve the objective. A Global Plan has been created to help member nations develop individual action plans. The Global Plan has five pillars: road safety management; safer roads and mobility; safer vehicles; safer road users; and post-crash response.

Transport Canada will champion the Decade and in consultation with other federal departments, provincial and territorial governments and non-governmental road safety organizations, will compile the related Canadian initiatives as a national plan. It has also developed a plan for its own initiatives to support the Decade of Action for Road Safety.

9.7 SECURITY

The Government of Canada has taken a collaborative approach with road operators, including urban transit and intercity bussing to improve their security cultures. Transport Canada has been working with urban transit and intercity bus industry partners and their respective associations (e.g., Canadian Urban Transit Association (CUTA) and Motor Coach Canada (MCC)) through the Steering Committee for Rail and Urban Transit Security Standards

Development to develop Codes of Practice (COPs) and other guidance materials on key security activities. Recently developed security COPs include: Conducting Security Risk Assessments; Developing and Maintaining Security Plans; Conducting Security Exercises; Employee Training and Awareness; and a draft COP on Developing Public Security Awareness Campaigns.

Transport Canada has also established an Intelligence Network for the sharing of security intelligence and incident reporting among railway, urban transit and intercity bus operators. It has also been conducting a risk-based analysis to determine the best approach for enhancing security for the transportation of dangerous goods by road, using a multi-phased policy development process that includes an environmental scan, consultations and information gathering, a strategic security risk assessment and an evaluation of potential policy options. The process includes consultations with industry, other federal government departments and provincial representatives. Transport Canada will continue its efforts to conduct this risk-based analysis by further engaging and consulting industry stakeholders and other federal government departments and provincial representatives.

The effects of 9/11 and the changes to customs processes that followed have continued to shape the Canada-U.S. border. Despite efforts to improve movement across the border, the perception remains that challenges continue to hamper trade and travel. Several approaches were taken over the years in response.

In February 2011, Canada and the U.S. issued a declaration entitled "Beyond the Border: A Shared Vision for Perimeter Security and Economic Competitiveness". Key areas of cooperation include: addressing threats early; trade facilitation, economic growth and jobs; integrated cross-border law enforcement; and critical infrastructure and cyber-security. A joint action plan was released on December 7, 2011, setting out 32 initiatives aimed at achieving the vision. It could also change the way security impacts operators. For instance, an integrated cargo security strategy will be developed, including common standards for screening inbound air and marine cargo at the first point of arrival in North America. Under the principle "cleared once, accepted twice," this same cargo, transported by rail or truck, would then be given accelerated passage across the land border. The strategy will also work toward streamlining and simplifying border and security processes to place less of a burden on industry.

TRANSPORTATION OF DANGEROUS GOODS 10

Economic growth. New pressures on Canada's transportation system. Amended Acts and regulations. 2007–2011 was a period of change for the transportation of dangerous goods.

10.1 OVERVIEW OF TRANSPORTATION OF DANGEROUS GOODS

Dangerous goods means a product, substance or organism that, because of its quantity, concentration, or physical or chemical characteristics may pose a real hazard to human health or the environment—such as gasoline, heating oil, paints, medication, household cleaning products and other materials used in homes and industrial activities.

Transport Canada estimates that, in terms of tonnage, 70% of dangerous goods are transported by road, 24% by rail and 6% by marine. A very small quantity of dangerous goods, accounting for less than 1%, is transported by air. The most common dangerous goods commodities transported in Canada are crude petroleum oil, gasoline and fuel oils, representing 77% of all dangerous goods transported by road. Alberta, because of its oil industry, is the province with the highest volume of dangerous goods movement on the road.

In 2009, Industry Canada indicated that about \$40 billion of chemical products are shipped in Canada annually, representing more than 8% of all manufacturing shipments in the country. Highly trained personnel are required to manage these dangerous goods and their associated risks.

Transport Canada is the major source of regulatory development, information and guidance on the transportation of dangerous goods (TDG) in Canada, and works closely with other federal, provincial and territorial agencies to foster effective and responsive governance and promote safety and efficiency.

Global economic growth and new sources of demands place pressure on Canada's transportation system. For example, the dramatic growth of the Asia-Pacific

market adds pressure to transportation networks. Growth such as this must occur with proper attention paid to both the transportation of dangerous goods and to Canada's emergency response capabilities. With traffic volume increasing across all modes of transportation, delays may occur, which means these dangerous goods, much like other types of goods may spend more time in the transportation system. This is taking place while Canada's transportation system is simultaneously becoming more integrated, leading to increased expectations for the seamless movement of dangerous goods between modes (e.g. from ship to train to motor carrier) and across borders.

Handling and transporting dangerous goods also raises concerns related to security and the environment. Issues such as real and perceived security threats have compelled Transport Canada to amend the *Transportation of Dangerous Goods Act*, 1992 in 2009 to permit emergency response measures addressing dangerous goods that have been lost, stolen or unlawfully interfered with and that may be used in security-related incidents. The pressure to mitigate environmental impacts related to the release of dangerous goods has significant implications for the design and structure of containment methods and in procedures related to emergency response (see tables S22 to S24).

10.2 2011 YEAR IN REVIEW

- In 2011, 358 accidents were reported to Transport Canada, meeting the transportation of dangerous goods Regulations' Part 8 reporting requirements—an 18% increase from 2010, but 5% below the five-year (2006–2010) average.
- Transport Canada, its stakeholders and emergency response personnel were involved in Exercise Kaboom in March. The purpose of the exercise was to draw upon

existing capabilities for Class 7, Radioactive Materials under the Emergency Response Assistance Program and to run an exercise testing these capabilities in the context of a Chemical Biological Radiological Nuclear and Explosive Response Program (CBRNE) incident requiring response to a radioactive dispersal device. Exercise Kaboom demonstrated industry participants' response capabilities harnessed in a full-scale, live-play, multi-agency CBRNE exercise. The exercise validated industry response capabilities by demonstrating the ability of response resources to effectively address gaps in incident response. All exercise participants and stakeholders worked well together forming linkages.

- The transportation industry implemented operational changes in response to new requirements resulting from the amended *Transportation of Dangerous Goods Act*.
- Several regulatory amendments were completed, including clarified requirements for Emergency Response Assistance Plans (ERAPs) and established compensation for plan holders (authorized by the Minister of Transport) when they respond to actual or anticipated releases of dangerous goods.

10.3 2007–11 RECAP

In response to industry changes and new security issues, Parliament amended the *Transportation of Dangerous Goods Act* in 2009 to provide requirements and authorities regarding: security regulations; emergency response plans; and control of the design, manufacturing, repair and testing of containers used in the transport of dangerous goods. These authorities allow Transport Canada to develop new policies and regulations—using the established consultation process—to enhance safety and security for Canadians while transporting dangerous goods.

While remaining focused on preventing incidents when dangerous goods are imported, handled, offered for transport and transported, the revised *Transportation of Dangerous Goods Act* expands the Government of Canada's response capability in the event of a security incident involving dangerous goods. This includes the CBRNE, which allows for a Canada-wide response to terrorism incidents involving such materials.

The ongoing harmonization of regulations and standards between Canada and the U.S. that incorporate United Nations recommendations has facilitated trans-border shipments, while increased awareness efforts have given industry direct access to Transport Canada inspectors through a Web feedback portal.

As the transportation of dangerous goods is a matter of concern for all Canadians, Transport Canada regularly consults with industry and with provincial and territorial governments about relevant policy changes through the Transportation of Dangerous Goods General Policy Advisory Council and biannual Task Force meetings.

10.4 TDG ISSUES

REGULATORY FRAMEWORK

Transport Canada is aligning the *Transportation of Dangerous Goods Regulations* (TDG Regulations) with the amended *Transportation of Dangerous Goods Act*, and is creating a compliance and response capabilities training program that will also fall in line with the amended requirements.

Specific focus will be placed on harmonizing the TDG Regulations with recent international regulations—incorporating updated references to technical standards—for the selection, use and manufacturing of means of containment, as proper classification of dangerous goods and selection of adequate containment means are key to the safe transportation of dangerous goods. Transport Canada is also enhancing its ability to gather data to support risk-based analysis and decision making, and has initiated work to amend data-reporting requirements.

Partnering with the U.S. Department of Transportation Pipeline & Hazardous Materials Safety Administration, Transport Canada is working to establish a cooperative arrangement that will increase regulatory harmonization and reciprocity to reduce costs for approvals, product testing, export certification and authorities' approvals requirements.

EMERGENCY RESPONSE/CANUTEC

The Canadian Transport Emergency Centre (CANUTEC) is a national advisory service that helps emergency response personnel handle dangerous goods emergencies 24 hours a day, seven days a week. CANUTEC is staffed with bilingual scientists trained in emergency response and specialized in chemistry or a related field. Emergency response advisors are experienced in interpreting technical information from various scientific sources to provide pertinent and timely emergency response advice to the First Responder community.

For the shipment of specific dangerous goods, Emergency Response Assistance Plans (ERAP) must be approved by Transport Canada. Emergency situations involving these materials may require Remedial Measures Specialists (RMSs) at the scene; in these

cases, joint CANUTEC/RMS experts provide Transport Canada's dangerous goods technical assistance expert advice to first responders. These individuals are experts in dealing with an emergency and in the characteristics of the dangerous goods involved and their possible impact on people and property. Transport Canada dangerous goods inspectors may also respond either in person or by teleconference, and can veto the proposed response and suggest alternatives if they believe public safety is at risk.

In addition to providing expert advice, CANUTEC also offers a free 24-hour emergency telephone service for Canadian consignors wishing to use this telephone number on their dangerous goods shipping documents. Approximately 7,000 consignors are registered for this service. In 2011, CANUTEC dealt with 1,032 emergency situations and handled more than 26,000 telephone calls in 2011.

CANUTEC is responsible for the production of the Emergency Response Guidebook (ERG), a joint effort between Canada, the U.S., Mexico and Argentina that is distributed to the Canadian First Responder community (and is also available in electronic format via the Transport Canada website, free of charge). A new guidebook is published every four years to reflect any changes in emergency response procedures and to update material names and identification numbers (called United Nations numbers). A newly revised edition of the guide will be released at the beginning of 2012.

RISK-BASED APPROACH

Handling and transporting dangerous goods presents a high risk to those directly involved as well as to the public at large. Risk is defined as the probability of damage, injury, liability, loss or other negative occurrence; examples of such negative occurrences include economic losses, infrastructure damage and death.

More than 40,000 Canadian sites are subject to the TDG Regulations. As a result, Transport Canada must allocate inspection resources where they will have the greatest impact. The risk-based approach currently being implemented involves inspecting sites according to the risk they pose to public safety. Using this approach, sites subject to the TDG Regulations are ranked according to factors such as the last time they were visited, their compliance history, the nature and quantities of dangerous goods handled and other characteristics. A score is then assigned to every site based on the risk it represents, and those with the highest scores are given priority by inspectors.

Ranking sites according to a measured risk helps ensure that dangerous goods are handled and transported safely in any mode of transport in Canada.

SAFETY PERFORMANCE

To better evaluate risk, accidents occurring during the transportation or handling of dangerous goods must be tracked. The TDG Regulations outline reporting requirements for releases of dangerous goods above pre-determined quantities and use data from these reports to calculate risk.

More than 70% of the 358 dangerous goods accidents reported to Transport Canada in 2011 occurred during handling at transportation facilities and the remaining 30% during transit (please see Addendum Tables S22 to S24). Ninety-six road-mode accidents were reported, representing more than 92% of in-transit dangerous goods accidents. The remainder occurred in the rail (6%) and air modes (2%). The TDG Regulations do not cover in-transit marine accidents involving bulk shipments of dangerous goods.

Seven injuries and no deaths were attributed to dangerous goods in 2011. From 2006 to 2010, there were an average of 11 injuries per year. The majority of dangerous goods accidents involved Class 3, Flammable Liquids (61%); Class 8, Corrosives (19%); or Class 2, Gases (12%). Most of the dangerous goods accidents in 2011 occurred in Alberta (63%), Ontario (12%) or Saskatchewan (8%).

The top two categories of underlying factors contributing to accidents were human error (56%) and equipment (32%), which includes gauges, valves, vents, closures, hoses and more.

AUDITOR GENERAL REPORT

On December 13th, 2011, the Commissioner of the Environment and Sustainable Development tabled its December report. Chapter 1 examined Transport Canada's oversight of the transportation of dangerous goods. The Audit focused on the oversight function of the program and recommended that Transport Canada establishes and implements an action plan to ensure that:

- Compliance monitoring and follow-up procedures are documented;
- Roles and responsibilities for dangerous goods inspections within Transport Canada are clarified;

- A performance measurement system that allows the department to report on the rate of regulatory compliance is implemented;
- The policy and procedure requirements for the review and approval of the emergency response assistance plans are clarified;
- Necessary guidance to review emergency response assistance plans is developed, and;
- A plan and timeline to complete an emergency response assistance plan is developed and implemented.

Transport Canada has put in place a management action plan that addresses all the findings in the report.

TRANSPORTATION SAFETY BOARD AND DANGEROUS GOODS

Transport Canada works with the Transportation Safety Board (TSB) to investigate accidents. Collaboration occurs during on-site investigations (for Transport Canada's own assessment of the situation with respect to TSB's authority), during reviews of TSB reports, and in relation to Transport Canada's response to TSB recommendations for preventing similar accidents.

Active TSB recommendations pertaining to transportation of dangerous goods accidents in 2011 include a recommendation related to tanker rail cars (tank car) standards for 286,000-pound cars that have been applied to new non-pressurized transportation of dangerous goods tank cars, and another recommendation tied to protocol for reporting and analyzing tank car stub sill failures so that unsafe cars are repaired or removed from service. Tank car stub sills are the two short steel beams (one attached to the bottom of each end of a

tank) that hold the couplers and draft gears. They are a structural part of a car under-frame and transmit coupler forces to the car body.

TDG RESEARCH

Transport Canada's transportation of dangerous goods Research and Development (R&D) program plans, manages and delivers engineering and scientific R&D projects, with the objective of informing and contributing to public safety in the transportation of dangerous goods.

Transport Canada was involved in the following research projects in 2011:

- *Investigation of Multiple Tank Car Rollover Derailments Related to Double Shelf Couplers and its Solutions*—Transport Canada is working with the National Research Council of Canada's Centre for Surface Transportation Technology to better understand tank car domino rollover derailments and assess solutions that could reduce these types of derailments. Tank car domino rollover derailments occur when the initial derailing tank cars are able to progressively roll over a number of subsequent tank cars. For further information, refer to the article in the *Transport Dangerous Goods Newsletter*, Fall 2011 edition¹.
- *Assessing the Toxicity of the Transport of Petroleum Sour Crude Oil*—This ongoing project will provide Transport Canada with important data and information regarding proper classification, safety marking and how petroleum crude oil should be contained during transport. The objective of the project is to correlate the hydrogen sulphide concentration in petroleum sour crude oil to the toxic vapours it generates during transportation in highway tanks.

¹ See <http://www.tc.gc.ca/eng/tdg/newsletter-fall-2011-1120.htm>

GATEWAYS AND CORRIDORS 11

Canada's Gateways and Trade Corridors comprise the transportation infrastructure, systems, operations, technology, regulatory and policies related to the marine, road, rail, and air modes supporting freight and passenger flows of national significance for international commerce. As a trading nation, Canada aims to improve the country's competitiveness in the world market leveraging the Strategic Gateways and Trade Corridors approach.

11.1 THE EMERGENCE OF STRATEGIC GATEWAYS AND TRADE CORRIDORS

With global supply chains evolving, trade movement on the rise and new markets emerging, the Government of Canada is working to ensure Canada's ongoing trade competitiveness through the implementation of long-term policies, strategic planning, and focused investment in the transportation system.

Since 1995, world container trade has more than tripled, exceeding 500 million twenty-foot equivalent units (TEUs) in 2009. In the same period, Canada's trade with the rest of the world grew by 65%. Canada's major ports now handle almost 33% more international trade volumes and 65% more containers than a decade ago. This trade increase has also affected Canada's airports, railways, roadways and internal waterways.

The growth of containerization has had a significant impact on world trade and created the opportunity for Canada to become a key gateway for Asia–North America trade. In the decade leading up to 2005, Canada's trade with China alone grew by almost 500%. All levels of government, along with private stakeholders, responded to improve both the capacity and efficiency of the transportation infrastructure on Canada's west coast. In 2006, these efforts culminated with the launch of the Asia–Pacific Gateway and Corridor Initiative (APGCI). The systems-based, multi-modal APGCI strategy extends beyond infrastructure to include policy, regulatory and operational measures to improve the efficiency and reliability of the supply chain.

Canada's connectivity with the U.S.—the country's largest trading partner—is also crucial. Central Canada's transportation infrastructure handles approximately 70% of trade (by value) with the U.S.

On the east coast, while European trade dominates, imports from South America and South Asia have grown significantly since 2000, providing new trade opportunities for Canada.

In response to the increase in trade and the resulting impact on the transportation system, the Government of Canada released the National Policy Framework for Strategic Gateways and Trade Corridors in July 2007. This Framework was developed to improve the capacity and efficiency of the country's transportation system to support international trade, thereby advancing the competitiveness of the Canadian economy. The Framework provides focus and direction through a government-wide approach that fosters further development and optimization of the transportation system that is fundamental to Canada's success in international trade.

The National Policy Framework emphasizes Canada's geographic advantages, includes long-term planning and public-private collaboration, and applies an integrated approach to assessing and implementing infrastructure, policy and operational measures.

Under the National Policy Framework, Canada's Gateways are divided into three strategic regions: the Asia–Pacific Gateway and Corridor, the Ontario–Quebec Continental Gateway, and the Atlantic Gateway and Trade Corridor. As each gateway is unique, specific strategies aim to reflect each region's local realities, opportunities and challenges, while recognizing that these gateways are complementary to one another.

CURRENT GATEWAYS AND TRADE CORRIDORS

The objective of the **Asia–Pacific Gateway and Corridor** (APGCI) Initiative is to strengthen Canada's competitive position by establishing the best transportation

network between Asia and North America. To date, 47 strategic transportation infrastructure projects valued at more than \$3.5 billion have been announced by the federal government in partnership with all four western provinces and other public and private sector partners. This gateway links the ports of Vancouver and Prince Rupert with the inland supply chain and the rest of the continent.

The **Ontario–Quebec Continental Gateway** is a vital component of Canada’s multimodal transportation system and provides a critical link between all key gateway facilities and also to Canada–U.S. border crossings. The Ontario–Quebec Continental Gateway is focused on developing a sustainable, secure and efficient multimodal transportation system that supports business opportunities.

Canada’s **Atlantic Gateway and Trade Corridor** is a transportation network that connects North America to markets in Europe, the Caribbean, Latin America, and Asia via the Suez Canal. With its deep-water ports, specialized niche and customized services, modern intermodal transportation network, and partnership between government and the private sector, the Atlantic Gateway and Trade Corridor reaches into the economic heartland of North America. The Atlantic Gateway and Trade Corridor Strategy was released in March 2011. It was developed through the collaboration of the Governments of Canada, Nova Scotia, New Brunswick, Prince Edward Island, and Newfoundland and Labrador, as well as the private sector.

DEVELOPMENT ACTIVITIES

ANALYTICAL FRAMEWORK

Since 2007, Transport Canada, in collaboration with provinces and other public and private stakeholders, has developed and implemented an analytical framework to support the various gateways. Substantial analysis has been conducted to identify capacity and demand of the multimodal transportation system, and considerable knowledge has been gained. This analytical framework has led to the identification of issues and bottlenecks affecting the efficient flow of international freight, as well as the competitiveness of the transportation system—both now and in the future.

COLLABORATION

A key factor in gaining knowledge and gathering relevant information is consultation and collaboration

with the private sector—owners, operators and users of the transportation system in Canada. Stakeholder roundtables, workshops and direct consultations create a strong base for collaboration to identify the real issues that impact the efficient movement of freight and Canada’s trade competitiveness.

The private sector offers insight into the daily challenges of moving goods through and along Canada’s transportation system. Formal partnerships have been established for all three gateways and corridors. Coupled with the national perspective of Canada’s Gateways, these partnerships assist the Government of Canada to address transportation system needs that are critical to the efficiency of international trade flows and trade competitiveness.

The APGCI Gateway Performance Table was established in 2008. Its participants represent a cross-section of major transportation, shipping and labour interests operating in the Lower Mainland of British Columbia and across the Prairies. The Performance Table was set up in response to ongoing stakeholder feedback regarding the overall performance of this supply chain, and to assess whether APGCI infrastructure investments were resulting in performance improvements over time.

Both a private sector and a public sector advisory committee were established for the Ontario–Quebec Continental Gateway, to provide advice on public policy issues and governmental measures, to collaborate on the development of the gateway and trade corridor, and to offer a forum for participants to share their expertise, information and insights.

In the east, the Atlantic Gateway Advisory Council provides regional perspectives to support the ongoing development of Atlantic Gateway initiatives. The Council consists of 13 private sector representatives from a broad range of industries in Atlantic Canada. The Council works with governments to identify and address the issues affecting Atlantic Canada’s international trade competitiveness, and to ensure the greatest possible long-term benefits to the entire Atlantic Region.

MARKETING

In addition to its efforts in stakeholder collaboration, the Government of Canada has been engaged in extensive marketing initiatives to promote the advantages of the Canadian transportation system—particularly the country’s first-class gateways and corridors that enable access to and from the North American market.

Trade missions have been led by various federal ministers, in partnership with provincial governments and

the private sector, to Asia, South America, the United States and Europe. Emphasis is placed not only on Canada's transportation system, but also on the country's significant business opportunities.

More specifically, under the APGCI, the Department of Foreign Affairs and International Trade was allocated dedicated funding to develop and implement an international marketing strategy for the Asia-Pacific Gateway and Corridor. The strategy included business-to-business engagement, a strong presence at international transportation and logistics events, targeted media outreach, and an advertising campaign. When appropriate, Canada's other gateways were also represented.

Marketing is also a major component of the Atlantic Gateway Strategy and is supported by a dedicated fund. Atlantic Gateway marketing focuses on building national and international awareness of the gateway's assets and includes key sectors such as bulk/break-bulk, containers and air cargo. Ongoing collaboration with ports and airports in the region has led to the development and implementation of strategic international marketing initiatives in key international markets including the United States, Europe, Asia and South America. Participation at key industry events provided Atlantic Gateway ports and airports with venues to identify and develop global business opportunities.

INFRASTRUCTURE INVESTMENTS

Coinciding with the National Policy Framework for Strategic Gateways and Trade Corridors, the \$2.1 billion Gateways and Border Crossings Fund and the \$1.0 billion Asia-Pacific Gateway and Corridor Initiative form a special element within Building Canada, the federal government's overall plan for infrastructure.

Almost \$6 billion has been committed to Canada's gateways and trade corridors from a variety of sources, leveraging significant public and private investments. These commitments support the objectives of improving both the capacity and efficiency of the country's transportation system, and advancing the competitiveness of the Canadian economy. Investments support key projects underway or recently completed, such as the South Fraser Perimeter Road and the Roberts Bank Rail Corridor in British Columbia, a new access road linking the planned new Windsor-Detroit crossing to Highway 401 in Ontario, modernization of Port of Sept-Îles in Quebec, terminal expansions at the Port of Halifax in Nova Scotia and the Port of Belledune in New Brunswick.

BEYOND INFRASTRUCTURE

Throughout the development and implementation of the various gateway and trade corridor initiatives, transportation system improvements have not been limited to infrastructure investments. In many cases, improvements have been identified and implemented to reduce policy, regulatory and financial barriers, to improve the business environment for trade growth, and to enhance freight operations at key facilities by way of company-level agreements, application of new technology and establishment of innovative operational practices.

These significant non-infrastructure improvements to date include modified customs tariff rules allowing greater domestic use of imported cargo containers, the elimination of the 25% duty on certain foreign-built vessels, amendments to the *Canada Marine Act*, the elimination of many manufacturing tariffs (Tariff-free Zones for manufacturers), free trade agreements under development (e.g. with the European Union and with India), and the amalgamation of ports in the Lower Mainland of British Columbia to form Port Metro Vancouver.

INLAND PORTS AND LOGISTICS HUBS

Inland ports and multimodal hubs offer opportunities to attract investment and the concentration of value-added manufacturing, logistics and other services.

Successful inland ports and other multimodal hubs exist near strategic transportation infrastructure that is well integrated into global value chains, that has space for development, that offers proximity to suppliers and markets, and that resides in a regional economy with a skilled labour force and concentrations of services that support trade and transportation.

One prime example of such an inland port is Winnipeg's CentrePort Canada, a provincial and locally initiated project to develop a 20,000-acre zone for an inland port and trade area around J.A. Richardson

FOREIGN TRADE ZONES

Canada offers a unique package of tax programs and policies that allow any business to operate as if it has its own foreign trade zone (FTZ), anywhere in Canada. Developed by the Department of Finance, these include duty deferral and remission policies, the customs bonded warehouse program, and programs for exporters. The programs combine with the fully refundable GST/HST system to allow unrestricted access to FTZ-like benefits without the requirement of operating within the limited zone of a traditional FTZ.

International Airport. The project seeks to leverage Winnipeg's geographic location on north-south and east-west trade routes, and build a multimodal hub for international transportation, manufacturing, distribution and warehousing activities.

Budget 2009 identified CentrePort Canada as a key priority for federal infrastructure funding, with contributions to six projects and operational funding for CentrePort Canada's start-up. A single-window task force and outreach program were also launched in Winnipeg to raise awareness of Canada's tax and duty deferral advantages, including enhanced promotion of Canada's foreign trade zone-type programs.

ENSURING CONTINUED SUCCESS

LESSONS LEARNED

Throughout the development and implementation of various tasks associated with Canada's gateways, collaboration among public and private stakeholders has been the key to success. While strong partnerships may take considerable time to develop, the ability to identify issues and implement solutions is a demonstration of what can be accomplished when stakeholders collaborate effectively.

Developing, maintaining, sharing and applying an extensive knowledge base of Canada's multimodal transportation system as well as the current and future trade flows it must support amount to a sizeable task. The economic environment is constantly changing, with decisions made daily that impact trade and the transportation system. Staying abreast of these issues and responding accordingly have been key to the gateways' success.

While the National Policy Framework for Strategic Gateways and Trade Corridors represents a national perspective, individual gateway initiatives have addressed needs at both regional and local levels. One essential—but often overlooked—benefit of the gateway approach is that gateways share global supply chains. As such, improvements to a specific supply chain in one gateway can benefit another gateway where the supply chain also exists.

NEXT STEPS

The APGCI has had many successes in the last five years. With federal funding fully committed, significant progress has been made on infrastructure projects. Moving beyond traditional bricks and mortar toward competitiveness measures, the APGCI has also helped ensure a thriving business environment. Moving forward, to derive the greatest benefits from its investments APGCI will focus on deepening relationships domestically and internationally and seizing opportunities to expand trade with international partners.

As for the Ontario-Quebec Continental Gateway, analysis of the multimodal transportation system within Ontario and Quebec continues in order to identify impediments and opportunities for more efficient trade. The Government of Canada is working with the private sector and other key public sector stakeholders to address current and future transportation needs.

The Atlantic Gateway and Trade Corridor Strategy includes a balance of immediate measures and longer-term directions to position the region's transportation system to take advantage of global trade opportunities. Core elements of the Strategy guide implementation activities, which are well underway. Beyond advancing the infrastructure projects, other activities include further supply chain analysis, focused analytical work, regional workshops on various issues, international trade missions and marketing efforts. Moving forward, the Atlantic Gateway Federal-Provincial Officials Committee will also continue to collaborate with the private sector to identify and address policy and regulatory issues that affect the competitiveness of the Gateway.

More information on Canada's Gateways is available at canadagateways.gc.ca.

11.2 SUPPLY CHAIN PERFORMANCE MONITORING

At the core of Canada's Gateways and Corridors Policy lies a crucial question: are Canadian gateways and supply chains reliable? Global competitive forces are imposing new standards in transparency and performance accountability in the international transport and logistics arena. Public and government agencies worldwide have somewhat lagged behind the private

sector in adopting systematic and transparent key performance indicators (KPI), but KPIs are now rapidly emerging across government agencies in the transport sector as essential tools that support a variety of meaningful and legitimate goals, such as setting performance targets, guiding national policy, monitoring continuous improvement, ensuring asset management accountability, measuring return on infrastructure investments, and marketing.

Meanwhile, the emergence of global supply chains has brought new challenges to transportation and logistics—notably the need for a systems-wide approach to performance evaluation. Transport Canada is developing new tools for transportation system performance measurement that better reflect the efficiency and reliability imperatives that Canadian and other companies face in today's era of global supply chains.

Transport Canada has also devised an integrated approach that seeks to monitor performance and utilization of critical gateway assets at both gateway (port utilization indicators) and supply chain (fluidity) levels. These initiatives rest on sound partnerships between Transport Canada and participating supply chain partners and leverage an unprecedented level of world-class expertise.

PORT UTILIZATION INDICATORS

With approximately 90% of global trade by volume transported by sea and waterways, ports are critical links in global supply chains. Despite the importance of seaports to the global economy, little is known about what makes a port truly competitive and a best-in-class performer. While no single metric can truly capture the full complexity of port operations, gateway stakeholders recognize the need to build a factual, impartial case for ensuring the competitiveness of Canada's gateways. To do so, a project has been initiated to develop a set of port utilization indicators at a national level to assist ports in monitoring their operational performance over time.

Few studies exist that compare port performance internationally. The current state of practice and research in port performance indicators yields limited opportunities for port-to-port benchmarking and comparison. The primary challenge stems from the lack of standard definitions and calculations. Port utilization indicators were recently developed and implemented based on the principle of methodological transparency and under

partnerships that leveraged operational and academic port expertise.

The project began in the fall of 2008 and involved the largest Canada Port Authorities (CPAs). The first phase of the project sought to implement metrics at container facilities, while bulk facilities were addressed in a subsequent phase due to methodological complexities related to bulk operations. Bulk indicators are aggregated by commodity and cover iron ore, coal, minerals (potash and sulphur), grain, general cargo, forest products and liquid bulks. All metrics focus on operational aspects of port facilities (see Table M30A).

FLUIDITY INDICATOR

To evaluate how gateways and strategic trade corridors interact together operationally a fluidity indicator was developed. This indicator examines end-to-end supply chain performance by focusing on the time component. The fluidity indicator measures the total transit time of inbound containers from overseas markets to strategic North American inland destinations via various Canadian gateways. Initial phases of this indicator project targeted inbound container movements for Pacific Gateway markets (British Columbia ports). However, future phases will cover inbound movements at other gateways, but also international outbound container and bulk movements across all major gateways.

The fluidity indicator project is multi-phased. Phase 1 monitors transit times of containers departing Shanghai and Hong Kong via Prince Rupert and Port Metro Vancouver destined for Calgary, Toronto, Montreal or Chicago. Total transit times are calculated by summing all modal segments of end-to-end movement. No single data source (or provider) can capture transit time data for the entire container trip; hence, a variety of data exchange partnerships are in place with several stakeholders. For the most part, the method relies on genuine primary data from private sector carriers supplied on a voluntary basis.

In terms of shipment delivery time and costs, world-class gateways can offer shippers numerous options, ranging from expedited and premium services to lower-value propositions. For the fluidity indicators project, Transport Canada identified eight different supply chain models (see Table M30B). These represent various combinations of modes and logistical arrangements, including transloading of containers.¹ The 'direct rail' model is predominant at the two British Columbia

¹ *Transloading* generally refers to the transfer of shipments from international marine containers (20', 40', 45'+) to domestic containers (53').

gateways, accounting for just over half of all inbound container movements. Direct rail occurs when inter-modal trains are built on-dock at marine terminals and leave the port directly for their final inland destinations. Besides a pure truck transit, direct rail is generally a faster landward option since containers bypass having to stop at origin rail yards. In the context of that project, Transport Canada estimates that during the year 2011, containers averaged 22.5 days of transit between Shanghai and Toronto via British Columbia ports using direct rail, compared to 25.6 days for the trans-load model.

Analysis of transit times by logistical segment reveals the essential role the marine component plays in overall trans-Pacific movement of containers. Indeed, ocean transit makes up 65% of the total journey, while port dwell and rail transit accounts for the remaining 35% of the journey. In other models, drayage—the transport of goods by truck on a short distance—generally constitutes a marginal share of total transit time, despite its critical role in the overall movement of goods.

Table M30C presents a sample of the fluidity results using the direct-rail model for Shanghai to Toronto via British Columbia ports over 2010 and 2011. Western Canadian gateways have achieved a consistent level of transit time performance from Asia to Central Canadian markets from 2010 to 2011, due to significant gains on the landside—notably at the port interface (dwell). Indeed, the two B.C. ports registered a combined 23% year-over-year decrease in port dwell times and achieved a remarkable average performance of slightly less than 2.5 days. The performance of Canadian supply chain partners has helped offset the significant deterioration of ocean transit times in 2011, thereby allowing for overall consistency of total transit times over the past 24 months.

Overall, Transport Canada's supply chain performance monitoring initiatives support the establishment of KPIs to assist government agencies in enhancing visibility and accountability in oversight of key assets. Transportation and logistics facilitate global trade, and their efficient performance is essential to trade-reliant countries such as Canada. Moreover, the nodal role of seaports in global supply chains and international gateways warrants special attention. Transportation decisions are increasingly made within a broader scheme of supply chain management; it is through this lens that performance should be approached.

Improved supply chain performance can impact the daily lives of nearly all Canadian consumers. Insightful performance measurement can lead to more precise identification of logistics elements needing adjustment, which can then improve supply chain performance and Canada's trade competitiveness.

This benefits all gateway users and, ultimately, end consumers. This type of detailed information is highly valuable and can be leveraged for several purposes, including overseas promotion of Canada's gateways, stakeholder facilitation, policy support, and measuring return on infrastructure investment, among others. In gathering performance measurement details—and to maintain integrity of the data collected—Transport Canada continues to expand the scope of trade lanes and corridors while supporting effective data exchange partnerships.

11.3 TRANSPORTATION, LOGISTICS AND GLOBAL VALUE CHAINS: A CANADIAN PERSPECTIVE

This section aims to describe the symbiotic relationship between global value chains and transportation, with a special focus on the Canadian context. It is not the objective of this section to discuss the drivers and the *raison d'être* of global value chains (GVCs)², but simply to highlight how the geographical extent of global production hinges on efficient transportation and logistics. GVCs impact the daily lives of every Canadian; given the central role transportation plays in GVCs, the vitality of this industry is a matter of high stakes to Canada's ability to prosper as a trading nation.

Transportation is integral to international trade. GVCs—also called global commodity chains, global production networks, or global supply chains—depend on efficient, affordable transportation, logistics and information and communications technologies (ICT). Today's global production activities are transport-intensive and rely heavily on responsive transportation and logistics capabilities. There is simply no value-added without the physical movement of resources, people, intermediate and finished goods—or transportation.

2 For a Canadian perspective, see Sydor, A. (ed.) 2011. *Global Value Chains: Impacts and Implications*. Foreign Affairs and International Trade. Ottawa.

Many have argued that the “container revolution” of the 1950s underpins globalization as we now know it.³ Today, 90% of global trade, by volume, still transits the oceans.⁴ Since its inception, the container has weathered global economic structural changes and proven to be an adaptive and resilient facilitator of merchandise trade. As containerization celebrated 50 years of service in 2007, the transportation industry strove to adapt to the new trade reality of GVCs. Indeed, 50 years after Sealand⁵ launched the world’s first container service, Maersk echoed that innovative spirit by introducing in September 2011 the concept of ‘absolute reliability’ through its Daily Maersk⁶ service. Maersk’s move recognized the need to adapt to the ever-increasing velocity of GVCs and the complete reliability demanded by shippers. In the rail sector, the concept of ‘precision railroading’ introduced in the past decade illustrates similar—and necessary—adaptation. Other transportation sectors have also made adjustments to this new global trade arena. Firms have been expanding from domestic to international, crafting new supply chain partnerships, and investing in logistics facilities and technologies. These transformations represent profound changes in the global economy and are reshaping the transport and logistics landscape, both in Canada and throughout the world.

Like many countries, Canada is seizing opportunities in trading with emerging economies showing strong growth, such as Brazil, Russia, India and China, commonly known as BRIC economies. Figure EC16A illustrates Canada’s total merchandise trade with the four BRIC economies over the past decade. Both the pace and magnitude of bilateral trade with China stand out and have even dwarfed trade with other BRIC countries. As terms of trade under the GVC paradigm are changing and new opportunities emerge, the appropriate conditions must be in place for Canada to reach its full GVC integration potential.

Global value chains and transportation have a mutually beneficial relationship. The geographical extent of global production hinges on efficient transportation and logistics. Canada’s ability to prosper as a trading nation

in the international marketplace is directly linked to the capacity of the transportation sector to support global value chains.

TRANSPORTATION IN GLOBAL VALUE CHAINS

Global value chains can be defined as “the full range of activities undertaken to bring a product or service from its conception to its end use and how these activities are distributed over geographic space and across international borders.”⁷ But what role does transportation and logistics play in GVCs? In the minds of many, *production* is often synonymous with *assembly*, but in a global trade reality this cannot be farther from the truth. Global value chains span functions well beyond assembly.

For a typical manufactured item, value-adding activities take place from design and conception through to post-consumption (see Figure 11.1). Transportation and distribution figure prominently at both pre- and post-assembly stages—namely procurement and distribution to consumer markets. For example, in the post-production distribution of goods to market for a flat-screen TV, ocean transportation costs from Asia to North America are estimated at 2% of retail value; for a shirt, 0.85% of its retail value; while for a tonne of grain these costs climb to 40% of the purchase price.⁸ Another example is fresh lobster, where air transportation from Halifax to Shanghai accounts for only 2% of its retail price.⁹ These transport costs are often supplemented by additional logistics costs such as storage or transloading.

While useful, Figure 11.1 focuses on finished goods and thereby does not accurately depict the magnitude of transportation activity in global value chains. Further transportation and logistics activities take place within each of the value-adding stages—particularly in and around the assembly (manufacturing) stage. These *embedded transportation costs* can be further explored through an example of automobile manufacturing. A typical automobile is made up of approximately

3 See, for instance, Levinson, M. (2006). *The Box: How the Shipping Container Made the World Smaller and the World Economy Bigger*. Princeton University Press, as well as Donovan, A. & Bonney, J. (2007). The Box that Changed the World: Fifty Years of Container Shipping. *The Journal of Commerce*.

4 World Shipping Council (2011). <http://www.worldshipping.org>.

5 Now owned by Maersk Line (since 1999).

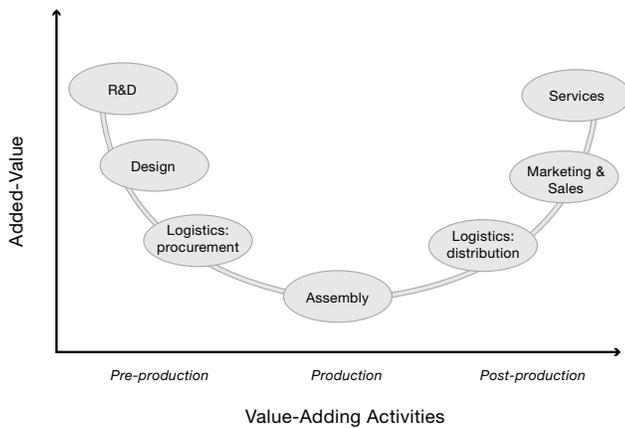
6 See <http://www.dailymaersk.com/>

7 Sydor, A. (2011). The Evolution of Global Value Chains. *Canada’s State of Trade 2011*, Government of Canada, Department of Foreign Affairs and International Trade, Ottawa. pp. 85-101 (Special Feature).

8 Kolding, E.D. (2010). *Beyond the Storm: the Industry our Customers Should Ask For*. Maersk Line. Presentation made at Transpacific Maritime Conference 2010, Long Beach, March 1, 2010.

9 Price on a per-pound basis. G.E. Simpson & Associates (2012). *Air Cargo and the Fish and Seafood Study*. Prepared for Transport Canada, January 2012.

FIGURE 11.1. VALUE CREATION ALONG THE VALUE CHAIN



Source: adapted from G. Gereffi, presentation at joint OECD-World Bank workshop on *GVCs and Emerging Countries*, Paris, September 2010.

30,000 different parts¹⁰ that are sourced, manufactured and sub-assembled at various locations around the globe. It is not a simple task to measure the number of truck trips, rail movements, air cargo shipments, or ocean container movements involved in the assembly of a single automobile, as thousands of individual parts make their way from several countries to a final assembly point. Each of these intermediate parts has further embedded transportation costs in its own manufacturing. Figure 11.2 attempts to illustrate this using tires as one of many intermediate components contributing to the assembly of a finished vehicle. As each successive stage of production is linked by the physical movement

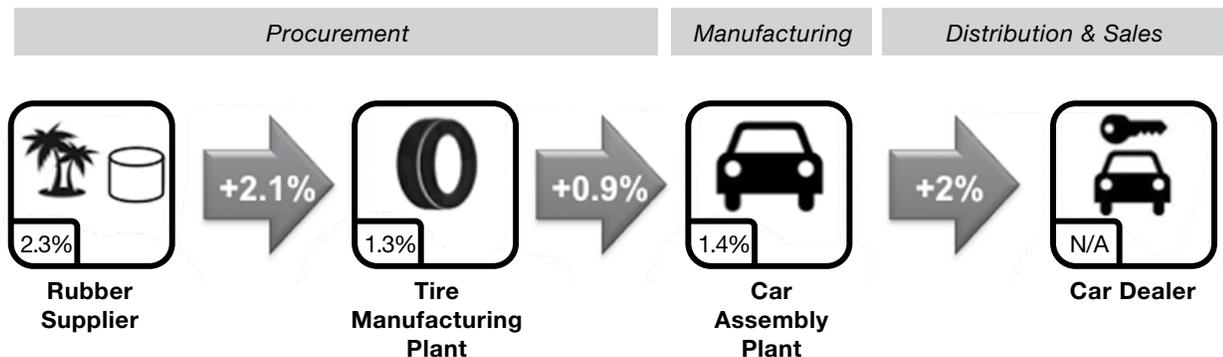
of semi-finished goods, a transportation cost is added cumulatively. Using the tire example, the embedded transport cost of producing rubber is 2.3% (as share of producer price). Then, the rubber must be transported to the tire production plant, a cost that represents 2.1% on top of producer price. The same cycle occurs for the manufacturing of the tire, adding another 0.9% to transport the tire from the factory to the car assembly plant. This cycle continues for the thousands of parts involved. Superimposed onto this process are border crossings—which can be several, even for a single part. It quickly becomes clear that transportation activities are vital linkages in GVCs.

These embedded transportation costs, however important, generally remain a small share of the final retail price of finished consumer goods, due to efficient and affordable transportation and logistics services. In the case of finished automobiles, it stands at an estimated 1.4%.

Transport as a share of producer price naturally varies, depending on the commodity, the geographical location of both inputs and the market and mode(s) of transport used. For example, for forest products, transportation as a share of final producer price stands at approximately 3.9%, while that share for coal stands at 1.1%. Generally speaking, bulk commodity supply chains tend to be more vertically integrated and transport costs more internalized. In addition, in Canada, an increasing share of traditional bulks are now being containerized for export (e.g. forest products, pulse), and logistics will vary whether commodities are loaded into containers at their source or at port prior to being shipped overseas.

Every value-adding process bears an embedded transportation cost. But despite the geographical lengthening of value chains, the proportion of transportation

FIGURE 11.2. EMBEDDED TRANSPORTATION COSTS OF FINISHED AND SEMI-FINISHED MANUFACTURED GOODS



Source: Transport Canada from Statistics Canada (input-output) data

10 From Toyota official website at www.toyota-global.com.

as a share of total production inputs into manufactured goods remains marginal. In fact, the criticality of transportation and logistics within GVCs against its small share in total production costs creates an interesting paradox.

THE TRANSPORTATION PARADOX

The marginal share of transportation costs as a proportion of the value of goods can be attributed to advances in global logistics, especially since the advent of containerization. However, to a large extent, this belies the necessity of reliable transportation and logistics services. This forms the transportation paradox: although transport costs may be small in the overall production process, the penalties of poorly performing transport/logistics systems can be severe—particularly for producers and consumers. Since transportation costs are compounded as value is added to goods, each time an intermediate good is physically transported at any stage of production it risks delays, which can result in cost penalties at the receiving end. Therefore, while transportation as a share of total input into manufactured goods can be relatively marginal, the share of total logistics costs can be high—and is strongly dependent on logistics competence. The inability to deliver on-time due to a transportation disruption can stop production, and the costs behind such a stoppage are significant.

To better capture this paradox, total logistics costs should be examined—a comprehensive set of costs to shippers that include transport costs, among others.¹¹ Taking the total logistics costs view, a shipper's penalty for providing underperforming and unreliable transportation services does not necessarily translate into higher transportation costs but into *other induced costs*: additional lead times, stock-out costs, additional safety stocks and inventory costs, opportunity costs of in-transit inventory, etc. A truck, ultimately, is inventory on wheels, and managing and maintaining inventory bears a cost. But these buffer costs are difficult to quantify and add uncertainty in the management of supply chains that costs billions of dollars each year to North

American shippers. Based on preliminary research conducted by Transport Canada and Industry Canada, total logistics costs represent a significantly higher proportion than transportation costs alone to importers and exporters.

In a recent survey, Industry Canada found that “the top 20% performers in total landed cost¹² and on-time shipment are more likely to invest in logistics network strategies—such as capability to electronically collaborate with networks of key suppliers and customers—and supply chain modeling applications”.¹³ The same study reports that investments in distribution centres in Canada increased by 106% from 2005 to 2010.

On a macro-economic scale, these logistics costs can become a tremendous liability to a nation's trade competitiveness. By facilitating global trade, logistics capabilities are at the core of a nation's global competitiveness.¹⁴ This concept applies to an even greater extent to developing countries, where logistical capabilities can often fall behind export production capacity and become a hindrance to trade.

The case of China is particularly interesting. Logistics costs as a share of gross domestic product (GDP) stood at 18% in 2008.¹⁵ This was high compared to developed economies, where typical logistics costs were less than 10% of GDP. Moreover, a decade ago, inland transport costs accounted for approximately 60% of the total transport costs from Chinese producers to overseas markets, compared to averages of 15% for Europe and 11% for the United States.¹⁶ China's Central Government recognized this shortcoming and made a policy objective to decrease this share in its last two consecutive five-year plans. China's government also introduced an initiative called the Rejuvenating Program for the Logistics Industry in February 2009. The same year, China announced transportation infrastructure investments of no less than \$290 billion U.S. (or 6% of its GDP). China's logistics industry has come a long way to support its booming export trade and, despite these shortcomings, no other country in history has ever handled the cargo volumes that China handles today.

11 These costs are generally made up of: (1) transportation costs, and (2) inventory costs, including (but not limited to): direct transport costs, in-transit inventory carrying costs, ordering costs, cycle stock carrying costs, safety stock carrying costs and stockout costs. From Chow, G. (2008). *Total Logistics Cost Model: Conceptual Framework*. University of British Columbia Sauder School of Business.

12 A concept similar to (yet narrower than) total logistics costs.

13 Industry Canada (2011). *Global Business Strategy and Innovation: A Canadian Logistics Perspective*. In partnership with Canadian Manufacturers and Exporters and Supply Chain and Logistics Association of Canada. http://www.ic.gc.ca/eic/site/dsib-logi.nsf/eng/h_pj00528.html.

14 The World Bank (2010). *Connecting to Compete: Trade Logistics in the Global Economy*. Washington.

15 KPMG (2008). *Logistics in China*. http://www.kpmg.com.cn/en/virtual_library/Property_Infrastructure/LogisticsChina.pdf

16 Carruthers, R., Bajpai, J.N. & Hummels, D. (2003). Trade and logistics: an East Asian perspective, in K. Krumm & H. Kharas (eds) *East Asia Integrates: a Trade Policy Agenda for Shared Growth*, Washington: the World Bank, pp.117-137. This supports the so-called ‘first mile-last mile’ argument, namely that the first and last ground transportation steps are critical to end-to-end performance.

In terms of costs, Canada's logistical performance offers both challenges and opportunities. The higher logistics cost associated with doing business in Canada compared to the United States was confirmed by a joint report by Industry Canada and the Supply Chain and Logistics Association of Canada.¹⁷ The survey-based study revealed that total logistics and supply chain management costs for the Canadian economy increased by 3% from 2005 to 2007. Compared to the U.S., total logistics costs were slightly higher for Canadian manufacturers and wholesalers but somewhat more significantly so for Canadian retailers in 2007. In other words, all else being equal, running a firm's global operations out of Canada costs more in logistics than out of the U.S. This finding supports the need to target measures to enhance Canada's competitiveness, whether from a trade, logistical, or information and communications technology capability viewpoint. The study also demonstrates how Canadian firms continue to outsource more of their activities in low-cost countries—notably in China—making them more sensitive to changes in international transportation costs and energy prices, although acknowledging that locational dynamics of offshoring may have changed since then.

SUPPLY CHAIN COLLABORATION

How are GVCs reshaping the Canadian transportation and logistics sector? In the global marketplace, supply chain management becomes a key differentiator for trade-reliant economies like Canada. Global value chains are forcing us to rethink conventional ways we look at competition. Two competing value chains may, for example, use the same airport but different airlines and ground transportation providers to bring goods to market. At the core of GVC competitiveness is governance—under what arrangements the various supply chain partners come together to differentiate their offerings and provide a competitive value proposition to the market. Although Canadian transportation and logistics firms are adapting to the realities of GVCs in numerous ways, collaborative partnerships are a strength that differentiates Canada on an international scale.

Supply chain collaboration and partnership is being driven by both private and public sector initiatives. At the public sector level, the National Gateways and Trade Corridors Strategy has proven a powerful metaphor to incite and foster greater levels of collaboration across the entire supply chain. The most advanced of the gateways, the Asia-Pacific Gateway and Corridor Initiative, captures the spirit of collaboration between all levels of government and private sector stakeholders. Ongoing collaborative platforms that have yielded real operational benefits include the Gateway Performance Table (performance measurement), the Winter Contingency Planning Table (resilience) and the Asia Pacific Skills Table (skills and knowledge base).

In the private sector, 2010 and 2011 were marked by an unprecedented number of service level agreements between marine terminal operators, Class I railways and port authorities in a consolidated bid to enhance the operational performance and competitiveness of national gateways and corridors. Such agreements were put in place at all four major container ports starting in April 2010, and provide service level guarantees to supply chain partners, backed by key performance indicators. These agreements have led to concrete results on both coasts: a reduction in the range of 20 to 25% in port dwell times at west coast ports¹⁸ during 2010 and similar reductions at the Port of Halifax from January 2010 to November 2011.¹⁹ A general trend among Canadian transportation service providers is to become more transparent and accountable for their performance, which speaks to improved collaborative relationships and better overall governance of supply chains. In fact, the Canadian gateway model is increasingly recognized internationally as a best practice.²⁰

CANADA'S PERSPECTIVE

Transportation and logistics are at the very core of global value chains, which aim for the seamless flow of commodities, people, knowledge, information, capital and goods. An embedded transportation cost lies in all finished and semi-finished goods. Transportation becomes **value-adding** when it is reliable and in sync

17 Industry Canada and The Supply Chain & Logistics Association of Canada (2008). *State of Logistics: the Canadian Report 2008*. <http://www.sclcanada.org/>

18 Based on data from Transport Canada collected under Port Utilization Indicators project.

19 Port Authorities of Vancouver Fraser, Prince Rupert, Montreal, and Halifax (2011). *Vancouver Fraser Port Authority, Prince Rupert Port Authority, Montreal Port Authority, and Halifax Port Authority Submission to the U.S. Federal Maritime Commission*. December 2011. http://www.portmetrovan-couver.com/Libraries/ABOUT_News_Press_Releases/FMC_Submission_-_Dec_21_2011.sflb.ashx

20 See, for example, Kulisch, E. (2011). Knatz: U.S. at Fault for Canada Diversion. *American Shipper*, October 26, 2011. See also a number of U.S. submissions to the Federal Maritime Commission Notice of Inquiry Docket No. 11-19: *U.S. Inland Containerized Cargo Moving Through Canadian and Mexican Seaports*, www.fmc.gov.

with all stages of production, but can become **value-subtracting** when it is underperforming and unreliable.

GVCs are reshaping the transportation landscape in Canada and worldwide by heightening the time-sensitivity of shipments that must meet leaner manufacturing requirements. A horizontal end-to-end integrated approach to transportation services and infrastructure becomes a more appropriate framework to examine domestic transportation systems. In such a context, consistency, reliability and visibility of transport and logistics services become premiums for shippers. Improvements in supply chain performance can often be traced to the supply chain's governance, where stakeholder collaboration can have a significant effect. Indeed, research shows that GVCs with sound collaborative frameworks are likely to perform best²¹ in the global marketplace. GVC governance—how various stakeholders come together to create the best value proposition in the marketplace—is critical in defining the long-term competitiveness of GVCs in Canada. Lastly, the international nature of GVCs has also placed an emphasis on the importance of trade facilitation processes. Such things as customs and border processes play critical roles in Canada, given its geography and the weight of U.S.–Canada trade.

Today's transportation decisions are increasingly being made within a broader context of seamless value-adding activities. Many of these new imperatives are being addressed under Canada's National Gateways and Trade Corridors Strategy. The Government of Canada has a role to play in fostering and facilitating quality dialogue with the private sector to define optimal conditions for the efficient, safe, secure and sustainable movement of goods. In 2009, Transport Canada introduced the concept of the **value-added gateway** as a "strategy that focuses on helping Canadian companies to further exploit opportunities such as intermodal transportation, transshipping, warehousing, logistics, information and communications technologies, finance, and skills development".²² Among other things, the federal government's support for the value-added approach was reflected in changes to the tariff and treatment of international marine containers, the elimination

of duties on foreign-built vessels to help modernize the country's domestic fleet, an international re-branding of Canada's foreign trade zone-like programs, as well as the implementation of a supply chain performance monitoring initiative.

This section has addressed transportation's role within GVCs, but public policy challenges relating to GVCs reach far beyond transport and logistics.²³ Other challenges facing developed economies include attracting and retaining talent, consequences of deindustrialization on labour, fostering innovation and partnerships, investing in smart infrastructure, streamlining international business practices, and reexamining fiscal policies—all areas that will determine Canada's role in tomorrow's global economy. Beyond Transport Canada, other federal departments such as Foreign Affairs and International Trade, Export Development Canada, Industry Canada, Agriculture and Agri-Food Canada, Human Resources and Skills Development Canada, and Canada Border Services Agency are also actively examining Canada's role in GVCs.

Global value chains offer both challenges and opportunities for Canada, which is well positioned to respond. The Government of Canada is committed to providing competitive, reliable and secure gateways in support of its international trade goals. It is Transport Canada's mandate to ensure that Canada's transportation system is efficient, safe, secure and environmentally sustainable to ensure Canada's integration into GVCs as well as the country's long-term trade economic prosperity.

21 Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The Governance of Global Value Chains. *Review of International Political Economy*, 12(1): 78-104.

22 Transport Canada (2009). *Gateway Corridor News*. 2009 Edition, Ottawa. <http://www.pacificgateway.gc.ca/gateway-news-2009.html>

23 For a full discussion on this topic, see: Organization for Economic Co-operation and Development (2008). *Staying Competitive in the Global Economy: compendium of studies on global value chains*. http://www.oecd.org/document/62/0,3746,en_2649_34173_40815102_1_1_1_1,00.html

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From maintaining the country's transportation infrastructure and gateways in a time of constrained spending to taking advantage of new technologies for greater safety and security, change will be the constant in Canada's transportation future.

12.1 INTRODUCTION

In the coming years, Canada's transportation system will continue to face previously identified challenges, such as a trade-reliant economy, evolving demography and a relatively small, largely urbanized population spread over a vast area. Canada must remain competitive and align itself with global trade opportunities. The rise of emerging economies such as Brazil, Russia, India and China (BRIC) has reshaped global business models and value chains, driving demand for raw materials and energy. Emerging economies—as well as Pacific Rim countries—will remain key players on the global economic agenda. The resulting pressures on the world's resources, renewable and non-renewable alike, will impact the price of global resources; countries with resource potential; and where and how trade takes place. This section takes a qualitative look at the challenges that lie ahead for Canada's transportation system.

Through its legislative and regulatory responsibilities, Transport Canada currently supports the efficiency, safety, security and sustainability of the national transportation system, and helps ensure that Canada's system is well integrated with global transportation networks. Supported by a modern and responsive policy and regulatory framework, that system can substantially contribute to long-term economic prosperity. That said, all partners have a role to play, including the federal, provincial and territorial governments, and municipalities that may own, operate or regulate aspects of the transportation system.

For Canada's transportation system to remain successful and efficient, each level of government and the private sector need to excel in their respective roles, respect the boundaries that frame these roles and coordinate their actions to advance their activities and work towards a common goal. Successfully positioning Canada's transportation system to better respond to challenges and

opportunities will require all stakeholders make strategic choices and take deliberate action that is predicated upon sound analysis, respect for each other's fields of responsibility, and effective collaboration.

12.2 GLOBAL PRESSURES

GLOBALIZATION

Global trade will continue to intensify demand for transportation, while the harvesting of Canada's natural resources, including future resource developments, will also increase demand on the transportation system. More industrial supply chains will become integrated globally, and the pressure to reduce transportation and logistics costs—while maintaining the highest standards of efficiency and reliability—will drive decision making. In Canada, transportation will continue to support increasingly diversified networks of trade in order to sustain economic growth and maintain a competitive advantage.

The competitiveness of global trade networks that are important to Canada can be modified by strategic transportation infrastructure investments within or outside the country. An example of such an outside of Canada investment is the expansion of the Panama Canal, a 77.1-kilometre shipping lane that opened in 1914 to cut across the Isthmus of Panama, connecting the Atlantic and Pacific Oceans. The maximum size of ship that can pass through the Canal is determined by the size of the locks.

The Canal has been a key contributor to the integration of the world economy and important to Canada specifically. Its opening prompted the construction of the first grain silo at the Port of Vancouver in 1918 for shipping Canadian grain to Europe. Today it supports Canada's growing trade between its East Coast, St. Lawrence and

Great Lakes ports and Eastern Asia, offering an efficient alternative to transiting through the Suez Canal.

Currently, close to 40% of container ships are too large for the Canal. A \$5.25 billion dollar enlargement scheme has been approved by the government of Panama and is in progress, with 2015 targeted for completion. Two new flights of locks to be built parallel to, and operated in addition to, the three existing flights of locks—namely Miraflores, Pedro Miguel and Gatùn—will allow more transits and larger ships, doubling the Canal capacity.

A wider Panama Canal may enable more ships from Asia to serve the midwest markets through ports on the Atlantic seaboard, while also encouraging ships from Europe to serve western markets via Pacific Coast ports. Any in-depth analysis of the impact on Canadian ports from the widening of the Panama Canal must also take into account efforts by the Suez Canal to attract traffic between Asia and North America, railways proposed by China between Columbia's Atlantic and Pacific coasts, the eventual opening of a Northwest Passage in the Arctic, and continuous improvements in the supply chain velocity and reliability of Canada's west coast ports which can accommodate larger ships—providing significant time and cost savings compared to routing ships through the Panama Canal.

In coming years, global integration and aviation and maritime alliances¹ will in part govern adjustments to rapidly changing market conditions; they will remain drivers of innovation, imposing breakthroughs in technology that support lower logistics costs, enhanced efficiency and reliability objectives.

Integration across natural boundaries increases the risk of disruptions resulting from human activity or natural disasters. Global integration compels governments to focus on the resilience of their infrastructure networks, and to adapt policies so they can rapidly respond to disruptions and provide support when they occur.

INTERNATIONAL FREIGHT TRAFFIC

Canada's merchandise trade has diversified, and the country's international trade policy aims to continue this trend, with the government embarking on numerous trade diversification initiatives since 2007. Budget 2012 indicated the desire for expanded trade with China, and trade negotiations with the Trans-Pacific Partnership, India and the European Union. Trade diversification

is likely to also occur through closer ties with Central and South America. Shifting trade patterns will force infrastructure providers—such as ports and terminal operators, and railway and trucking companies—to realign their service offering and increase their ability to process larger vessels. The trade supply chain will require a continuous push for smooth, seamless integration and cooperation between the marine, rail and road sectors. The United States will, however, continue to remain the country's prime trading partner, and initiatives such as Beyond the Border will help streamline the transborder movements of goods.

INTERNATIONAL PASSENGER TRAFFIC

Emerging economies in Asia and Latin America are expected to grow at a faster rate than long-standing industrialized economies such as those in Canada, the U.S. and Europe. This represents a significant growth opportunity for the airline industry and its stakeholders. The Asian presence in the global travel market, particularly China, is expected to increase, with China's planning to build 45 new airports by 2017 and to expand existing facilities.

The future of the airline industry will be influenced by factors such as competition; the role of low-cost carriers; and the ability of legacy, full-cost carriers to adjust to changing market conditions. Airlines will continue to make the most of opportunities arising from emerging economies without neglecting their mature markets, which are expected to grow at a slower pace.

Increased air traffic will translate into operating efficiencies at the carrier level—such as right-sizing aircraft capacity to fit the market (e.g., larger planes for larger volumes), modernizing fleets with more fuel-efficient aircraft and possible substitution of smaller regional jets with more fuel-efficient large turboprop aircraft. It will also promote the establishment of a greater number of Open-Sky air service agreements, as encouraged in Canada's Blue Sky Policy (see Section 6.4).

Demand for international air transportation will be driven by a number of factors, including increased international business ties, greater desire by Canadians to explore the world and improvements in the Canadian tourism offer. However, one important factor remains immigration, which is a strong contributor to air transportation as it creates a new market for visiting relatives and friends. These types of travel are particularly

¹ A type of joint marketing effort by either airlines or shipping lines

significant in markets with large immigrant populations, such as Canada-India or Canada-Morocco. Statistics Canada predicts that by 2031, nearly half of Canadians aged 15 and over will be foreign born, or will have at least one foreign-born parent, up from 39% in 2006.²

This is expected to create additional demand for air travel to Southeast Asia, China and the Maghreb countries from where this influx of new Canadians is expected to originate.

Between 2012 and 2025, the total number of passengers carried by the Canadian air transport industry is expected to increase at an average annual rate of 3%, driven by strong growth in overseas flights—particularly to China, India, Brazil and other emerging economies. The average aircraft size for Canadian carriers is expected to climb from today's 74 seats to 95 seats by 2025, driven in part by the replacement of Air Canada's B-767 with the B-787 and Westjet purchase of 20 to 45 new Bombardier Q400 NextGen turboprop aircraft. However, increased demand will exceed the additional capacity provided by larger aircraft, translating into a predicted annual increase in aircraft movements of more than 1% per year on average over the next 20 years. Growth in the industry must be fully managed to ensure no increased exposure to accident risk.

Cross-border passenger traffic should experience an increase in volume as both Canada and the United States work on facilitating passenger movement through the use of enhanced driver's licences that permit drivers to cross the border, programs such as NEXUS for frequent travellers, and customs pre-clearance of passengers across all modes.

PERSPECTIVES ON ECONOMIC FRAMEWORK POLICIES

Within the global marketplace, an integrated, efficient, clean, safe and secure transportation system will remain a significant competitive factor, helping create jobs, stimulating economic activity and investment, and improving quality of life for Canadians over the next decade and beyond. Canada's gateway strategy has been conducive to the adoption of a 'transportation system' perspective instead of a modal one. Meeting the challenges of the 21st century will require sustaining such a perspective as well as integrating more effectively transportation-related priorities across levels of government.

TRANSPORTATION POLICY IN GERMANY

While Canada addresses its future policy challenges, other countries are refocusing their national transportation policy and can inspire more actions to ensure the competitiveness and responsiveness of Canada's transportation system. Interesting parallels can be drawn between Germany and Canada: while Germany's economy is more than twice the size of Canada's and tends to do its utmost to seek a compromise between state intervention and a market economy, just like Canada, it is an export-focused nation strategically located at the heart of a large consumer market.

In November 2005, the German Federal Government agreed to continue consolidating Germany's leading position as a logistics hub, promoting Germany's competitive advantage, and improving the efficiency of the transportation network. Following this, the Federal Minister of Transportation developed the Freight Transportation and Logistics Master Plan by means of a broad consultative dialogue involving more than 700 participants, including all levels of government and the European Union. This led to the publication of the 2008 Freight Transport and Logistics Master Plan, which brought forward the 2010 Action Plan.

Some of the issues brought to the forefront by Germany's plans include developing a port and airports strategy, marketing Germany's competitive advantages, encouraging a shift from trucking to rail and inland marine, segregating passenger and freight traffic, optimizing infrastructure use, developing urban logistics initiatives, fostering training and good working conditions, and ensuring that freight transportation is done in an environmentally responsible manner.

In spite of the significant differences between Canada's and Germany's transportation system, the nature of their trade, and the solutions advocated or put forth by each country, there are also numerous parallels in the issues facing each, especially with respect to efficiency, environmental sustainability and in positioning each country as an important logistics hub in the global value chain.

In November 2006, Advantage Canada—a federal government plan to help Canadians build a strong economy—comprised a transportation infrastructure component designed to create modern, world-class infrastructure to ensure the seamless flow of people, goods and services across roads and bridges, through ports and gateways, and via public transit. In the same period the Asia-Pacific Gateway and Corridor Initiative was launched as the first application of the national policy framework for strategic gateways and trade corridors. This framework—as well as other efforts on the part of Transport Canada to maintain a modern policy framework and articulate a national transportation vision with its partners—underline Canada's desire to ensure its transportation system keeps pace with the global economy and plays its critical role in moving passengers and goods in an efficient, safe, secure and environmentally sustainable manner. Much like Germany, Canada has determined that it cannot remain complacent if it wishes to prosper and has taken tangible steps to evolve its transportation policy and infrastructure.

2 See <http://www.statcan.gc.ca/daily-quotidien/100309/dq100309a-eng.htm>

In the past several years, Canada’s perspective on transportation has shifted from an emphasis on each of the four modes—air, rail, marine and road—to a horizontal and holistic ‘system-wide’ view, following freight and passengers end to end through increasingly seamless connections. That view will be important to meeting the challenges of the 21st century, as will the further integration of transportation-related priorities within all levels of government. Taking an operational approach (which looks at end-to-end supply chains and cost internalization) rather than one focused on simply expanding the system seems to be a practical way forward. As well, decision-making processes may have to be revisited to allow for faster responses to change as it occurs.

Global integration compels governments to take new or different policy approaches. For Transport Canada, this means helping ensure that Canada’s transportation system is safe and secure, with policies that are framed around a seamless integration with global transportation networks. Transport Canada’s role also comes into play in relation to the efficiency and environmental performance of the national transportation system, which is instrumental in supporting the country’s socio-economic agenda.

Global economic uncertainty, an accelerating pace of technological changes, plus real and perceived security risks are going to provide challenges for strategic investment decisions. In addition, many developed economies are facing fiscal constraints that limit their flexibility. Yet in this environment, Canada must target transparency, predictability and stability in its policies and regulations to enjoy competitive advantages and to become more attractive to foreign investors. Government policies, legislation and regulations (at all levels) will have to respond to medium- to long-term changes in origins/destination of both freight and passenger international traffic—with a likely focus on market forces and user-pay principles as well as transportation system integration.

For Canada’s transportation system to remain efficient, clean, safe and secure, public and private transportation stakeholders must continue to work together effectively and transparently—coordinating their respective activities based on sound analysis, exchange of information, open communication and effective collaboration.

PERSPECTIVES ON ENVIRONMENTAL POLICIES

Between 1990 and 2008, total transportation GHG emissions grew at an average of 1.9% per year, or 40% overall, from 122 Mt to 171 Mt of CO₂. During the 1990–1999 period, GHG emissions grew by 19%, compared to 16% during the 2000–2009 period. Transportation

Table 12.1

Canadian Trends in Transportation Sector Air Pollutant Emissions (1990–2009)

| Criteria Air Contaminant (CAC) | Transportation Share of Total Emissions (2009) | | Percentage Change in transportation-related emissions (1990–2009) |
|--|--|---------------|---|
| | Including ONS | Excluding ONS | |
| Fine Particulate Matter (PM _{2.5}) | 5% | 24% | -35% |
| Sulphur Oxides (SO _x) | 6% | 6% | -48% |
| Nitrogen Oxide (NO _x) | 52% | 56% | -27% |
| Volatile Organic Compounds (VOC) | 2% | 29% | -48% |
| Carbon Monoxide (CO) | 68% | 75% | -44% |

Source: Environment Canada, 2011, National Pollutant Release Inventory.

GHG emissions are expected to continue to grow but at a slower pace—an average of 0.5% per year. In a case like this, transportation GHG emissions would go from 171 Mt of CO₂ in 2008 to 180 Mt of CO₂ in 2020, a growth expected to come mainly from a 17% and 31% increase respectively in freight trucking and air passenger activities’ GHG emissions, assuming continued fossil fuel energy use by both modes.

In 2009, excluding emissions from open and natural sources (ONS) such as emissions released from wildfire or dust from construction activities and unpaved roads, the transportation sector accounts for 75% of total carbon monoxide (CO) emissions, 56% of nitrous oxide (NO_x) emissions, 24% of fine particulate matter (PM_{2.5}) emissions, 6% of sulphur oxide (SO_x), and 29% of volatile organic compounds (VOC) emissions.

All transportation-related air pollutant emissions fell over the 1990–2009 period, as illustrated in Table 12.1. Between 1990 and 2009, there was an overall decrease in the amount of air pollutant emissions from the transportation sector. Specifically, fine particulate matter and nitrogen oxide emissions declined by 35% and 27%, respectively. As well, sulphur oxide, VOCs and carbon monoxide all decreased by approximately 45%.

PERSPECTIVES ON SAFETY POLICIES

Canada has experienced a decade of decreasing accident rates across all modes, as shown in Table S1. Expected future traffic growth in the transportation industry could increase the risks of accidents and incidents, which will require intensified efforts to improve safety in order to maintain Canada's enviable low accident rate. To do so, Transport Canada has to improve its understanding of risks and causes of accidents. Such knowledge will lead to improved surveillance programs tailored to pre-identified company risk factors.

Transport Canada must continuously strengthen its Safety Management Systems (SMS) with lessons learned, feedback from front-line inspectors, updates of SMS guidance material, inspector training tied to surveillance procedures, and information sessions across Canada on SMS implementation and regulatory obligations. SMS is a key to the robustness of Canada's transportation safety regime.

To date, Canada's largest air passenger carriers and certified Canadian Air Navigation Service providers have completed SMS implementation, as explained in Section 6.6. Canadian airports are expected to have completed implementation by the end of 2012. With SMS in all regulated civil aviation organizations, the emphasis will shift from adoption to refinement and ongoing improvements.

It will remain important for Transport Canada's transportation safety program to stay aligned with those of its trading partners and with international transportation standards in keeping with technological advances. Because aviation and marine safety goes beyond Canada's borders—as do rail and road transportation safety—Canada must continue to engage in bilateral, trilateral (Canada/USA/Mexico) and multilateral discussions with other transportation authorities. Transport Canada must also continue to actively participate in processes seeking harmonized transportation standards

SAFETY MANAGEMENT SYSTEMS

Since the 1940s, technological improvements have contributed to the steady decrease in accident rates. The majority of today's accidents are attributed to human or organizational factors. Strengthening the safety culture within aviation organizations represents the future focus of accident prevention in aviation. SMS offers the most promising means of reducing risks generated by human and organizational factors.

and regulations—including for the global aviation and marine communities—and leverage knowledge and expertise to influence and advance worldwide aviation and marine safety while further solidifying the country's place as a transportation safety leader. Bilateral/trilateral continental road and rail safety agreements are also to be pursued.

PERSPECTIVES ON SECURITY POLICIES

Transportation systems will remain key targets for terrorist and extremist groups due to the potential for both mass casualties and economic, psychological and political disruption. Terrorist groups are generally displaying patience and determination in their operational planning, with attempted attacks around the world over the past five years illustrating continued efforts to defeat or bypass transportation security regimes.

Transportation security technology and methodologies must continuously evolve, primarily in response to terrorist plots. Each time a change is introduced, new training for security inspectors and—in some cases—a new regulatory approach is required. Transport Canada will have to develop formal and structured curricula with increased focus on on-the-job training in a less prescriptive regulatory environment and with risk-based oversight. The education approach has to be structurally cost-efficient, integrated and innovative, and must balance the need for traditional in-class training with virtual classrooms and e-learning.

Security in the aviation sector in particular has advanced with the application of new technologies, coupled with evolution in training and heightened use of threat-risk analyses to identify priority areas. Since 2009, the majority of threats to surface transportation have been experienced in high conflict zones or areas of civil unrest, with some one-off exceptions that do not demonstrate a continued pattern.

The Beyond the Border declaration and action plan is expected to change the way security impacts transportation operators when moving goods across the Canada-U.S. border. For instance, an integrated cargo security strategy with common standards for screening inbound air and marine cargo at the first point of arrival in North America is under development under the principle "cleared once, accepted twice". This will allow the same cargo transported by rail or truck to be given accelerated passage across the land border, streamlining and simplifying border and security processes and reducing the burden on industry.

Where Canada plays host to major international events, additional measures to reinforce the security of Canada's transportation system are required. Transport Canada, in concert with the RCMP, local law enforcement and other strategic partners, took steps to enhance transportation safety and security for the 2010 Vancouver Winter Olympics and Paralympics, and for the 2010 G8/G20 Summits held in Canada; the 2015 Pan-American Games in Toronto will likely require the same. To prepare for such events as well as other security-related emergencies or scenarios, Transport Canada conducts and participates in international, whole-of-government, departmental and industry-led exercises on air, marine and surface security, ensuring that all stakeholders are ready to respond to emergency situations affecting Canada's national transportation system.

12.3 DOMESTIC PRESSURES

Although globalization has undeniable impacts on transportation in Canada, there are a number of significant domestic challenges as well. This sub-section examines some of these and their implications for domestic demand and supply of transportation services.

DEMOGRAPHICS

A number of demographic trends with transport ramifications are expected to continue in coming years, including the ageing and increasing urbanization of Canada's population.

The **ageing population**—a worldwide trend—has also established itself in Canada. The proportion of Canadians 65 years and over will increase substantially, not slowing down until some time between 2036 and 2056. The country's demographic trends are likely to increase passenger traffic, with intra-urban travel in large metropolitan areas topping the list of transportation challenges, and accessibility a key consideration given the ageing population. According to Industry Canada forecasts for the Canadian tourism sector, total arrivals in Canada by all modes of transportation are expected to increase by 21% between 2010 and 2020, while travel by seniors (those 65 and over) during the same period is expected to increase by 45%—an increase from 19% to 23% of the total number of travellers entering Canada.

The propensity to travel differs by age but is highly correlated with financial situation and the availability of leisure time. Consequently, the senior and baby boomer populations are an increasing market for the tourism

industry. While the inclination to travel changes with age, distance travelled and destination choice, it also varies by age cohorts, with younger generations often choosing to travel longer distances and older generations mixing both short and long-haul travel. Evidence suggests that the coming generation of Canadian seniors will be healthier, wealthier, more independent, better educated, and more active than preceding generations. Consequently, the seniors' share of travel is expected to increase in coming years.

Demographic information shows a positive **relationship between ageing and the incidence of disability**. Disability implies special transportation-related needs depending on the nature of the disability; e.g., hearing, vision, speech or mobility. As mobility impairment increases with age, Canada's ageing population increases demand for accessible transportation services. In 2006, 4.4 million Canadians (14.3%) reported having a disability, including hearing, vision, speech, learning and mobility disabilities. Of seniors, 1.7 million (43.4%) reported having a disability, with mobility, hearing and vision impairments being the most prevalent; this increases to 53.3% for persons 75 and over.

Statistics like these are not unique to Canada. The United Nations has projected that the number of people 65 and older worldwide will increase from 420 million in 2005 to 835 million by 2025. By 2050, it is projected that there will be almost 2 billion people 60 years and older, or about 22% of the population (United Nations). Because mobility impairment increases with age and the Canadian population will age dramatically over the next 20 years, a significant increase in the demand for accessible transportation can be expected. Disability rates for persons aged 65 and over are three to five times higher than those 25 to 54.

Mobility will be more important to Canadians aged 65 and over. As their numbers increase, adjustments will be required to transportation infrastructure and related services to compensate. Wealthy and healthy seniors expect to travel not only to access activities and social services locally, but to make longer trips to visit family and friends, and to travel for pleasure both domestically and internationally.

While Canada's population growth has remained steady since the 1980s, around 1.1% per year, this population growth is highly concentrated in certain regions, and more specifically in the **largest metropolitan areas**, which is already resulting in intra-metropolitan transportation bottlenecks. These challenges will remain and will need to be addressed, as **urbanization** will intensify in the future. This may translate into increasing demand for

accessible transportation services, accommodating mobility-impairment adjustments to transportation infrastructure and services, addressing intra-metropolitan transportation bottlenecks, and working with industry stakeholders to develop strategies to attract and retain employees in transport-related job opportunities. These demographic-driven pressures will take place in an upcoming period of uncertain economic times and restrained public expenditures.

TRANSPORTATION WORKFORCE AND EXPERTISE

The demographic outlook highlighted above will also impact the human resource availability of transportation activities and operations. As the population ages and an increased portion of today's workers retire, there will be a smaller supply of skilled professionals to take their place. As well, many prominent Canadian university researchers and professors in the transportation field are approaching retirement, which has potential implications beyond the university setting given the importance of academic research to innovation and the training of new transportation professionals.

University-level transportation programs may have difficulty attracting students as these programs are scattered widely across a few institutions competing to win enrolments, graduate students and funding. In some regions, the effects of this have been mitigated successfully by establishing collaborative research networks or clusters. This is the case with aerospace in Quebec, automotive in south-western Ontario, and marine on the east and west coasts. Some of the more successful research models also involve partnerships with industry or local governments, maximizing available expertise and ensuring the practical application of research results.

Traditional transportation careers, particularly at the technical level, have lost some of their appeal among younger generations, making it a challenge for employers to attract and retain new skilled employees. Upgrading the skills of current workers is also a higher-profile concern today than in the past due to the pace of technological change and new specializations in information and communication technologies necessary for efficient transportation. For some transportation undertakings, the flexibility and foresight to embrace change and the anticipated large-scale exodus of workers into retirement present a unique opportunity to replace a portion of the transportation workforce with technology and focus on innovation to achieve productivity improvements.

ENERGY SUPPLY AND USE IN TRANSPORTATION

The planet's large and growing population is placing greater pressures on limited energy resources for transportation. Transportation demand for energy, specifically, will continue to be met largely by fossil fuels in the mid-term, and likely at greater cost. All modes of transportation in Canada are highly dependent on petroleum-derived fuels and will need significant technological breakthroughs to reduce consumption.

Energy has environmental consequences, and also creates equity issues. In the context of foreseeable energy price increases, the most disadvantaged—both those dependent on automobiles and those who do not have vehicles of their own—may see their mobility and accessibility limited as higher energy costs translate into higher transportation costs and product prices.

Public and international pressure to minimize the environmental impact of economic activity and promote clean air and clean energy agendas, coupled with escalating conventional energy prices, will help drive the development of alternative energy sources including wind, hydrogen cells, solar and bio-fuels. Continued advances in technologies will be critical to boost future fuel efficiency and energy production levels.

On the energy supply side, Canada will not be exempt from the pressures to exploit oil and gas found in remote and challenging environments, including the complex Arctic area. Projects such as the Northern Gateway pipeline project will increase maritime traffic and may put additional pressures on the regime for responding to oil spills.

TRANSPORTATION INFRASTRUCTURE

Ageing transportation infrastructure will remain an issue, as maintenance and upgrades are costly; however, short-term decisions to defer maintenance translate into greater rehabilitation costs in the future.

Some economically positive decisions can add to the pressure on Canada's transportation infrastructure, as is the case in the 2011 federal government decision to award a \$25-billion shipbuilding contract to Irving Shipbuilding Inc. of Halifax for the construction of new navy and coast guard vessels over the next 20 to 30 years. The project's economic benefits for Nova Scotia are undeniable, but the scope of work will stress the existing transportation infrastructure in terms of moving materials, equipment and workers to and from the shipyard in downtown Halifax. At the same time, the project

will provide an opportunity to address some of the supply chain imbalances in the region, where, traditionally, outbound volumes far exceed inbound volumes.

Infrastructure issues span the range of transportation modes and services. Public transit will face challenges directly associated with ridership and funding. For rail freight, despite recent investments by the private sector, capacity is often limited, particularly in Western Canada. Commercialization and privatization of the aviation sector have resulted in significant investments funded by users.

Canada's road network faces many challenges—some due to the country's extensive land mass, harsh climate conditions, high degree of urbanization and dependence on trade, while others are more universal, such as ageing infrastructure, fiscal constraints, safety concerns and environmental considerations. These will continue to pressure governments to invest in Canada's roads; however, the public sector fiscal constraints will require new and innovative approaches to road infrastructure financing. Some solutions that may warrant further investigation and that are already being used to a limited degree include tolls (see Addendum Table RO2A) and other user-pay mechanisms, public-private partnerships for building and operating infrastructure, and potential efficiency gains through the use of technology and intelligent transportation systems. Also, innovation in transportation finance leading to wiser investments and potentially to more direct user charges may emerge. This will orient consumers and commercial organizations toward choosing the most cost-effective means of transportation in any given case.

The need for infrastructure funding conflicts with limited public funding. The stifling effects of the recent recession and financial crises among heavily indebted governments at all levels have contributed to a financial-risk-averse environment. As well, with spending curtailed, competition for funding among the various other sources of public spending is increasing—health and education being two primary examples.

The challenges identified above have implications for major initiatives such as developing Canada's North. The various levels of Canadian government may have to assume a share of the risks if they hope to harness that region's resource potential. This could mean making strategic decisions on the use of available resources, both public and private.

SUSTAINABLE TRANSPORTATION

Sustainable transportation will be a particular challenge in the coming years, and internalization of costs will become increasingly important. Transportation costs will have to take into account the social impact of transportation, which may favour some modes over others. User pay principles could be expanded beyond the financial cost to look at important social costs, such as safety and air, water and soil pollution.

Sustainable transportation also requires users to rethink their modal choices, favouring public transit, carpooling and active transportation over single occupancy car commuting, and by turning to greener and more energy-efficient supply chains.

Transport Canada together with a federal-provincial task force conducted extensive research on cost internalization through its Full Cost of Transportation study.

The consistent and rigorous Estimates of the Full Cost of Transportation in Canada (i.e., the financial and social costs of transportation), were released in 2008 (see Table 12.2). Financial costs include infrastructure capital and operating expenses, as well as vehicle and carrier capital and operating costs.

The full cost of transportation in Canada estimated for the study's base year (2000) totalled \$216.4 billion, which included \$184.4 billion (85%) in financial costs, with the remaining 15% being social costs (see Table 12.2). The five social costs ranked as follows: accidents, air pollution, congestion, GHG emissions and noise.

Air pollution costs were the highest, representing 18% of social costs, followed by GHG costs at 14%. The road mode had the largest share of both costs at 82% and 80% respectively.

Despite its limitations, the analytical tool allows a more comprehensive and compete way to compare costs of transportation activities across modes. It can be useful in a context where sustainable transportation considerations and user-pay principles are used to guide decisions.

Table 12.2**Full Cost Estimates by Modal Sub-activities in Billions (based on the 2000 dollar)**

| Mode | Financial Costs | Social Costs | Full Costs | Share of Social Costs |
|-----------------------------|-----------------|--------------|------------|-----------------------|
| Intercity Passengers | | | | |
| Light Road Vehicles | 31.17 | 10.21 | 41.38 | 25% |
| Coach | 0.86 | 0.05 | 0.91 | 5% |
| Rail | 0.41 | 0.02 | 0.43 | 4% |
| Marine | 0.62 | 0.05 | 0.67 | 7% |
| Air | 14.65 | 0.58 | 15.24 | 4% |
| Sub-Total | 47.71 | 10.92 | 58.63 | 19% |
| Local Passengers | | | | |
| Light Road Vehicles | 68.66 | 13.04 | 81.69 | 16% |
| School Bus | 2.82 | 0.13 | 2.95 | 4% |
| Urban Bus | 3.01 | 0.07 | 3.08 | 2% |
| Local Rail | 1.94 | 0.01 | 1.95 | 1% |
| Sub-Total | 76.43 | 13.25 | 89.68 | 15% |
| Freight | | | | |
| Truck | 49.83 | 4.01 | 53.84 | 7% |
| Rail | 6.73 | 0.9 | 7.63 | 12% |
| Marine | 2.41 | 0.78 | 3.19 | 24% |
| Air | 1.24 | 0.03 | 1.27 | 3% |
| Sub-Total | 60.21 | 5.72 | 65.94 | 9% |
| Unallocated | 0.01 | 2.1 | 2.11 | 99% |
| Total | 184.36 | 32 | 216.36 | 15% |

Source: Full Cost Investigation of Transportation in Canada Synthesis Report, 2008

THE FUTURE DEVELOPMENT POTENTIAL OF THE NORTH AND TRANSPORTATION

Emerging economies are putting added pressure on the world's renewable and non-renewable resources—a trend that will sustain growth in resource-rich countries like Canada. The resource potential of Canada's Arctic, despite the challenges it presents, could be developed sooner under favourable world prices of resources. Such a development comes with its own new transportation needs and requirements, and with its practical challenges associated with northern realities. In many cases, it enriches the paradigm of northern freight transportation by adding the movement of extracted resources to

markets in the south. However, the nature of the goods involved; heavy bulk commodities as opposed to light; possibly time-sensitive, finished goods; as well as the distance between existing Northern communities and resource extraction sites may lead to the establishment of parallel north-bound and south-bound supply chains, each tailored to meet specific and challenging needs.

Climate change presents both challenges and opportunities for Canada's northern transportation system. Degraded permafrost, melting ice caps and a shorter ice-road season all affect transportation infrastructure and operations. By the same token, a warmer climate provides opportunities for increased socio-economic development and associated transportation activity.

Permafrost degradation has a particularly significant impact. Airstrips, roads and railways, once thought to be robust and secure, are becoming unstable and unreliable. Not only must significant repair and maintenance costs be incurred, but other forms of economic development reliant on the transportation system are hindered.

Northern waters have become increasingly active in recent years. As communities expand due to growing demographics and as resource projects are developed, marine transportation in the north is likely to continue growing. Yet climate change is having an effect here, too. Milder Arctic summers are sending dangerous hard-packed multiyear ice flowing into the Arctic Ocean and into the shipping lanes of the Canadian archipelago. With more traffic in those lanes, there could be greater incidence of marine emergencies and a greater need for adaptive technologies to ensure sustainable, safe and efficient transportation routes.

As new navigational channels open, this will create opportunities, including the development of new routes to resupply communities, transport natural resources extracted from the North to southern markets, and provide a shorter route between the Atlantic and Pacific Oceans. However, these opportunities also introduce new risks to the transportation system, be it on the safety, security or environmental front. Increased traffic will require an examination of the current transportation infrastructure in the North. This is particularly challenging for marine navigation services and emergency and pollution-spill response. Care will need to be taken to develop precautionary measures and emergency response capabilities comparable to those currently found in southern regions.

Given the above, Transport Canada is investing in fundamental research and technology development through its new Northern Transportation Adaptation Initiative. The initiative brings together key partners from federal departments, provinces and territories, and academia and industry to envision a northern transportation system that will be resilient to climate change.

This will require the appropriate authorities to understand how to manage transportation infrastructure and operations under changing climate conditions, and also requires them to have the necessary tools and technologies to apply that knowledge as well as the skilled personnel to conduct adaptive operations. As a result, the initiative partners are supporting research that will inform a better understanding of emerging climate trends and impacts, develop adaptive solutions for northern transportation infrastructure and operations, and expand knowledge of promising technologies and

best practices. They aim to gather and analyze baseline data, perform vulnerability assessments, understand the mechanisms and processes through which climate impacts transportation infrastructure and operations, and develop solutions including new designs, more efficient operation and construction techniques, and new or improved innovative technologies.

Other critical aspects of the initiative are disseminating information, research results and best practices to those applying this knowledge, and supporting the development of the next generation of northern transportation experts. Over the coming years, the initiative will help ensure that Canada's North can count on and benefit from a reliable, efficient and safe transportation system for its social and economic development.

Many projects in the coming decade are expected to significantly alter Northern Canada's transportation system; some of these are at the planning stage while others are already underway. Some of these projects are presented below for illustrative purposes.

Newfoundland and Labrador's proposed development of the Lower Churchill hydroelectric project will involve the construction of two hydroelectric dams, one at Muskrat Falls and the other at Gull Island. This project could place unprecedented pressure on Labrador's transportation system and related infrastructure, in turn generating significant and sometimes critical transportation issues tied to its relatively remote and sparsely populated location. The proposed project may require new roads for moving materials to and from the site via the Port of Goose Bay. There will also be a significant increase in passenger traffic at Goose Bay airport, where operations have recently been transferred from the Department of National Defence to the Goose Bay Airport Corporation.

The proposed **Mary River iron ore mining project on Baffin Island (Qikiqtani region) in Nunavut**, possibly the largest mining project in Canada and one of the largest iron ore developments in the world, would involve mining, ore-crushing and screening; rail transport; port operations; and marine shipping to global markets. The project would include a 149-kilometre rail system to support the year-round transportation of ore from the mine site to port facilities at Steensby Inlet. In full operation, this project will significantly alter the transportation profile of Nunavut, creating new infrastructure and important economic spin-offs.

Quebec's Plan Nord, an initiative aimed at promoting and developing northern Quebec, was launched May 9, 2011 and is expected to continue over a 25-year period. It contains expected investments of more than

\$80 billion for renewable energy, mining and public infrastructure including roads, ports and airports in the northern part of the province. Plan Nord has six major public infrastructure priorities, namely:

- the extension of highway 167 to the Otish mountains;
- the extension of highway 138 between Kegaska and Blanc-Sablon;
- the rebuilding of highway 389 between Baie-Comeau and Fermont;
- studies of possible land connections between Kuujuaq and southern Quebec;
- studies on a deep-water port in Whapmagoostui-Kuujuarapik and a road connection to Radisson; and
- improvements to airports.

Besides the priorities identified by the province, several mining projects currently in the exploration phase will include the construction and relocation of railway and port infrastructures within the Plan Nord territory. For example, the exploration of an iron deposit at Oteluk Lake between Kuujuaq and Schefferville could lead to the construction of an approximately 800-km railway between the deposit and port of Sept-Îles. A second iron ore deposit exploration project close to the Inuit community of Aupaluk, in Nunavik, includes the construction of a port in Hopes Advance Bay. Several engineering challenges will accompany the development of infrastructure north of the 49th parallel. These improvements will also alleviate the isolation of the communities residing in this part of the province.

In March 2011, the **Ontario** government released its **Growth Plan for Northern Ontario, 2011**, and launched a consultation process with stakeholders to identify long-term directions for transportation infrastructure and services in Northern Ontario. The intent of the consultation is to obtain views on how to address the following:

- the growth of the transportation, aviation and aerospace industry sector in northern communities;
- the development of a range of transportation options and investments in regional transportation links between hub communities and rural and remote communities;
- the development of revitalization strategies for integrated public transportation systems within the core areas of the municipalities of Greater Sudbury, North Bay, Sault Ste. Marie, Thunder Bay and Timmins;

- the capital operating and financing needs of northern airports;
- the enhancement of the freight and tourism potential of waterways and ports; and
- the re-alignment of winter roads to improve remote communities' access.

Studies will review all modes to define long-term travel trends and demand forecasts, identify strategic transportation network improvements and regional economic supports, establish a coordinated investment plan, and promote integrated economic land use and transportation planning.

The **Alberta oil sands** play a significant role in Canada's economy as the province's total proven oil reserves, estimated at approximately 171 billion barrels—about 12% of total global oil reserves (1,469.6 billion barrels)—are critical to the world's energy future. Alberta ranks third after Saudi Arabia and Venezuela in proven global crude oil reserves. Of its supply, about 99% comes from the oil sands.

The continued extraction of Alberta oil sands depends on satisfying regulatory requirements for responsible and sustainable development as well as requirements of the *Navigable Waters Protection Act* since that industry requires the construction of works built in, on, over, under, through or across navigable water. Transport Canada continues working with the provincial government to streamline regulatory processes related to the Navigable Waters Protection Program, and consulting with Aboriginal groups potentially affected by developments along the Athabasca River. This process includes the development of a map identifying the areas of greatest concern related to navigability.

Another prerequisite for developing the oil sands further is ensuring an adequate infrastructure to transport personnel and materials. Highway 63, a two-lane, undivided road between Edmonton and Fort McMurray, is the main route to and from the oil sands, with commuter, heavy-truck and dangerous goods traffic, and is the only arterial route to the urban service area of Fort McMurray. Highway 63 carries the highest tonnage per kilometre in Canada, and the largest and heaviest loads the country's trucks have ever carried.

Finally, there remains the challenge of bringing oil and gas from Western and Northern Canada to growing markets in the United States and China. Two oil pipeline projects and one gas pipeline project have been proposed, namely:

- Trans-Canada's 3,456-km Keystone XL for transporting crude oil between Hardisty, Alberta and Illinois—for use in the U.S. or for delivery to overseas markets, and to deliver gas condensate³ from the port of Kitimat to Alberta;
- Enbridge's 1,177-km Northern Gateway twin pipeline between Bruderheim, Alberta and Kitimat, British Columbia; and
- the 1,220-km Mackenzie Valley gas pipeline between the Northwest Territories and Alberta, which was approved by the federal cabinet in March 2011

All three projects would impact the transportation system during their construction, and would allow other resources to be developed once completed—further altering the transportation landscape in Northern and Western Canada. The Northern Gateway project specifically would have important transportation implications, bringing oil and gas tankers to the port of Kitimat, markedly increasing the use of that port and potentially raising issues with navigating the Douglas Channel, which links the Pacific Ocean to the port. Both the Keystone XL and Northern Gateway projects are in the regulatory review process.

12.4 TECHNOLOGY AND RESEARCH IN THE PURSUIT OF AN EFFICIENT, CLEAN, SAFE AND SECURE TRANSPORTATION SYSTEM

TECHNOLOGY AS AN ENABLER OF A MORE EFFICIENT TRANSPORTATION SYSTEM

Innovation has increasingly been recognized as an important element in stimulating long-term economic growth. However, in recent years a number of well-publicized reports by the Council of Canadian Academies and the Institute for Competitiveness and Prosperity, among others, have suggested that Canada's persistently lagging productivity growth is directly tied to weak innovation performance.

Innovation—which can be defined as new or better ways of doing valued things—plays an important role not only in strengthening Canada's long-term economic

growth, but also in promoting greater competitiveness and productivity in Canada's transportation system and sector.

Transportation innovation is not a new concept; over the past twenty years, productivity gains in Canada's transportation sector have outpaced that of Canada's overall economic growth. These gains were largely driven by mode-specific, market-oriented policies and regulatory measures, such as commercialization, privatization and deregulation. However, in recent years these sector-specific productivity gains have started to tail off. The competitiveness of Canada's transportation sector is also challenged by issues such as ageing infrastructure, congestion in major cities and along trade corridors and border crossings, the rising costs of fossil fuel, security concerns, and the challenge of continuing to preserve and improve safety in spite of greater traffic volume.

To overcome these challenges and encourage productivity and competitiveness, governments, industry, and academic stakeholders are collaborating to foster greater transportation innovation, including investments in transportation-related research and development, technology development and deployment, and sharing of best practices.

Research and analysis are essential to developing future transportation policies. This is particularly true for transportation issues, in which economic, social, environmental, safety and security considerations must all be weighed. There are a number of active transportation research forums conducting leading-edge work in transportation research; amongst those is the OECD/ITF's⁴ Joint Transportation Research Centre (JTRC), of which Canada is a member. The JTRC conducts research on a variety of topics, brings together international transportation experts and contributes to the annual International Transportation Summit. The 2010 summit was presided by Canada and innovation was its theme.

Closer to home, the Canadian Transportation Research Forum promotes the development of research in transportation and related fields and provides a forum for networking and discussion. It also publishes research papers, provides opportunities to discuss transportation issues and organizes an annual conference. Finally, Transport Canada conducts numerous research projects through a variety of means, including its Transportation Development Centre or through its Socio-Economic Research Fund (see Section 5.6).

3 Gas condensate is a diluent that reduces the viscosity of crude oil, making it easier to transport by pipeline.

4 Organisation for Economic Co-operation and Development/International Transportation Forum

Investment in and deployment of productivity-enhancing technologies and processes have improved the performance of Canada's multimodal transportation supply chains. For example, the use of Radio Frequency Identification (RFID) tags and GPS/satellite tracking and monitoring technologies has proven effective in a recent China-Canada cargo container pilot project aimed at enhancing the efficiency and security of transporting goods.

Focusing on fostering greater integration of Canada's transportation system will stimulate the next generation of sector productivity gains and further improve system performance. Currently, transportation stakeholders are piloting innovative approaches to supply chain and fleet management, resulting in more efficient, reliable and lower-cost services. Moreover, network-sharing arrangements have demonstrated increased fluidity, and systematic and proactive risk-management practices.

The information technology revolution has improved the efficiency of transportation and enabled the integration of different modal activities. Potential future technological developments are unclear, but will likely focus on stresses to the system caused by economic growth and increased passenger and freight traffic, and on continued pressure to make transportation safer and more environmentally sustainable.

Intelligent Transportation Systems (ITS) have been instrumental in delivering major efficiency gains across all transportation modes in Canada. Such gains will continue with the ongoing growth of data flows and the proliferation of sophisticated geographic positioning tools, mobile communications and ever-greater computing power. Future ITS developments will provide transportation users and operators with reliable, accurate, timely multimodal information—about traffic, transit and parking—often through smart phones and other mobile devices. Operators will be able to manage their transportation assets holistically, and travellers will be able to make informed decisions before departing and while en route to their destinations.

In surface transportation, ITS will combine positioning systems, vehicle and infrastructure sensors, and data management processes to create transformational transportation solutions that address surface and intermodal transportation challenges while maximizing the efficiency and output of transportation infrastructure. The widespread availability of wireless communications will allow for much greater connectivity within each mode and at the interfaces between modes, allowing for more efficient movement of people and goods,

TRUCK RESERVATION SYSTEM AT THE PORT OF METRO VANCOUVER

Truck reservation systems use software and communications equipment (such as RFID tags and readers) to allow operators to schedule the arrival of trucks for container pick-up and delivery. They also track trucks, align them with their scheduled time slots, and direct them to the appropriate location within the port facility. In coming years the use of these systems is expected to grow and become more sophisticated, leveraging the capabilities and ubiquity of smart phones and other mobile devices.

The Port of Metro Vancouver has had a truck reservation system in place since 2001 at its VanTerm, Centerm and Deltaport terminals. Trucks with a reservation for a particular time slot have access to reserved gate lanes, reducing turnaround and engine-idling times. This kind of information technology systems is creating efficiency gains at modal interface facilities and generating environmental benefits.

complemented by further gains in safety, security and environmental performance.

The potential for future efficiencies also rests in the ability of ITS to facilitate integration and interoperability between jurisdictions. 'Smart corridor' strategies are being developed and applied in Canada to examine transportation systems and achieve maximum efficiencies using existing infrastructure, minimizing the need for new capital investments. This requires stakeholders to work together to identify priorities and gaps, coordinate plans, and integrate systems.

Merging ITS with the next generation of wireless communication networks may allow tomorrow's transportation system to prevent a significant number of accidents. For example :

- **Intersection collision avoidance systems** that use sensors and wireless connectivity to monitor traffic approaching dangerous intersections and warn vehicles of approaching cross traffic. In the near future these systems will warn drivers of potential dangers, such as a vehicle that is about to run a red light, or provide services such as left-turn assist.
- **Collision avoidance systems** that use Wi-Fi, radar, sonar, lidar⁵ or other sensors to detect nearby vehicles and potential roadway hazards and alert drivers so they can take corrective action. Some systems could also take proactive measures to avoid or mitigate the severity of a collision, including providing automated braking assistance and engaging vehicle stability control systems.

5 Light Detection and Ranging. It operates on the same principles as radar, but using light (or a laser) rather than radio waves.

- **Pedestrian detection systems** using wireless connectivity, radar sensors and/or cameras that detect people in front of a vehicle, warn if anyone walks out into its path and then automatically activate the brakes if the driver fails to respond in time.

Other possible applications of ITS include lane departure warning systems, drowsy-driver detection systems, wildlife detection systems and road weather sensors.

Advances in communication technologies will also improve safety in relation to railway-roadway grade crossings, with the development of low-cost grade crossing warning systems based on wireless wheel sensors. These will also permit remote monitoring of the physical condition of infrastructure and structural health of bridges.

Efficiencies will also come from the explosion of user-generated non-profit content and collaboration made possible by increases in data availability and accessibility. For instance, fuelled by streams of “open data”, individual programmers have created many successful transportation-related apps (applications) for smart phones, providing travellers with more accurate, real-time information. This trend is already underway, and will permit the development of efficiency-enhancing applications at a relatively low cost.

In aviation, advances in engine technology, efficiency gains in air navigation, and the use of lighter materials in airframes have significantly reduced the fuel burn of modern aircraft on a passenger-kilometre basis. These changes have been driven by a desire to reduce both aviation’s carbon footprint as well as costs, as fuel is often an air carrier’s greatest expense. Adopting such new technology for a carrier means reducing its fuel consumption, which is exactly what Air Canada hopes to achieve when it starts receiving in 2014 its 37 Boeing 787 Dreamliner aircraft purchased for long-haul flights. Many airlines are expected to replace regional jets with more fuel-efficient aircraft such as the Bombardier Q-400 turboprop—a trend that will likely continue in the future.

New or re-engined⁶ aircraft such as the Bombardier C-Series, the Airbus A-320neo and the Boeing B-737Max promise to deliver significant fuel-burn reductions. Evolution of drag-reducing wingtip devices such as winglets, sharklets and raked wing tips also

help. Many older aircraft, particularly Boeing B-737s, B-757s and B-767s, are now retrofitted with blended wingtips to improve fuel efficiency.

Finally, operational changes such as the use of satellite-based navigation, more efficient take-off and landing procedures (e.g., continuous descent⁷) and the possible introduction of electrical taxiing⁸ are further examples of how technology may help the aviation sector reduce its carbon footprint.

TECHNOLOGY AS AN ENABLER OF A MORE SUSTAINABLE TRANSPORTATION SYSTEM

Governments (federal, provincial/territorial, municipal), academic researchers and industry will continue to **work together** to better understand the potential impacts of climate change on the transportation system, and to assess different options and strategies to address the impacts. Technology has a clear role to play in enabling sustainable transportation.

In 2010, the Canadian Council of Ministers of the Environment agreed to move forward with a new national approach to air management: the Air Quality Management System (AQMS). This federal-provincial initiative will establish regionally coordinated air sheds and air zones within individual provinces and territories, and use coordinated mechanisms across federal and provincial environment, transport and energy ministries to address transportation emissions. Under the auspices of the Council of Ministers Responsible for Transportation and Highway Safety, federal, provincial and territorial transport ministries are collaborating to advance a national vision for transportation to 2030 that includes advancing sustainable transportation issues and understanding air emissions issues and challenges in a national context.

In 2011, the Government of Canada approved a **new suite of initiatives** to follow the 2007–2011 Clean Air Agenda. The new initiatives support the government’s commitment to pursuing a balanced approach in reducing emissions, which recognizes the importance of greening the economy for tomorrow and protecting jobs today. Specific to transportation, the new initiatives cut across numerous federal departments and organizations, including Transport Canada and Environment Canada.

6 Using a new technology engine on an existing aircraft.

7 As opposed to the current practice of a step-down approach.

8 Taxiing refers to aircraft moving on the ground and on its own power.

They use regulations to meet existing emission-reduction commitments (for example, GHG emission regulations for light- and heavy-duty road vehicles) and set targets for the adoption of clean technologies and practices.

Embedded in all of this is a new approach to addressing transportation-related emissions that focuses on encouraging technology uptake. Targeted incentives will accelerate technology deployment to address emissions sources that fall under federal jurisdiction (e.g., ports, interprovincial and international shipping). These incentives will aim to balance and optimize the environmental, safety and economic performance of the Canadian transportation system.

In addition to Transport Canada and Environment Canada, Natural Resources Canada will also be involved in transportation initiatives, promoting the sustainable development and use of the country's energy supply. Elements of its Vehicle Efficiency Program will be supported by clean transportation initiatives (e.g., consumer awareness, labelling and Smart Way Partnerships⁹). Natural Resources Canada's research and development initiatives for pre-commercial on-road innovations will complement Transport Canada's commercial-stage vehicle technology proposals.

One-way **regulations** are expected to generate environmental benefits and reduce fuel use and emissions is by accelerating technological change. This will require Canada's current vehicle safety approach to become more proactive, streamlined and targeted. Identifying environmental benefits and potential safety risks earlier in the development of new vehicle technologies facilitates the safe, cost-effective introduction of advanced vehicle technologies in Canada.

Transport Canada's Transportation Development Centre conducts **research and development** in support of the government's Clean Air Regulatory Agenda. Its projects include initiatives to develop regulations and technologies increasing Canadian rail network capacity, and to ensure regulatory compliance. Its five rail-related research and development areas are: locomotive systems, data management, infrastructure, railcars and fuels. The Centre is also engaged in marine-related R&D, with emissions inventories, emission control, improved energy use, alternative fuels/power systems and ice navigation being its main focus.

TECHNOLOGY AS AN ENABLER OF A SAFER TRANSPORTATION SYSTEM

Important changes will be made in the coming years to the **regulatory framework governing transportation safety** in Canada. Changes will account for stakeholder inputs, streamlining and simplifying regulatory burdens on companies and resorting to regulation only when no other means is feasible. Performance-based rather than prescriptive regulatory frameworks will prevail. Safety Management Systems are an example of regulated entities' greater role in ensuring desired regulatory outcomes, and they offer the potential to further entrench a strong safety culture within the stakeholder community. It is an approach aligned with Cabinet Directives on Streamlining Regulations¹⁰ and the Red Tape Reduction Commission.

Innovation and rapidly evolving transportation equipment technologies have been and will continue to be instrumental to safety and emissions improvements. Traditional engineering and safety/environmental standards have focused on vehicles/equipment. On the safety side, emphasis has been placed on avoiding accidents altogether. In road vehicles, advanced in-vehicle systems that use sensors and complex signal processing to detect and evaluate hazards in the road traffic environment are already on the market (e.g., automatic collision-warning and braking systems).

Because transportation equipment industry manufacturers see competitive advantages in offering increasingly sophisticated systems to achieve higher levels of safety, the systems being developed will have to be assessed in terms of their impact on transportation operations and their actual impact on safety. For example, the availability of wireless communications combined with the emergence of increasingly powerful and more affordable mobile devices in use within automobiles will remain under the scrutiny of transportation safety.

The transportation system of the future will be tied to **multi-modal information systems**. Advanced ITS developments may well be at the forefront of profound transportation safety improvement aimed at reducing the number of annual road accidents.

With expected increases in northern economic activities over the coming years, the safety of transportation activities in the Arctic will receive special attention. The First Air accident on August 20, 2011 near Resolute

9 A voluntary partnership between the U.S. Environmental Protection Agency, shippers and freight companies where the other two commit to benchmark operations, track fuel consumption and improve environmental performance annually.

10 <http://www.tbs-sct.gc.ca/ri-qr/directive/directive00-eng.asp>

Bay was a stark reminder of the challenges related to mounting search and rescue operations in Northern Canada, even when cold temperatures are not a factor. With respect to marine transportation, Arctic shipping is growing rapidly with the opening of the Arctic due to climate change, and marine safety issues are bound to gain importance as traffic increases. Transport Canada will continue to **monitor proposed and actual changes** to shipping patterns in that part of the country, with special attention on the Northern passageway.

Global interest in Arctic resources—including minerals, oil and gas—is intensifying. Greater activity in the Arctic will create security issues for the Canadian government and international maritime shipping community. The potential increase in the shipping required for resource exploitation in the Arctic, as well as an increase in cruise ship traffic, may impact the environment and existing infrastructure and communities. The Canadian government is working toward a coordinated strategy to strengthen transportation links to and within the North, including improved infrastructure to support social and economic development and enhance Canada's security and sovereignty.

TECHNOLOGY AS AN ENABLER OF A MORE SECURE TRANSPORTATION SYSTEM

A new generation of transportation security equipment has or will soon be introduced, driven by changing security needs and threats and by technological innovations that improve threat detection. Another emerging development is the networking of security equipment, which enables the remote screening of passengers and baggage from a centralized location. From a security perspective, this arrangement has many advantages and provides a great deal of operational flexibility.

Improving screening and developing smarter approaches is an ongoing security task. This involves no change to Canada's common security standards, but rather has more to do with learning from experience and applying these lessons to the entire screening process. Moving away from a "one-size fits all" model of screening is one such approach, allowing more screening resources to be devoted to higher-risk individuals/situations. This requires revisiting and updating prohibited items lists and harmonizing them with those of the rest of the world.

One of the biggest changes to security screening equipment recently was the introduction of full-body scanners, which work by projecting low-level millimetre wave radio frequency energy over and around the passenger's body. The radio frequency wave is reflected back from the body and signals are recovered using highly sensitive detectors, which are then processed and converted to digital format to produce a three-dimensional image, revealing objects concealed on the body. Its positive evaluation on a trial basis in early 2009 at Kelowna B.C airport—as well as a failed terrorist attack—led the government to proceed with deployment of this technology at 20 Canadian airports, making it part of Canada's aviation security screening system. The entire scan process takes about five seconds and meets all regulated health and safety requirements.

New full-body scanning technologies will be further developed and equipped with advanced auto-detection software. Current designs are essentially based on two different design concepts: x-ray backscatter and millimetre wave. Due to health regulations, many jurisdictions restrict the body scanning process to millimetre wave systems only. For that reason, this latter system may witness a greater development in the near future.

Another technology trend in the field of aviation security is the introduction of improved x-ray technology that provides multiple views and significantly better images, allowing operators to detect prohibited items in carry-on bags in a more efficient and timely manner.

Finally, air cargo security has been receiving additional attention due to the \$95.7 million dedicated to air cargo security over five years within Budget 2010. As part of this program, new technologies (e.g., x-ray, explosive trace detection) are introduced for screening air cargo and then adapted to the different sizes, contents and packaging that are prevalent in that segment of the air transport industry.

NEXUS¹¹ lines are already operating in all eight major international Canadian airports at domestic and select international checkpoints. Passengers travelling to the U.S. will soon be able to use NEXUS cards as well as dedicated lines to be screened faster at Canada's largest airports (Halifax, Montreal, Ottawa, Toronto, Winnipeg, Calgary, Edmonton and Vancouver). The Government of Canada will work closely with airport authorities to start fully implementing this service in 2012.

11 NEXUS is joint program between the Canada Border Services Agency (CBSA) and the U.S. Customs and Border Protection (CBP) to expedite the border clearance process for pre-approved travellers into Canada and the United States. Participants in this voluntary program receive a NEXUS card, which identifies them as low-risk travellers and allows them to use NEXUS priority lanes at certain border crossings.

The Aviation **Security Regulatory Review** will be pursued in coming years to renew the security regulatory framework for all air transportation industry stakeholders and carriers. The Canadian Air Transport Security Authority (CATSA) and other aviation service providers will work closely with industry to understand and minimize the regulatory burden while promoting further harmonization of the regulations with international standards.

Transportation security practices will continue to mature and adapt to a dynamic context, the complexity of technology, increased operations and globalization, as there is a need to apply modern security practices. Because there will always be hazards, risks and threats, Transport Canada is committed to and supports a more comprehensive approach—the use of security management throughout the transportation system—under a policy framework that makes the industry accountable for systematically and proactively managing risks and threats within their transportation activities. This is done through formal frameworks designed to integrate security into the daily operations of a transportation enterprise, combining a variety of processes that interact to achieve the overall goal of managing risks and threats. This type of approach has been successfully taken in the rail and urban transit sector.

Transportation operators are advancing their own security culture and implementing security measures to address specific needs without undue interference to the efficiency of their system. Security is a reality of the modern environment, and transportation operators are increasingly enhancing their security cultures and adopting security measures as a matter of good business, rather than because they are imposed by regulatory requirements.

With respect to the transportation of dangerous goods by road and rail, Transport Canada has been conducting risk-based analyses to determine the best approach for enhancing security by using a multi-phased policy development process that includes an environmental scan, consultations and information gathering; a strategic security-risk assessment; and an evaluation of potential policy options. The process includes consultations with industry, other federal government departments and provincial representatives.

12.5 CONCLUSIONS

This chapter has touched on a great number of issues, both global and local, that will mould the evolution of Canada's transportation system in the coming years. Not only is demand for passenger and freight services shifting, but the manner in which transportation services are delivered will also have to evolve, be it through more accessible passenger transportation, better integrated freight supply chains, more sustainable transportation or a continued emphasis on safety and security.

For passenger and freight transport, future challenges are expected to come in part from significant changes in the origins and destinations of international freight and passenger traffic to and from Canada. A modern, flexible policy and regulatory framework coupled with continued progress on the technology and research front, innovative funding models, and cooperation across governments and between the public and private sectors will be key to successfully addressing these challenges.

CONCLUSIONS 13

The future of the transportation industry will continue to be one of adjustments driven by global and domestic changes in competition and in market conditions.

As this report has shown, Canada's transportation sector has largely recovered from the effects of the 2008–2009 recession. Yet the world economy remains in a fragile state, and risks remain—associated with the European sovereign debt crisis and a slow, prolonged recovery in the U.S. Perhaps the only certainty with respect to the global economy is that uncertainty is here to stay.

Within this context, however, Canada's transportation sector continues to be dynamic and innovative across all modes. Both passenger and freight transportation have grown in volume, and initiatives are in place to improve the environmental sustainability, safety and security of transportation. Accessibility remains an important consideration, particularly given the aging of the population.

Adaptability is essential in transportation: the ability to respond to social and economic changes. Diversified networks of trade are driving ever-greater demand for transportation, and the economics of transportation require demand be met with in ways that keep costs down and achieve the highest levels of efficiency and reliability. Existing and future natural resource developments as well as sprawling global industrial supply chains will require more and more support from Canada's transportation system to sustain economic growth.

One of the chief challenges in coming years will be to decouple economic growth from energy use and greenhouse gas emissions—not only reducing the amount of energy spent to move one passenger or tonne over one kilometre but also to bring down the total amount of energy used despite growing demand. Across all modes, operators have to reduce their dependency

on fossil fuels and leverage new fleets of vehicles that integrate new technologies, advanced materials and emerging fuel sources.

For a trading nation like Canada, the Gateways and Trade Corridors strategy has led to improvements in the country's competitiveness in the world market. Another major challenge in the years ahead is likely to be meeting the ongoing needs for infrastructure maintenance and improvement while accounting for the realities of fiscal constraint.

The Canadian transportation system is vital to the nation's economy and Canadians' quality of life. The challenges ahead will require the sector to simultaneously address issues tied to financing, aging infrastructure, institutional change, energy consumption, the environment, safety and security.

The future of the transportation industry will continue to be one of adjustments driven by global and domestic changes in competition and in market conditions. Alternative and innovative transportation service and infrastructure delivery models will showcase technological breakthroughs supporting transportation's efficiency, reliability, sustainability, safety, security, and integration across modes and boundaries. Taking advantage of new technologies and ongoing adjustments to programs, policies and regulatory frameworks will permit to address new pressures on Canada's transportation system.