Transportation in Canada 2021

COMPREHENSIVE REPORT

Transport Canada Transports Canada

Canada

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THE HONOURABLE

OMAR ALGHABRA

MINISTER OF TRANSPORT

As Minister of Transport, I am pleased to present *Transportation in Canada 2021*, which provides Canadians with an overview of their transportation system at work.

In 2021, we entered the second year of the global COVID-19 pandemic, with Transport Canada and the Government of Canadians safe. Measures were announced requiring employees and passengers in the federally regulated air, marine, and rail transportation sectors to be vaccinated. Measures like this helped keep Canadian's safe by delivering immediate protection from infection and severity of illness and increased broader community protection by encouraging vaccine uptake. Meanwhile, the Government continued offering relief to the Canadian air industry through programs such as the Airport Critical Infrastructure Program, the Airport Relief Fund, and the enhancement of the Airports Capital Assistance Program. This will help Canada's air operators and airports to invest in the infrastructure and tools needed to re-invigorate the aviation industry and allow Canadians to feel safe and secure when they travel.

To further keep Canadians safe, Transport Canada initially restricted certain aircraft arriving in Canada to four airports, later adding additional airports during the year. The department also continued to monitor and enforce requirements for pre-departure COVID-testing for travellers coming to Canada, as well as the wearing of masks at airports and onboard passenger aircraft. The land border between Canada and the United States remained closed for non-essential travel by foreign nationals for much of the year—though Canada re-opened the border for most fully vaccinated Americans in August.

In the ongoing aftermath of Ukraine International Airlines Flight 752, which was shot down after taking off from Tehran, Iran, in January 2020, Transport Canada and other Government of Canada departments continue to pursue transparency, justice, and accountability for victims. In March 2022, Transport Canada co-hosted the second Safer Skies Forum, which brought together technical subject-matter experts from around the globe to discuss conflict zone risk mitigation as well as the efforts aimed at preventing such tragedies from happening again.

In our waters, the Government of Canada worked with industry and stakeholders to put in place strict safety and environmental measures for cruise ships before the start of the 2022 cruise season. Not only does this mean that these vessels return to our ports for the first time since the pandemic began, but their arrival will be cleaner and greener than before. Meanwhile, Transport Canada continues to make enhancements to industry efficiency that complement the Ports Modernization Review and advances efforts to ensure the St. Lawrence Seaway remains a competitive and sustainable transportation corridor. Also, this year, the department launched public consultations on a proposed regulatory charge to finance a Vessel Remediation Fund, which would help prevent and address wrecked, abandoned, or hazardous vessels.

As for the Oceans Protection Plan—the largest investment ever made to protect Canada's coasts and waterways while growing the economy—Transport Canada remains an engaged partner with Indigenous Peoples, coastal communities, marine stakeholders, and provinces and territories. Under the Plan, the Enhanced Maritime Situational Awareness program provides Indigenous communities with near real-time information on maritime activity in local waters through a user-friendly web platform. The Plan is also helping to restore marine habitats and ecosystems in key strategic areas, and it has funded almost 350 projects to remove and dispose of abandoned boats across Canada— as well as making it illegal to abandon your boat in Canada's waters. The department has also implemented new and revised measures to reduce vessels' negative effects on the endangered Southern Resident killer whales and North Atlantic right whales.

The freight rail sector continued to feel the impacts of COVID-19 in 2021, as well as those from environmental challenges, such as major flooding and wildfires in British Columbia. In response, a Ministerial Order on rail safety was issued, requiring additional precautionary measures to protect against wildfires and impacts from extreme weather conditions. Transport Canada's Rail Safety Improvement Program announced more than $21 million in 2021 to fund improvements in overall rail safety, increased safety at grade crossings and along rail lines, and increased public confidence in Canada's rail transportation system. Additionally, Transport Canada organized two virtual meetings of the Commodity Supply Chain Table. A call for proposals was initiated in December under the National Trade Corridors Fund, and in January I held a National Supply Chain Summit to bring together business and industry leaders and associations to discuss challenges and potential solutions for a more efficient and resilient supply chain. To further advance this work, a national Supply Chain Task Force has been created.

Over the course of the year, the majority of the regulatory requirements in the *Passenger Rail Transportation Security Regulations* came into force. In addition, the Intermodal Surface Security Oversight team continued to oversee the *Transportation of Dangerous Goods by Rail Security Regulations*, which came into force in 2019. Meanwhile, the Government of Canada also increased the fine amounts related to trespassing and to actions that obstruct the safe flow of trains.

Finally, in 2021, the Government of Canada continued to take action to advance zero-emission vehicle (ZEV) adoption across the country and instituted a mandatory target of 100% light duty vehicle ZEV sales by 2035. Canadians and businesses who have participated in the iZEV program are reducing up to 470,000 tonnes of emissions per year or 5.6 million tonnes over the lifetime of these vehicles. This is equivalent to powering over 1.3 million homes for one year. This is just the beginning of the future of ZEVs in Canada.

In summary, that's a long list of projects and accomplishments, which in turn comes from the high standard Canadians hold us to. I trust that the remaining pages of this Annual Report will provide readers with even more detailed information on Canada's transportation system as well as the continued efforts we are making to continue improving it.

Sincerely,
The Honourable Omar Alghabra, P.C., M.P.
Minister of Transport

Highlights

The past two years brought unprecedented challenges to the transportation system including extreme climate events, global supply chain disruptions, and the enduring effects of the COVID-19 pandemic. Despite these challenges, the system was resilient and was able to swiftly recover and adjust. By the end 2020, freight volume was back to 2019 levels in some regions of the country and for some modes.

The empty shipping container shortage has continued to be a challenge throughout 2021. This, coupled with high demand and other supply chain issues, has resulted in congestion on west coast ports across North America. Despite this, Canadian ports continue to handle high volumes and face lower levels of congestion than U.S. counterparts.

Strong demand for consumer goods through 2021 resulted in an increased container throughput at Canadian ports up 5.6% compared to 2020, and also 2.8% above pre pandemic levels. This import surge led to higher-than-average end-to-end transit times from Shanghai to Toronto via West Coast ports (34.5 days in 2021 vs. three-year average of 27.6 days).

Rail traffic remained 0.1% below 2020 levels, and 3.1% lower than pre-pandemic levels. Although 2021 brought strong growth to international merchandise trade, decreased movement of goods were driven by significant disruptions in the lower Mainland of B.C and a reduced demand for grain due to a smaller 2021-2022 crop-year. Bulk shipments excluding grain were up 4% compared to 2020.

In 2021, truck border crossings grew by 7.5% compared to 2020 but remained overall slightly below pre pandemic levels. Border crossings remained fluid in despite the border reopening to travelers in August 2021.

The COVID-19 pandemic, particularly emerging variants, posed a great challenge to all modes of passenger transportation throughout 2021. Travel patterns have changed, and although restrictions have begun to ease, passenger travel recovery lags. This is particularly true for the air industry, with domestic air travel down 74% compared to 2019.

Over the past decade, transport-related greenhouse gas emissions have increased by 15% (2010 to 2019). While emissions in the marine sector have lowered, all other modes experienced increases. The road sector makes up 84% of these emissions, and despite improvements in fuel efficiency, emissions increased due to growths in both passenger and freight activity.

Despite overall increases in emissions, there have been some notable improvements in the sector. For instance, the emissions intensity of Canadian air carriers has decreased by 18% between 2008 and 2019. Moreover, the rail sector also witnessed decreases in its emissions intensity, with intercity passenger emissions down by 8.4%.

Canada continues to have one of the safest and most secure transportation systems in the world. Road casualty collisions decreased steadily over the last ten years, while the use of vehicles increased. In the air sector, accidents involving registered aircraft are down 18% from the previous ten-year average. The rail sector saw a 5% increase in the number of accidents in 2021 yet recorded 19.2% less deaths than the previous 10-year average.

Purpose

Transportation is a major contributor to the economy and plays an important role in the wellness of Canadians. It also supports many industries, including the manufacturing and tourism sectors.

Transportation not only moves finished Canadian goods to domestic and international markets, it also provides Canadian businesses with the materials and goods they need. Transportation also connects people within and between different communities, major urban centres, provinces, territories, and countries.

Canada's vast and sparsely populated territory, and extreme weather conditions, can make it challenging to ensure the safe, secure and efficient movement of goods and passengers in Canada. In this context, Transport Canada plays a central role in monitoring and reporting on the state of the Canadian transportation system by sharing data and information with the public through this annual report.

The *Canada Transportation Act* of 2007, subsection 52, requires the Minister of Transport to table this report every year, in both the House of Commons and Senate. This report provides an overview of transportation in Canada based on the latest information for all modes of transportation (at the time of writing).

The report highlights the role that transportation plays in the economy and summarizes the infrastructure of national and regional networks. It describes major developments in the transportation sector during 2021 from an efficiency, safety and security, and environmental perspectives.

The report also assesses the Canadian transportation system's performance in 2021 by looking at the system's use and capacity. It ends by looking at upcoming trends in the transportation sector.

In addition to this report, a statistical addendum containing information on freight and passenger traffic for each mode, infrastructure and labour statistics, price and productivity indicators, freight trade data by mode and country, reported accidents, and greenhouse gas emissions has been produced and will be available online through the Canadian Centre on Transportation Data and its Transportation Data and Information Hub.

The role of transportation

Supporting the economy

Using traditional measures of Gross Domestic Product (GDP), a monetary measure for the total value of goods and services across a time period within a country or region, the sector made up 3.6% of GDP ($72 billion) in 2021. In the past year, the sector grew by 1.3% after a 20.5% decline in 2020 due to the COVID-19 pandemic. The effects of the pandemic on transportation sector GDP have largely been seen in passenger services (air travel and urban transit) in 2021 as those two sub-sectors combined are down 72.7% from their 2019 level. Conversely, freight sub-sectors combined (trucking, rail and marine) in 2021 were down 6.5% compared to 2019.

The sector's labour market recovered considerably from COVID-19; the unemployment rate dropped to 4.3% in 2021, compared to 7.5% in 2020 and a 10-year average of 4.1%. Although the sector's unemployment rate compares favorably with the national average of 7.5%, that was not reflected in wage growth. While average weekly earnings in transportation and warehousing grew by 1.4% in 2021, they increased by 3.1% on average for all industries.

Competitiveness

The World Economic Forum's Global Competitiveness Index is a yearly indicator of a country's performance, based on measures of productivity and economic growth. Transportation infrastructure is included in calculating the Index and helps compare the quality of transportation infrastructure in Canada to other countries.

Overall, Canada ranked 14th in 2019 with a score of 79.6. This was close to the best performer, Singapore, which had a score of 84.8. Canada slipped 2 spots and lost 0.3 points compared to 2018. This is partly due to trade issues that have affected Canada's ability to stay competitive.

In terms of transportation infrastructure, Canada ranked 32 and scored 65.7 (far below the 100 level, an ideal state where an index component ceases to be a constraint to productivity growth). This score highlights areas that need improvement, including the quality of roads, as well as the efficiency of train and seaport services. On the other hand, road connectivity (98.7) and airport connectivity (96.3) both scored very high with little room for improvement.

Productivity

Recently, multifactor productivity (a way of measuring the economy's performance by comparing the amount of goods and services produced (output) to the amount of material used to produce those goods and services) in the transportation and warehousing sector has plateaued. Between 2011 and 2020, multifactor productivity decreased around 3.6% per year, compared to the 0.4% increase for the business sector as a whole.

In contrast, labour productivity in transportation and warehousing decreased over the same period, at an annual rate of 0.6%. That's lower compared to the overall business sector which increased by 1.9%. Labour productivity for rail transportation outperformed the business sector with average annual growth rate of 3.9% while air transportation declined by 1.8% over the same period.

Supporting trade

Transportation is important for trade. It allows natural resources, agricultural products and manufactured goods to reach domestic and international markets.

In 2020, the value of interprovincial merchandise trade totalled $163 billion, down 5.9% from 2019.

In 2021, international merchandise trade equalled around $1.24 trillion, a 16.8% increase from 2020 and the highest annual value of total trade on record. The U.S. remains Canada's top trading partner, with $774 billion in total trade ($476 billion exported, $298 billion imported), up 19.4% from 2020. The U.S. made up 62% of all Canadian trade in 2021.

Excluding the U.S., Canada's top four trading partners included China, Mexico, Japan and Germany. These four countries represented 17.0% ($212 billion) of Canada's total international trade in 2021.

Canada has 15 free trade agreements in force with 49 countries, representing two-thirds of the global economy. Canada is also the only G7 country to have free trade agreements with every other member of the G7. These agreements connect Canadian businesses to over 1.5 billion consumers around the world.

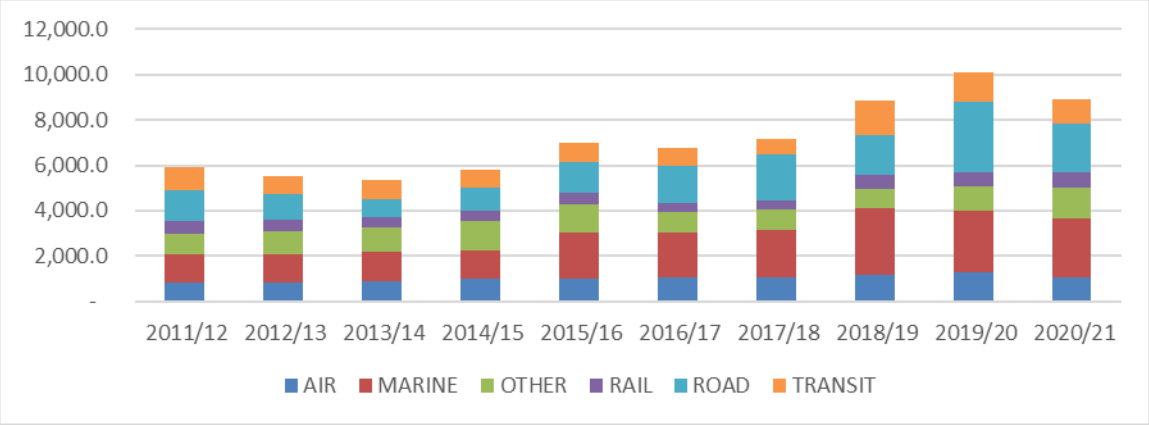
Government Expenditures and Revenues

Federal, Provincial, and Territorial Spending Initiatives

Federal Government

Total federal transport-related expenditures reached $8.9 billion in 2020-2021, an 11.8% decrease from 2019-2020. While Transport Canada's expenses increased 24% from the previous year, this overall decrease can be attributed to reduced expenditures from Infrastructure Canada, Canadian Air Transport Security Authority (CATSA), Windsor Detroit Bridge Authority and Parks Canada.

Figure 1: Federal expenses, 2011/12 to 2020/21



In 2020-2021, the three main federal departments in terms of transportation-related spending were Transport Canada, with $1.97 billion (22.2% of total federal spending), followed by Infrastructure Canada with $1.8 billion (19.8% of overall spending), and the Canadian Coast Guard with $1.5 billion (16.7% of overall spending). Federal spending included operating and maintenance expenses, capital expenditures as well as transfer payments. Tax expenditures, such as the cost of the GST exemption for municipal transit and the Public Transit Tax Credit, are also included.

At the federal level, transportation-related revenues offset transportation-related spending ($4.1 billion). Federal revenues from transportation items totaled $13.1 billion in 2020-2021, a 13.6% decrease from 2019-2020. This includes $4.9 billion in fuel taxes and $7.5 billion in sales taxes on transportation-related household purchases. Overall federal user fees, licenses, and other miscellaneous revenues, including major items such as the Air Travellers' Security Charge ($90 million in 2020-2021) and lease payments by Canadian Airport Authorities and Canada Port Authorities ($19.3 million in 2020-2021), were down 68.9% compared to the prior fiscal year. Federal fuel and excise fuel tax revenues decreased by 13.9%, while transportation-related sales tax revenues increased by 2.0%.

Provincial-Territorial Governments

Provincial-territorial spending on transportation totaled $33.5 billion in 2020-2021, up 30.0% from the previous year. After netting-out federal transfer payments related to transportation, provincial-territorial spending was $29.1 billion, an increase of 30.3%. British Columbia reported the highest year-over-year increase (45.7%), along with Nunavut (38.3%) and Québec (36.5%). Manitoba and Newfoundland and Labrador were the only two jurisdictions reporting declines in transportation-related spending, down 7.7% and 12.9% respectively.

Provincial and territorial transportation-related revenues came from sales taxes on transportation-related household purchases, fuel taxes, license and registration fees, user fees and various other sources. In 2020-2021 revenues amounted to $27.5 billion, a 4.4% decrease from the previous year. Sales tax revenue made up for 40.5% of overall provincial-territorial revenues, with fuel taxes contributing 30.3%.

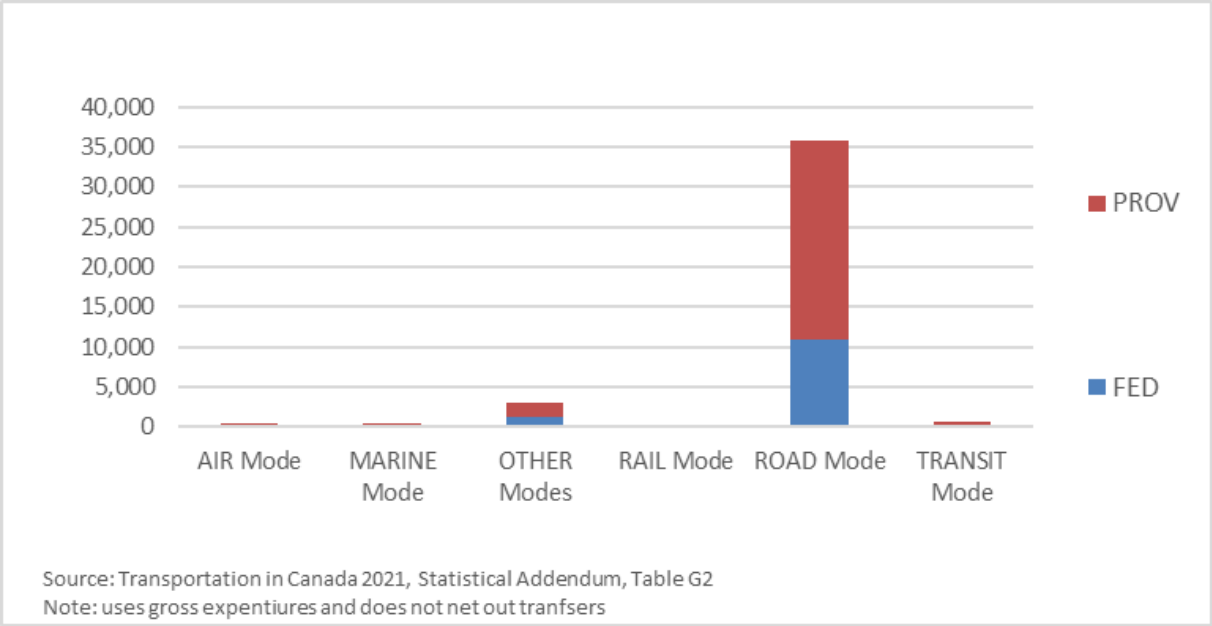
Fuel tax revenues in 2020-2021 ($8.4 billion) decreased by 19.0% across all provinces compared to 2019-2020. New Brunswick had the largest decrease (down 35.5% versus 2019-2020), followed by Ontario (down 28.0%) and then Yukon (down 27.8%).

Federal-Provincial-Territorial public revenues and expenditures by mode

Combined federal-provincial-territorial expenditures (net of transfers) increased by 17.2 % in 2020-2021, with the largest portion being road expenses in Quebec $6.4 billion (up 43.6%) followed by transit expenses in Ontario $5.3 billion (up 72.1%) from 2019-2020.

Federal and provincial/territorial spending are not distributed evenly across modes. Taken together, the provinces/territories account for over 89.6% of expenditures for roads and transit, while the federal level contributes three-quarters or more of total expenditures on air, marine, rail and multimodal.

Figure 2: Federal / Provincial and Territorial expenses by mode, 2021

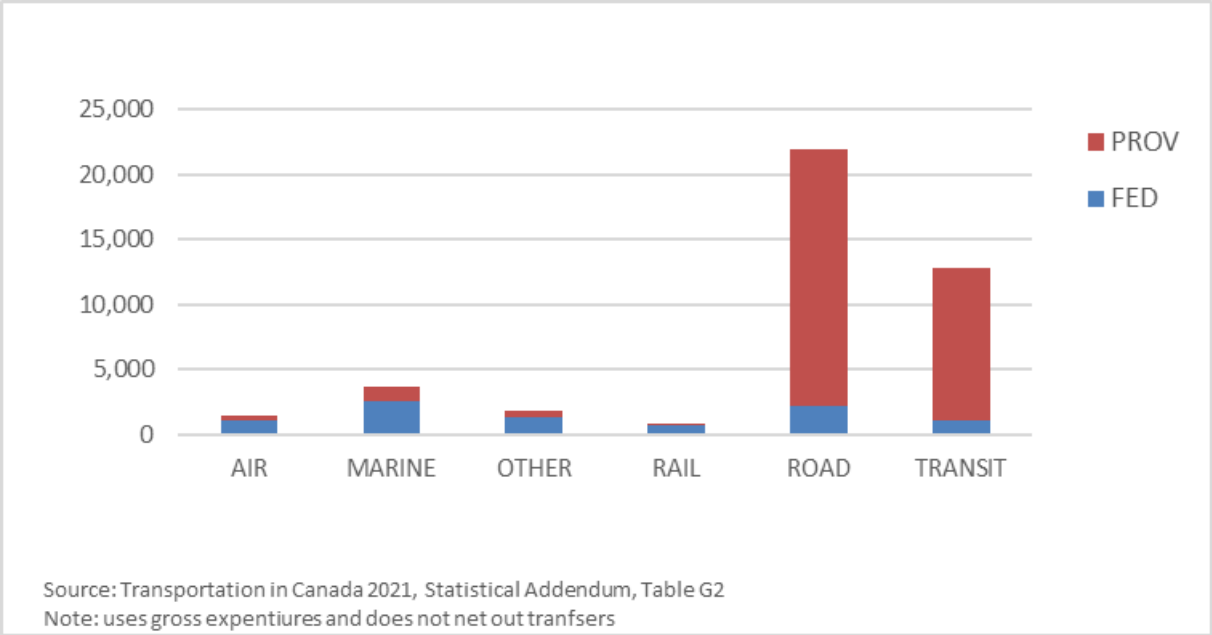


Source: Transportation in Canada 2021, Statistical Addendum, Table G2
Note: uses gross expentiures and does not net out tranfsers

Federally, marine mode expenses decreased by 6.1% from the previous year but were responsible for 28.8% of transportation spending, while road was by far the largest mode for the provinces and territories. Road expenses in 2020-2021 were up 23.4% to $18.7 billion and made up 64.1% of all Provincial and Territorial expenses.

The road sector was the main source of revenues for both the federal and provincial/territorial levels of government, making up 90.4% of transportation-related revenues provincially/territorially and 83.9% federally.

Figure 3: Federal / Provincial and Territorial revenues by mode, 2021



Source: Transportation in Canada 2021, Statistical Addendum, Table G2
Note: uses gross expentiures and does not net out tranfsers

COVID-19 Expenditures

The COVID-19 pandemic has had an immense financial impact on the transportation sector. In response, the Government of Canada has launched a multitude of financial relief programs to keep supplies flowing, protect jobs, maintain connectivity, and ease businesses back into normal operations and facilitate their recovery. Transportation related revenues and expenses were noticeably impacted during 2020-2021. Federal, provincial and territorial expenses reduced by 17.1% and revenues decreased by 7.6%.

While many of these programs are led by Transport Canada, others led by other departments also provide funding that impact the transportation sector. Funding summaries are highlighted below.

Air Sector

It is no surprise that the air sector was heavily impacted by the pandemic, with domestic air travel dropping from 93 million passengers in 2019 to 24 million in 2021. To aid the sector, support has been offered to:

1. Airports
2. Airlines
3. Industry-wide support

Airport Support

In total, $1.12 billion in subsidies have been provided to airports:

Program	Highlights
Airport Critical Infrastructure Program (ACIP)	Offers support to larger airports to make critical investments in safety, security, and transit infrastructure as well as testing and screening to mitigate the transmission of COVID-19 and its variants ✓ Funding: $570 million ✓ Program running from 2020-2026
Airport Relief Fund (ARF)	Provides direct financial relief to airports with revenues less than $250 million in 2019 ✓ Funding: $64.8 million ✓ Provided throughout 2021
Enhanced Airports Capital Assistance Program (ACAP)	Contributes funding to small/regional airports with annual passenger flows between 1000 to 525000 ✓ Funding: Up to $186 million, plus $38 million per year ✓ Running from 2021-2023
Rent Relief (Deferral or Waiver)	Defers or waives rent payments to assist airports in maintaining airport operations ✓ Estimated $34.9 million waived for small/medium airports, including BBTCA ($33 million to date) ✓ $126.8 million waived for large airports ✓ $150.6 million deferred for large airports Running from 2020-2024

Airline Support

In total, $240 million in subsidies and $3.3 billion in loans have been provided to airlines:

Program	Highlights

Remote Air Services Program (RASP)	A federal program plus provincial and territorial funding to ensure essential air connectivity links (fly-in only) to transport medical supplies, medical travel and food ✓ Funding: Up to $174 million ✓ Running from July 2020-March 2022
Carrier-Specific Loan Facilities	Deals to major airlines to ensure their ensure liquidity during the pandemic. May include clauses for social commitments such as job protection and ensuring connectivity ✓ Funding: Up to $7.2 billion ✓ Program ran throughout 2021

Industry-Wide Support

Program	Highlights
Regional Air Transportation Initiative (RATI)	Enables the regional air ecosystems to remain operational, supporting regional economic growth. Eligible for airlines, airports, and other supporting parties ✓ Funding: Up to $206 million ✓ Running until March 2023
Canada Emergency Wage Subsidy (CEWS)	A Finance led subsidy to enable impacted companies to retain workers an rehire lost personnel and ease back to normal operations. ✓ Funding: Up to $2.7 billion for the air sector ✓ Program ran from March 2020-October 2021

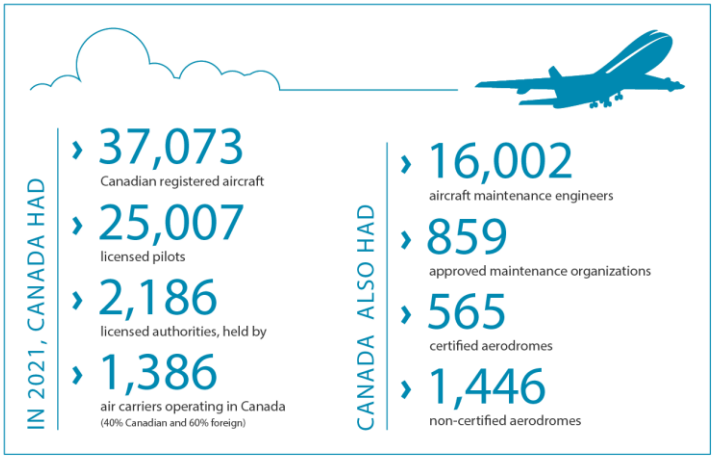
Modal overview and developments

Air network

Key traffic and volume statistics

Canada's air transportation system connects Canada to the world and moves passengers across the country which spans six time zones and covers about 18 million square kilometers.

Canadian airspace is managed by NAV CANADA, a privately run, not-for-profit corporation that owns and operates Canada's civil air navigation system. It operates air traffic control towers at 42 airports and flight service stations at 55 airports.



The Canada Flight Supplement and Canada Water Aerodrome Supplement listed 1999 certified and registered sites in 2021, and 12 other military landing sites. The sites fall into three categories:

- 344 water aerodromes for float and ski planes
- 420 heliports for helicopters, and
- 1,247 land aerodromes for fixed-wing aircraft

Table 1: Volume highlights from some domestic Canadian airlines

Airline	Highlights
Air Canada	• Accounted for 51% of available seat-kilometres in the domestic air market • Operated an average of 456 scheduled flights per day • Air Canada's fleet of aircraft totalled 228 aircraft for the main line, 187 for Air Canada Express, and 41 for Air Canada Rouge
WestJet	• Accounted for 29% of available seat-kilometres in the domestic air market • WestJet's fleet totalled 158 aircraft, with 47 from WestJet Encore • The airline provides scheduled passenger services to 41 Canadian destinations, 23 U.S., and 36 other foreign destinations
Porter Airlines	• Porter Airlines fleet of 38 aircrafts, including 29 Q400 turboprop aircraft, connects passengers to 15 destinations in Canada and 5 in the U.S.
Air Transat	• Air Transat is the largest leisure carrier, with a fleet of 31 aircraft serving 34 international destinations in 18 countries
Sunwing Airlines	• Sunwing Airlines is Canada's second largest leisure operator, with 28 aircraft serving 29 international destinations in 15 countries

Latest developments

Competitiveness and efficiency

In response to the pandemic, the federal government worked with Canadian air operators to help them weather the impacts of COVID-19. Over $11 billion were made available to the air sector, including over $2.7 billion through the Canada Emergency Wage Subsidy, and by year end 2021 agreements were in place for loan facilities with:

- Sunwing (for up to $448.3M)
- Air Canada (for up to $1.4B)
- Transat (for up to $700M), and
- Porter (for up to $270.5M)

The agreements helped these airlines access funding under the Large Employer Emergency Financing Facility and required them to refund passengers for cancelled flights due to COVID-19. Air Canada was also required to re-establish domestic regional services.

The Government also created a series of rent waivers and deferrals to support airport authorities. These programs provided support such as:

- the Airport Critical Infrastructure Program ($570.7M) to support critical investments in large airports
- the Airport Relief Fund ($64.8M) to address the financial impacts of COVID-19

- the enhancement of the Airports Capital Assistance Program ($186M), and
- the Regional Air Transportation Initiative ($206M) to keep regional air ecosystems operational and support economic growth

Working with the provincial and territorial governments, the Government of Canada also created the Regional Air Services Program (up to $173.1M) to protect air transportation for remote communities. Another $17M was given to the Governments of Nunavut, the Northwest Territories and Yukon during 2020 at the start of the pandemic.

Safety and security

COVID-19

In 2020, measures were put in place to manage the risk of new COVID-19 cases arriving in Canada, such as limiting international arrivals to four Canadian airports through a Notice to Airmen (NOTAM). In the interest of public safety and in support of a gradual resumption of operations these measures were updated in 2021 to include other airports in August, September, and November 2021, thereby expanding Canadian aviation operations while contributing to a Government of Canada approach to the management and mitigation of COVID-19.

Additional NOTAMs were also used to prevent the spread of COVID-19 in Canada through the suspension of flights from select countries. Given the high number of COVID-19 cases seen in air passengers arriving from India, Pakistan and Morocco and other countries, Transport Canada issued a NOTAM to temporarily suspend all commercial and private passenger flights arriving from these countries. As COVID-19 conditions improved, the notices were repealed.

Transport Canada continues to issue COVID-19 measures, updates, and guidance for aviation, including, but not limited to, the regular issuance, review, and implementation of the Interim Order Respecting Certain Requirements for Civil Aviation Due to COVID-19, and any exemptions to it that may be of national interest. Such exemptions include supporting humanitarian relief and diplomatic efforts, law enforcement activities, and facilitating the medical and religious accommodations of individuals.

Transport Canada continues to issue COVID-19 measures, updates, and guidance for aviation.

5G radio altimeters

Transport Canada's Civil Aviation Directorate published a Civil Aviation Safety Alert (CASA) (2021-08) to communicate the potential risk of 5G interference worldwide, recommend operational measures and to provide a way to report radio altimeter disturbance/interference event to Transport Canada.

Transport Canada found it was likely that some radio altimeter models could be affected by 5G radio waves in different operational scenarios, most notably at low altitude (less than 1000 ft) in the 3700-3980 MHz frequency band.

In November 2021, Innovation, Science, and Economic Development Canada set interim technical rules in the 3450-3650 MHz band to manage interference with radio altimeters.

In November 2021, the U.S. Federal Aviation Administration issued a Special Airworthiness Information Bulletin on the risk of adverse effects on radio altimeters and multiple Airworthiness Directives to

impose operational restrictions. Transport Canada issued supporting Airworthiness Directives (December 2021) for Canadian airlines that operate in the United States.

Ukraine Airlines Flight PS752

On January 8, 2020, Ukraine International Airlines Flight 752 was shot down minutes after taking off from Tehran, Iran, by an Iranian surface-to-air missile. 55 Canadian citizens, and 30 permanent residents were among the 176 people killed in this tragedy.

In 2021, Transport Canada and other federal departments continued to pursue transparency, justice, and accountability for victims' families and to act on the recommendations from Special Advisor Ralph Goodale's report to the Prime Minister on Flight PS752.

This includes:

- securing reparations for the families of the victims (led by Global Affairs Canada)
- advocating for improvements to the international air accident investigation framework, and
- continuing to work on the Safer Skies Initiative

In 2021, Transport Canada also consolidated the Conflict Zone Information Office. The office monitors, assesses and responds 24/7 to the risks conflict zones pose to civil aviation. The office issued several notifications to advise Canadian air operators on high-risk areas in 2021.

Internationally, the office worked on key deliverables with the Safer Skies Consultative Committee. These deliverables included:

- developing information-sharing practices for conflict zones
- sharing best practices for managing and assessing risks
- developing guiding principals for closing airspace, and
- reviewing global standards and guidance materials

In October 2021, the committee submitted a written update to the International Civil Aviation Organization Council. In March 2022, Transport Canada and the committee hosted the second-annual Safer Skies Forum. The forum brought together technical subject-matter experts from around the globe to discuss how the industry can manage and reduce the risks to air transportation in conflict zones.

Green transportation

Transport Canada is actively involved in maintaining the International Civil Aviation Organization's Carbon Offsetting and Reduction Scheme for International Aviation, also known as CORSIA. The plan addresses the increase in international aviation emissions from 2020 on by requiring aircraft operators to buy emission units on the open market to offset a portion of their greenhouse gas emissions on international flights.

This applies to any operator that will emit more than 10,000 tonnes of carbon dioxide emissions on international flights from 2019 to 2035.

In December 2020, an update was published to the regulations under the *Aeronautics Act* to set out the offsetting and alternative fuels requirements of CORSIA. With this act, CORSIA was fully implemented in Canada. The offsetting phase of CORSIA began in 2021.

Transport Canada has also been supporting ICAO's ACT-CORSIA Program which is helping countries build capacity and train airline staff to support the global implementation of CORSIA.

Work continues closely with Canadian air carriers to improve their environmental performance through Canada's 2012-2020 Action Plan to Reduce Greenhouse Gas Emissions from Aviation. The sector's progress towards improving fuel efficiency is reported annually under this Action Plan. The 2019 report, released in 2022, shows that Canadian air carriers have improved their fuel efficiency by 17.8% between 2008 and 2019.

Marine network

Key traffic and volume statistics

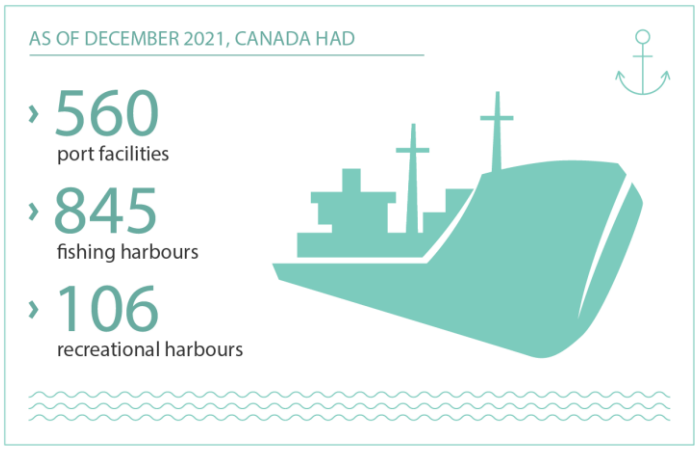
Canadian ports allow Canadian bulk commodities to reach overseas markets, and they are the main point of entry for imported containerized manufactured goods. Ports are also important hubs that connect Canada's coastlines to domestic and U.S. markets where the goods are shipped by railways and trucks.

Transport Canada oversees two types of ports:

- 17 ports that are independently managed by Canada Port Authorities
- 34 port facilities that are owned and operated by Transport Canada

Canadian registered vessels carry around 99% of domestic tonnage. Canadian vessels also support trade between Canada and the U.S. In contrast, foreign registered fleets carry goods to and from non-U.S. destinations. The domestic marine sector's main focus is transporting bulk cargo. The sector is also key to supplying northern communities and developing offshore resources.

In 2020, Canada's commercial registered fleet (made up of vessels of 1,000 gross tonnage and over) had 727 vessels, with a total of 3.7 million gross tonnes. 440 barges were the fleet's backbone, with 28.1% of total gross tonnage and 60.5% of vessels, followed by cargo vessels (77) and workboats (63). The barges were registered on the Pacific coast.



Passenger ferries in Canada provide a link to coastal, island, and remote communities. In 2021, there were 65 registered ferries in Canada. Every year members of the Canadian Ferry Association, which includes all major ferry companies in Canada, carry more than 53 million passengers and more than 21 million vehicles.

Latest developments

Competitiveness and efficiency

The Ports Modernization Review, launched in spring 2018, is strengthening Canada's port system and making Canada's Port Authorities more efficient. Once completed, the review will help us update governance structures and promote investments in ports.

In August 2021, the Minister of Transport announced that the Vancouver Fraser Port Authority will work with partners to design a new system to manage marine vessel traffic and optimize the flow of supply chains at the Port of Vancouver.

Transport Canada continues to focus on making sure the St. Lawrence Seaway remains a competitive and sustainable transportation corridor for North America. This work is being informed by a review of the Seaway, which was first announced in 2017. As part of this review, Indigenous communities and stakeholders were consulted, including the St. Lawrence Seaway Management Corporation, industry, provinces, and municipalities.

Safety and security

Since 2017, Transport Canada has introduced regulations that promote a safe, secure, efficient, and environmentally responsible marine transportation system.

Since June 2019, updated provisions have been added to the *Pilotage Act* and continue to work with stakeholders on creating new regulations that better integrate pilotage into the navigation system.

Transport Canada has improved the oversight of vessel safety by expanding the Small Vessel Compliance Program to help owners and operators to meet the requirement for owning or operating a small commercial vessel.

On June 23, 2021, the new *Ballast Water Regulations* came into force in Canada. Implementing these regulations strengthen existing rules and protect Canada's environment from aquatic invasive species and pathogens.

In support of the International Maritime Organization's decision to ban the use, and carriage for use, of heavy fuel oil by ships in the Arctic, heavy fuel oil has been banned from Canadian Arctic waters starting July 1, 2024.

In 2021, Transport Canada took steps to address the shortage of seafarers by signing agreements with Norway, France, and Australia for recognizing seafarer credentials.

Transport Canada also prepared guidance materials, issued numerous Interim Orders, and worked closely with domestic and international marine partners to support the marine sector throughout the pandemic.

Green transportation

In 2021, Transport Canada held public consultations on a proposed charge to finance a Vessel Remediation Fund. The fee would be paid by vessel owners and used to prevent and address wrecked, abandoned, or hazardous vessels in Canadian waters.

Public consultations were launched on the draft *Voluntary Guidance for Relevant Authorities on In-Water Cleaning of Vessels*. The voluntary guidance clarifies the recommended best practices that stakeholders can use to manage the risks of cleaning vessels in-water.

Oceans Protection Plan

The Government of Canada continues to deliver projects under the $1.5 billion national Oceans Protection Plan. In partnership with Indigenous and coastal communities, this project is developing a world-leading marine safety system to meet Canada's unique needs and improve the ability to prevent and respond to marine pollution incidents. Initiatives under the Oceans Protection Plan are listed below.

Building meaningful partnerships

Transport Canada continues to engage and partner with Indigenous Peoples, coastal communities, marine stakeholders, and provinces and territories. As of December 2021, there have been over 2,220 engagement sessions, including more than 1,762 with Indigenous groups.

Indigenous and local communities have been supported through funding programs, like the Indigenous and Local Communities Engagement and Partnership Program for long-term projects and the Community Participation Funding Program for short-term projects.

Engaging Canadians

Transport Canada held over 30 engagement sessions with Indigenous peoples and industry to get input and suggestions for the next phase of the Oceans Protection Plan. A What We Heard report has been developed to reflect suggestions and comments raised through those sessions.

National Aerial Surveillance Program (NASP)

In 2021, NASP aircrews travelled to the Arctic a few weeks later than planned due to the Public Health Agency of Canada's pandemic-related rules travel. For the 2021 season, the aircraft flew 214 hours observing Arctic waters.

Cumulative Effects of Marine Shipping Initiative

Transport Canada collaborated with Indigenous peoples to identify valued components for cumulative effects assessments in six pilot sites under the Cumulative Effects of Marine Shipping initiative. Transport Canada continued the development of a draft national framework for cumulative effects assessments, after collaborating with Indigenous partners, academic experts, and stakeholders.

Enhanced Maritime Situational Awareness (EMSA)

Transport Canada has partnered with 13 Indigenous communities and organizations to test a new web-based system that increases access to a range of maritime information, including near real-time marine traffic information. Transport Canada is currently expanding the system's user base to a national scale. So far, about 650 system licences have been distributed to our partners.

Vessels of concern

The Vessels of Concern project is helping to restore marine habitats and ecosystems in key strategic areas. By the end of 2021, Transport Canada addressed 780 abandoned and wrecked vessels, 505 more than the 275 vessels planned at the launch of the Oceans Protection Plan. This works has been done in partnership with the Department of Fisheries and Oceans and the Canadian Coast Guard.

Protecting whales

Southern Resident killer whales

For a third year, Transport Canada put in place new and updated rules, including limits on approaching killer whales and creating temporary sanctuary zones to reduce acoustic and physical disturbance from vessels on Southern Resident killer whales. Most vessels complied with these measures in 2021. As of March 2022, Transport Canada has issued $57,814 worth of administrative monetary penalties (fines) to vessels that violated the 2021 rules.

Under the Vancouver Fraser Port Authority's ECHO Program, Transport Canada implemented a lateral displacement in the Strait of Juan de Fuca and vessel slowdowns in Haro Straight, Boundary Pass and at Swiftsure Bank.

As part of a commitment to address underwater vessel noise, in spring 2021 the Quiet Vessel Initiative launched a call for projects that focus on new vessel designs and technologies. Projects are currently under review.

North Atlantic right whales

For a fifth year, from April 28 to November 15, Transport Canada put in place vessel traffic management measures in the Gulf of St. Lawrence to reduce the risk of vessel colliding with North Atlantic right whales. In 2021, 99% of vessels complied with these rules.

Transport Canada was heavily involved in monitoring right whales through the National Aerial Surveillance Program's drones and acoustic underwater gliders.

International Maritime Organization

Canada continued work at the International Maritime Organization by securing a new work output and chairing the correspondence group created to review the existing 2014 IMO guidelines on underwater noise.

Rail network

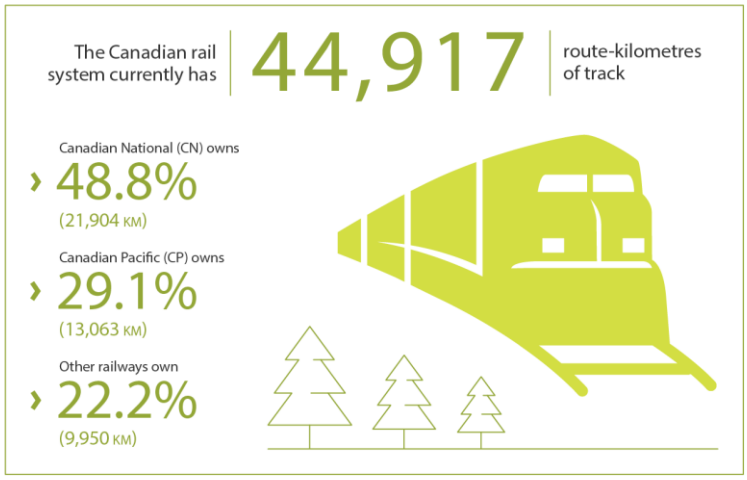
Key traffic and volume statistics

Rail transportation serves nearly every part of the Canadian economy. Canada has an extended railway system that is used to transport mainly freight to and from the U.S. and international markets via coastal ports. There are also many passenger lines across Canada.

Freight sector

The freight rail sector focuses on moving heavy, bulk commodities and container traffic over long distances.

Canada has two major Class I freight railways, CN (Canadian National) and CP (Canadian Pacific), which are responsible for most freight rail traffic. Large U.S.-based carriers also operate in Canada, including the Burlington Northern Santa Fe Railway Company and CSX Transportation Inc.



Together, CN, CP and Burlington Northern Santa Fe Railway Company link trade between Canada, the U.S. and Mexico. Burlington Northern Santa Fe's service to Canada's Pacific Gateway gives Vancouver the unique advantage of being the only port on West Coast served by three Class I railroads.

In terms of equipment, in 2020 Class I railway carriers had:

- 2210 locomotives
- 64,663 freight cars (mainly hopper cars, boxcars, flatcars and gondolas), and
- 423 passenger cars

There are 82 companies that fall under the authority of the *Railway Safety Act*. 25 of these companies are federal railway companies, who must also hold a certificate of fitness from the Canadian Transportation Agency.

There are also many federally or provincially regulated shortline railways that connect shippers with Class I railways or to other shortlines and ports in order to move products across longer distances. Shortline railways move an average of $34.4 billion worth of freight to and from continental rail networks, and to ports and terminals.

Passenger sector

The passenger rail sector provides commuter, intercity and tourist transportation services. National rail passenger services are mostly provided by VIA Rail on behalf of the Government of Canada. VIA Rail is an independent Crown Corporation created in 1977 that operates Canada's national passenger rail service from coast to coast. It mainly uses tracks owned by freight rail companies.

Most of its services are in central Canada along the Québec-Windsor Corridor. VIA Rail also operates long-haul passenger routes between Toronto and Vancouver and Montreal and Halifax, as well as regional services to destinations such as Jasper, Prince Rupert, Winnipeg, and Churchill. In 2020, VIA Rail ran 202 weekly train departures on a 12,500 km network.

In addition to shortlines that move freight, some provide passenger rail services or tourism services, like the Rocky Mountaineer Railway.

Latest developments

Competitiveness and efficiency

In 2021, the freight rail sector saw many challenges due to the ongoing impacts of COVID-19. The freight rail sector was also severely impacted by major floods and wildfires in British Columbia that also affected rail-based supply chains.

Industry working together is critical to having an efficient transportation system. To that end, the Commodity Supply Chain Table brings together over 150 participants from the freight rail-based supply chain to identify and address transportation system issues. The table is an inclusive, national discussion forum that focuses on the resiliency, efficiency, and effectiveness of Canada's freight rail system.

In response to pandemic, B.C. wildfires and floods, Transport Canada organized 2 virtual meetings of the Commodity Supply Chain Table in 2021.

During the year, Transport Canada continued work to develop amendments to the *Transportation Information Regulations.* These regulations will significantly improve the data reported by class 1 rail carriers, increase transparency, and ultimately, improve supply chain resiliency and overall fluidity within the freight rail network.

The High Frequency Rail (HFR) Project in the Toronto-Québec City Corridor continues to be a high priority for the Government of Canada. This project, the largest passenger rail investment in decades, will create concrete benefits for Canadians, like quicker trips, cleaner transportation, more departures, and a more reliable system.

In 2021, Transport Canada along with project partners, including VIA Rail, finished preparing for the procurement process. The process launched in March 2022 with the launch of the Request for Expressions of Interest (RFEOI). This RFEOI outlines the Government's overall vision for the project and is an opportunity to obtain early feedback from potential private sector partnerships to support the next steps in the procurement. VIA Rail, its unions, and its employees will be critical to the success and advancement of HFR. The Government of Canada will require that any arrangement with a private partner respects collective agreements and benefits and demonstrates how the partner will work with VIA Rail's employees and unions. The Government of Canada is eager to work with the private sector, Indigenous peoples, municipalities, provinces, stakeholders, and Canadians to make progress on this project which will benefit Canada for generations.

Safety and security

Passenger Rail Transportation Security Regulations

To improve the security of Canada's passenger rail, the *Passenger Rail Transportation Security Regulations* were registered on October 6, 2020. Over the course of 2021, most of the regulatory requirements came into force.

The Intermodal Surface Security Oversight team implemented the security program, which included developing and issuing industry guidance documents, inspection checklists, and standard operating procedures. Oversight of the regulations began in 2021, mostly through outreach and reviewing security plans.

Transportation of Dangerous Goods by Rail Security Regulations

Transport Canada wants to reduce the security risks of transporting dangerous goods by rail through regulations. In 2021, the Intermodal Surface Security Oversight team continued to oversee the *Transportation of Dangerous Goods by Rail Security Regulations*.

Implementing the security program continued throughout the year, and the team developed and issued program documentation like guidance documents and standard operating procedures.

Changes to the Contraventions Regulations, Schedule X

In 2021, the Government of Canada increased the fines for trespassing on rail company land and blocking the flow of trains. The goal of this change is to use fines to discourage people from interfering with rail lines and property. In turn, it will also enhance the safety and security of the rail system, rail employees, rail passengers, and the communities where rail lines exist.

As shown by the recent increase in trespassing and other interference on Canada's rail infrastructure, the previous fines were not high enough to deter people from committing these acts.

Transport Canada increased these fines to $500 for violating Section 26.1 of the *Railway Safety Act*, and $750 for violating Section 26.2 of the Act. These changes also aligned fines for interfering with rail lines in line with similar fines for other modes of transportation.

Green transportation

Rail transportation makes Canada's transportation network more efficient by reducing congestion and wear-and-tear on roads and highways. A 100-car freight train carrying 10,000 tonnes of goods can replace 300 trucks. Railways can also play an important role in supporting the Government's goal of reducing greenhouse gas emissions by 2030.

Under a series of agreements with the Railway Association of Canada, Transport Canada has been working with the rail industry to address greenhouse gas emissions. Most recently, a renewed agreement was signed with the Railway Association of Canada to cover 2018-2022. This agreement means that emissions intensity levels will continue to be tracked through annual reporting.

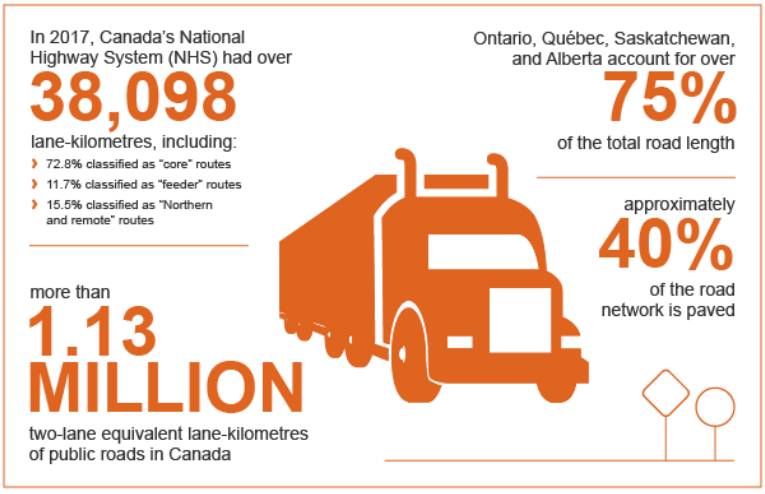
The agreement also sets new greenhouse gas emissions intensity reduction targets for 2022, including a 6% reduction for Class 1 freight and intercity passenger, and a 3% drop for regional and shortlines. It also calls for developing a pathway document to align government and industry work to reduce emissions produced by the railway sector.

Road network

Key traffic and volume statistics

Road transportation is the primary mode for moving both freight and passengers across Canada. Canada is connected from the Pacific to Atlantic coasts by a network of highways, anchored by the Trans-Canada Highway. Canada also has extensive road networks across the southern, more populated areas.

In 2019, 25.4 million road motor vehicles were registered in Canada, up 1.4% from 2018 and 16.4% from a decade ago. Around 92% were vehicles weighed less than 4,500 kilograms, mainly passenger automobiles, pickups, SUVs, and minivans, 4.4% were medium and heavy trucks weighing 4,500 kilograms or more, and 3.3% were other vehicles such as buses, motorcycles and mopeds.



As of December 2021, there were 128,935 trucking businesses. 51,114 of

these companies had employees and 77,821 didn't. The trucking industry includes many small for-hire carriers and owner-operators, and some medium and large for-hire companies that operate fleets of trucks and offer logistic services. Trucking companies are mostly located in Ontario (46.8%), Quebec (15.4%), Alberta (14.8%), and British Columbia (11.3%).

Latest developments

Competitiveness and efficiency

COVID-19 continued to impact the road sector from both the passenger and freight perspectives. Passenger volumes continued to recover along with the return of traffic congestion in many major cities. Although there was high demand for freight and trucking services throughout the year, services were impacted by the COVID-19 pandemic and unexpected weather across Canada and damage to roads. The trucking industry continued to keep Canada's supply chains flowing.

Trucking companies and truck drivers were deemed essential and were exempt from measures intended to limit non-essential travel. Transport Canada regularly spoke with stakeholders and our provincial and territorial counterparts to make sure that the trucking industry continued to operate safely and efficiently.

Transport Canada worked with federal partners like the Canada Border Services Agency to accelerate reopening of Free and Secure Trade (FAST) enrollment centres at the Canada-U.S. border and increase the supply of FAST-approved Canadian truck drivers for transborder freight.

In response to public health measures for much of the year, the land border between Canada and the United States stayed closed for all non-essential travel. Canada re-opened its land border to Americans on August 9, 2021, and the U.S. opened its land border for Canadians on November 8, 2021, allowing Americans/Canadians to travel between the two countries for non-essential purposes.

Safety and security

There has been a significant downward trend in motor vehicle casualties for decades in Canada. Since their peak in the mid-1970s, fatalities have decreased by over two-thirds while serious injuries have declined over 60% even though the number of vehicles and kilometers driven by Canadians have increased significantly. TC's commitment to safer vehicles, roads and road user behaviour have all contributed to this greater level of safety.

Over the years, TC has introduced or updated a significant number of vehicle safety standards, regulations, technical standards and test methods concerning vehicle safety features such as electronic stability control, door lock and door retention, truck anti-lock brakes, steering control systems, head restraints, child restraints, seat anchorage strength, occupant protection in frontal collisions, tires, headlights, rear view mirror visibility, helmet and seatbelt use.

In 2021, TC continued to support the safety and security of the road network with the following initiatives:

- Supported the inclusion of emerging vehicle safety technologies and driver assistance features in new Canadian vehicles through domestic and international engagement on standards and regulations for automatic emergency braking and naming conventions for advanced driver assistance technologies.

- Supported the development of automated and connected vehicle technologies through updated guidance for Testing Highly Automated Vehicles in Canada and the publication of TC's Vehicle Cyber Security Strategy and Canada's Vehicle Cyber Assessment Tool .
- Continued school bus seatbelt pilot projects and development of regulations based on recommendations from the *Strengthening School Bus Safety in Canada* report from the Task Force on School Bus Safety which are anticipated for publication in Canada Gazette 1 in mid-2022.
- The Enhanced Road Safety Transfer Payment Program (ERSTPP) funded 29 projects from twenty-four organizations to support nationally consistent road safety objectives (e.g., measures to address impaired and distracted driving).
- The coming into force of federal regulations requiring the use of electronic logging devices (ELDs) by commercial carriers. These devices replace paper-based daily logbooks to help mitigate the risk of commercial vehicle driver fatigue.

Green transportation

The Pan-Canadian Framework on Clean Growth and Climate Change committed the federal government to work with provinces, territories, and industry to explore options for retrofitting heavy-duty vehicles with fuel-saving technologies to reduce greenhouse gas emissions.

In 2018, a federal-provincial-territorial task force was created to explore the role of heavy-duty vehicle retrofits in Canada. In 2021, the task force completed its Phase I report and delivered a detailed account of Canada's heavy-duty vehicle sector. Phase II will examine and assess retrofit programs and policies that support the use of retrofits.

The Government of Canada released its Strengthened Climate Plan in December 2020, which included several commitments that target emissions from on-road vehicles:

- investing another $150 million over three years in charging and refueling stations across Canada
- working with partners on supply-side policy options to achieve additional reductions from Canada's light-duty vehicle fleet and expand the consumer availability of zero-emission vehicles in Canada as demand grows
- developing a national active transportation strategy and working to deliver more active transportation options, like walking trails and cycling paths
- helping buy 5,000 zero-emission public buses and school buses
- consulting stakeholders on measures to increase the supply of, and demand for, medium- and heavy-duty zero-emission vehicles in Canada, to make sure businesses have access to the types of zero-emission vehicles that meet their needs.

Transportation of dangerous goods

Improving the oversight of the transportation of dangerous goods

Transport Canada has continued to oversee the safe and secure transportation of dangerous goods. In 2021, 85 inspectors carried out 3,602 inspections and completed 5,003 enforcement actions and risk reduction measures.

As a result of the restrictions put in place following the pandemic, Transport Canada has improved the oversight of dangerous goods by:

- issuing guidance on alternative oversight activities, including remote inspections, and
- issuing 16 temporary certificates and one equivalency certificate so dangerous goods could continue moving in support of pandemic relief efforts

Launching new research projects

Work is underway on 23 new projects on transporting dangerous goods, to be initiated from 2020 to 2023. A total of $3.6 million has been allocated to the 23 research projects, with funding provided through court settlements paid in connection with the tragic 2013 Lac-Mégantic train derailment.

Regulatory sandbox on electronic shipping documents

As part of the Transportation Sector Regulatory Review Roadmap, Transport Canada launched a Regulatory Sandbox on Electronic Shipping Documents. This pilot project assesses the feasibility, effectiveness, and safety of using electronic shipping documents instead of the currently required paper documents. This project includes analysing the impacts, costs, and benefits of using electronic shipping documents instead of paper ones.

Responding to emergencies

CANUTEC (the Canadian Transport Emergency Centre) continued to distribute the Emergency Response Guidebook 2020 to Canadian first responders. This guide, designed for incidents involving dangerous goods on highways or rail lines, helps first responders identify hazards based on the material involved in an incident, and protect themselves and the public during the initial response to an incident.

Responding to the House of Commons Standing Committee on Public Accounts

In November 2020, the Commissioner for the Environment and Sustainable Development released their follow-up audit of the TDG Program and the Canada Energy Regulator. Overall, the Commissioner concluded that the Transportation of Dangerous Goods Program has improved, but there's still work to do.

In response, the TDG program committed to addressing the findings over a two year period, guided by a Management Action Plan to track progress. As of December 2021, 2 of the 5 recommendations have been addressed, and the TDG program continues to work on responding to the remaining three.

System performance

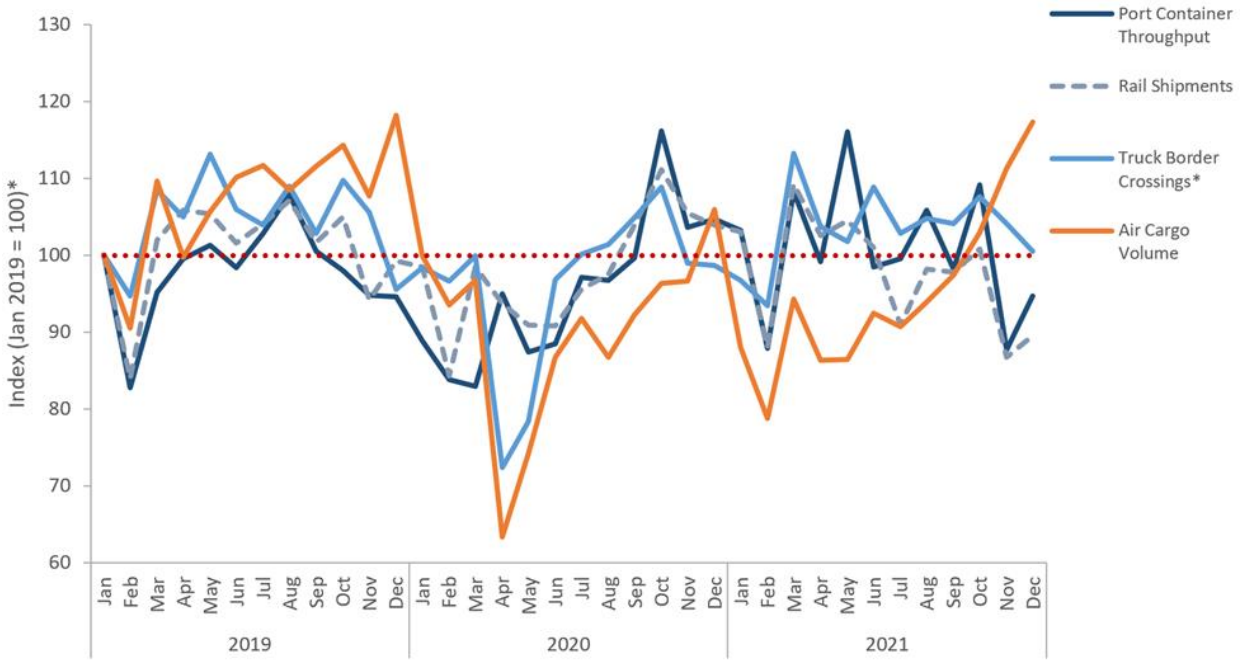
Freight

The strong recovery of Canada and the world's economies led to high demand for all modes of transportation in 2021. However, the performance of the system was impacted by various disruptions:

- global supply chain disruptions (Suez Canal blocked in March, rising global container freight rates, shortage of microchips in the automotive industry)
- operational challenges (five day strike at the Port of Montréal in April)
- extreme climate events (July wildfires and November flooding in British Columbia)
- renewed national and global public health restrictions (Omicron and Delta variants)
- harsh winter conditions

As a result, in December 2021, freight volumes for rail and marine transportation were still below pre-pandemic levels.

Figure 1: Freight flow by mode



Source: Statistics Canada, Transport Canada, Canadian Port Authorities

Air transportation

In 2021, airports in Canada handled 1.3 million tonnes of cargo from domestic and foreign carriers, a 5.1% increase from 2020. However, the yearly average remains below 2019 levels (-11.5%). As of October 2021, monthly air cargo volumes have recovered to pre-pandemic levels as shown in Figure 1.

The 3 busiest airports for air cargo were Toronto Pearson International Airport (319.8 thousand tonnes in 2021, 2.1% more than in 2020), the Vancouver International Airport (249.7 thousand tonnes in 2021, 5.2% more than in 2020) and the Hamilton International Airport (149.6 thousand tonnes in 2021, 21.2% more than in 2020).

Marine transportation

Demand for consumer goods was strong through 2021. This resulted in increased container throughput at Canadian ports up 5.6% compared to 2020, which was also above pre pandemic levels (+2.8% compared to 2019). Movement of empty containers increased as global shortage of containers placed greater pressure for rapid return of empty containers to consumer goods producers.

The import surge that started in late 2020 continued to affect marine and port transit time on the West Coast. After remaining flat in 2020, container throughput at the Port of Vancouver was up +7.1% in 2021. The Port of Prince Rupert saw a 7.3% drop in its container throughput in 2021, due to supply chain disruptions, industry specific issues and a competitive West Coast market that led ocean carriers to skip Prince Rupert on some voyages.

Despite a labour dispute at the Port of Montréal in April 2021, the port's container throughput grew by 7.5% in 2021 compared to 2020. Available capacity and only a few of disruptions in Eastern Canada led the port of Halifax's container throughput to increase by 18.0% compared to 2020.

Dry bulk was down 2.5% in 2021 compared to 2020 at Canadian Port Authorities, mainly due to the lower Canadian grain production for the 2021-2022 crop year, while liquid bulk throughput grew by by 1.6%.

Rail transportation

In 2021, rail traffic remained slightly below 2020 levels (-0.1%) and below pre pandemic levels (-3.1% compared to 2019) despite strong growth in international merchandise trade. Bulk commodities slightly grew in 2021 compared to 2020 (+0.9%) while containerized goods decreased by by 2.2%. The decreased in movement of containerized goods was driven by the significant outages in the Lower Mainland of British Columbia in 2021. Grain carloads were down 14% year-over-year due to a smaller crop-year, which freed up locomotives and crew to move other products. Indeed, bulk shipments excluding grain were up 4% compared to 2020.

In Western Canada, wildfires and floods had a major impact on rail infrastructure over the summer and the fall, but the system was able to recover. Impacts were felt across the network, specifically for bulk exports (coal, grain, potash) and container imports. The B.C. wildfires also led to a Ministerial Order on rail safety.

This Order called for speed reductions and increased patrols in extreme fire warning zones to keep the rail network safe. Implementing planned tier restrictions in late 2021 limited the system's ability to recover from the B.C. floods. Due to these disruptions, rail shipments to and from Western Canada declined in 2021 (3.1%). On the other hand, central and Eastern Canada saw large increases in their rail shipments of 4.8% and 18.7%, respectfully.

Road transportation

In 2021, truck border crossings grew by 7.5% compared to 2020 but remained overall slightly below pre pandemic levels in 2021 (-1.0% compared to 2019). As shown in Figure 1, truck border crossings were consistently above pre pandemic levels since March 2021. Trade by trucks to and from the U.S. is concentrated in central Canada. Truck border crossings grew by 7.1% in Central Canada and by 8.7% in Western Canada in 2021 compared to 2020. Border crossings stayed fluid in August 2021 despite the

border reopening to travelers. At most border crossings wait times stayed slightly below the 3-year average in 2021.

Road traffic congestion remained slightly below 2019 levels in many major urban areas. Indeed, through 2021 congestion will stay consistently close to pre-pandemic levels in Vancouver, Toronto, Montréal, Calgary and Halifax.

Supply chains

Container supply chain

The Canadian transportation system continued to handle high container volumes, despite container availability issues and higher than average end-to-end transit time.

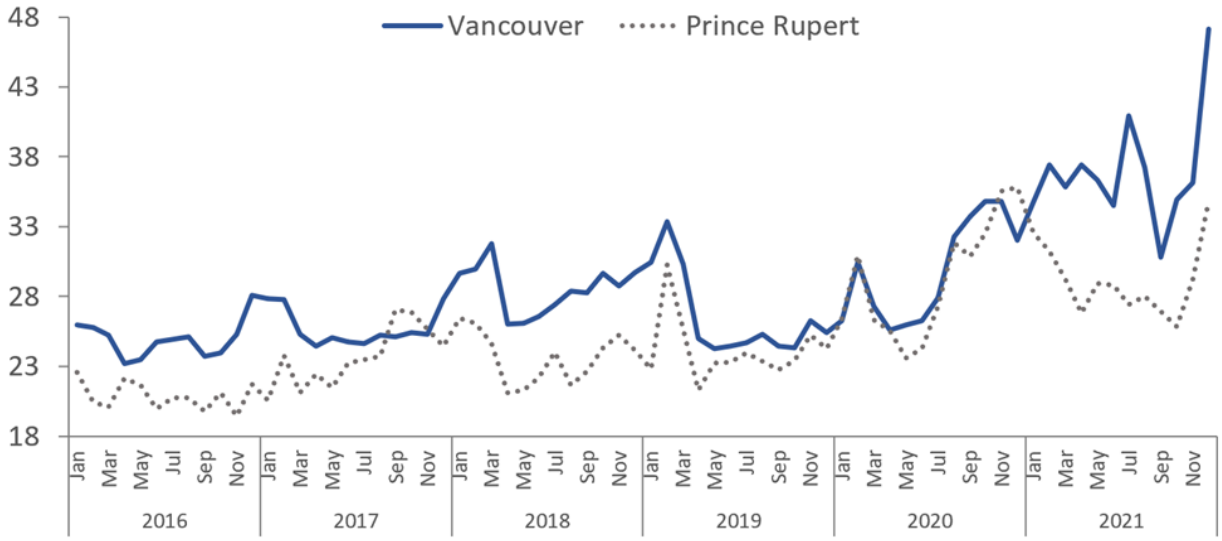
The high demand for container goods has led to congestion at West Coast ports in both the U.S. and Canada. End-to-end transit time from Shanghai to Toronto via West Coast ports averaged 34.5 days in 2021, well above the three -year average of 27.6 days. The Port of Vancouver's end-to-end transit time peaked at 47 days in December 2021, following the B.C. flood. Despite challenges, Canadian ports were less congested than their U.S. counterparts.

On Canada's East Coast, container end-to-end transit time from Antwerp to Toronto was 20.5 days, only slightly above the three-year average of 19.1 days.

The empty container shortage across North America continued to be a challenge through 2021. Amid high demand and high freight rates, ocean carriers prioritized returning empty containers to Asia to be re-filled with imports. This led to accessibility challenges for Canadian exporters especially for the grain and forestry industries. In 2021, exports of empty 20ft containers were up 25% at the Port of Vancouver compared to 2020.

As global demand for shipping rebounded in 2021, shippers were willing to pay higher freight rates for marine carrier services. This led to a sharp rise in container freight rates (by 400% on some shipping lanes) which started to stabilize in October 2021, but are still higher than pre-COVID.

Figure 2: End-to-end transit time for inbound containers via West Coast ports (Shanghai to Toronto)



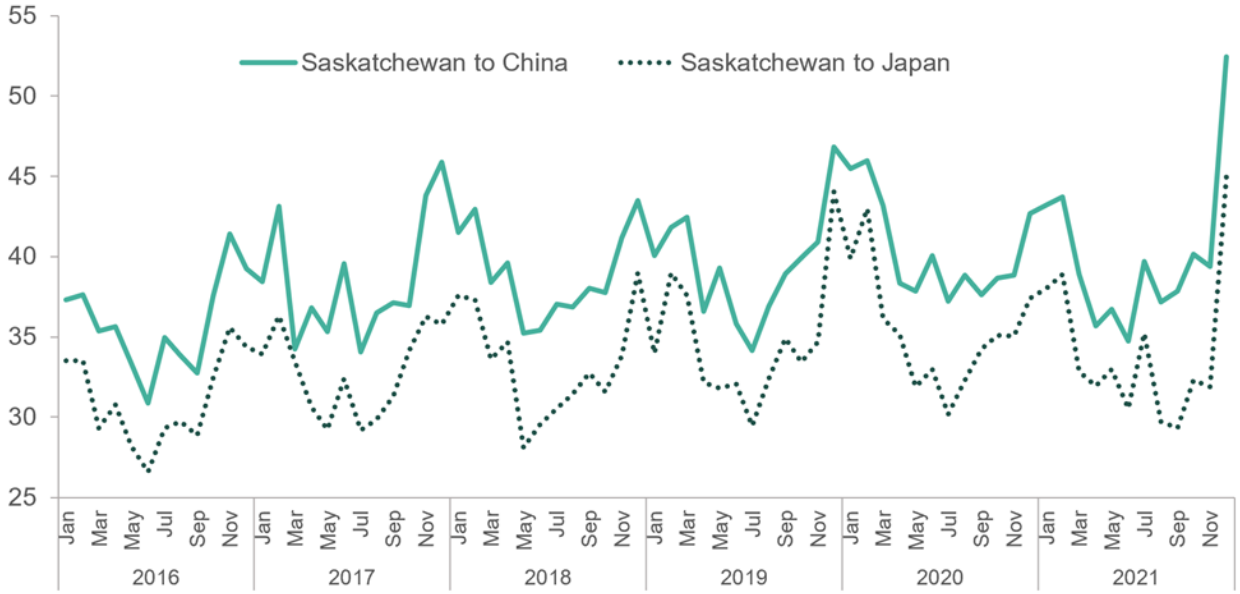
Source: Transport Canada, Class 1 Railways, Canadian Port Authorities, CargoSmart

Grain supply chain

The 2020-21 crop year exported an all-time high volume of grain following a large crop and high demand for Canadian agri-products. Grain volumes have been strong with shipments from the Prairies up 3.6% and exports from western ports up 16.5% for the 2020-2021 crop year. Summer drought conditions led to a significant drop in grain production for the current crop year (2021-2022).

End-to-end transit time to ship grain from Saskatchewan to Asia through the Port of Vancouver has stayed relatively stable over the last couple of years, with some seasonal changes including times peaking in winter months. In 2021, grain heading to China averaged 39.9 days, only slightly above the three-year average of 39.6 days. For grain going to Japan, the 2021 end-to-end transit time was 34.0 days, slightly below the three-year average of 34.4 days. However end-to-end transit time to Japan and China peaked (52.5 days to 45.0 days respectively) in December 2021 following the B.C. flood.

Figure 3: End-to-end transit time for grain from Saskatchewan to Asia via the Port of Vancouver

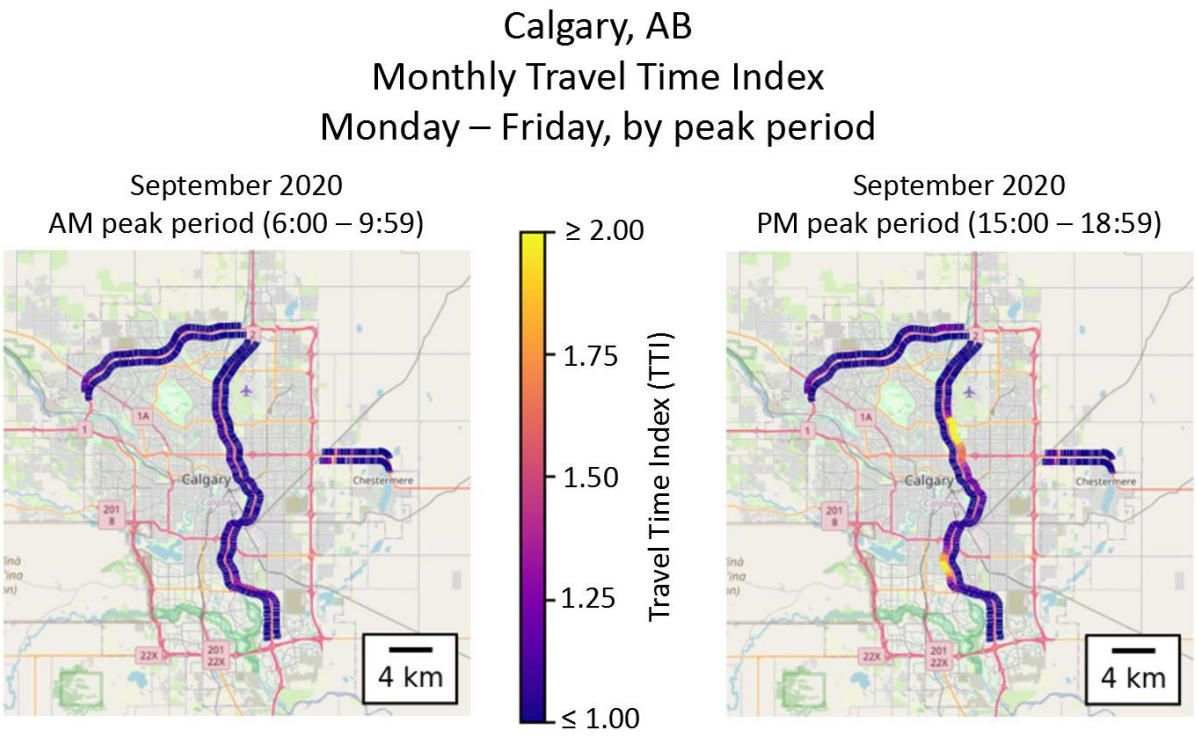


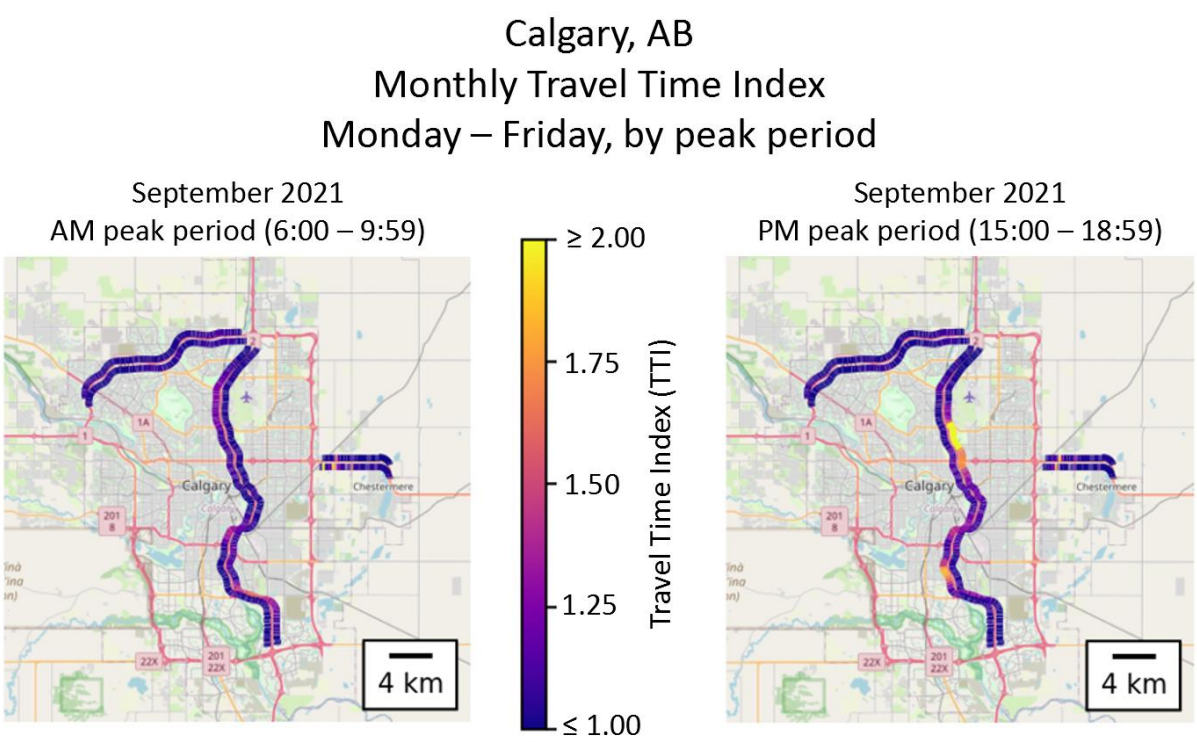
Source: Transport Canada, Class 1 Railways, Port of Vancouver, Lloyds List intelligence

Urban mobility

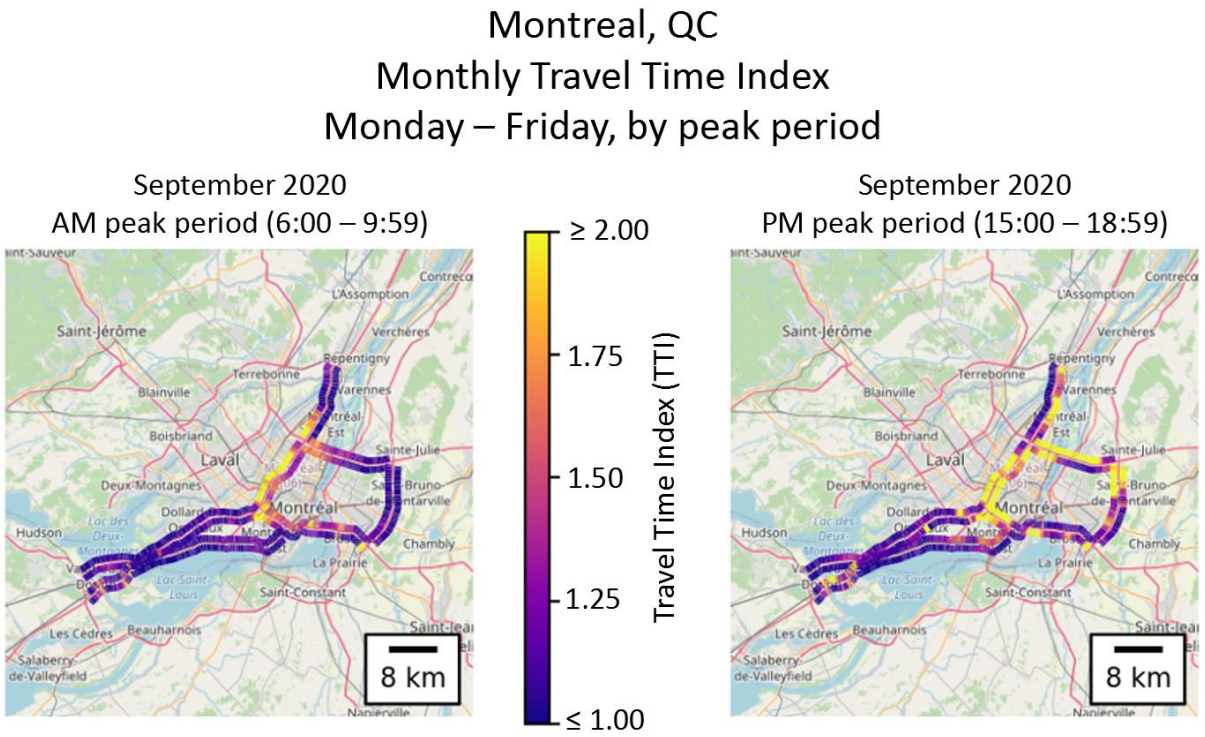
Since the beginning of the COVID-19 stay-at-home measures in March 2020, traffic in urban areas across the country was significantly reduced. In 2021, road traffic congestion levels increased week-over-week in most major urban areas until September and remained stagnant afterwards. At the end of 2021, congestion returned to 2019 levels in Vancouver and Montreal, but remained lower than the 2019 levels in Vancouver, Calgary, and Halifax. As of April 2022, in most major urban areas, road traffic congestion is greater than congestion measured one year ago and has returned to pre-pandemic levels.

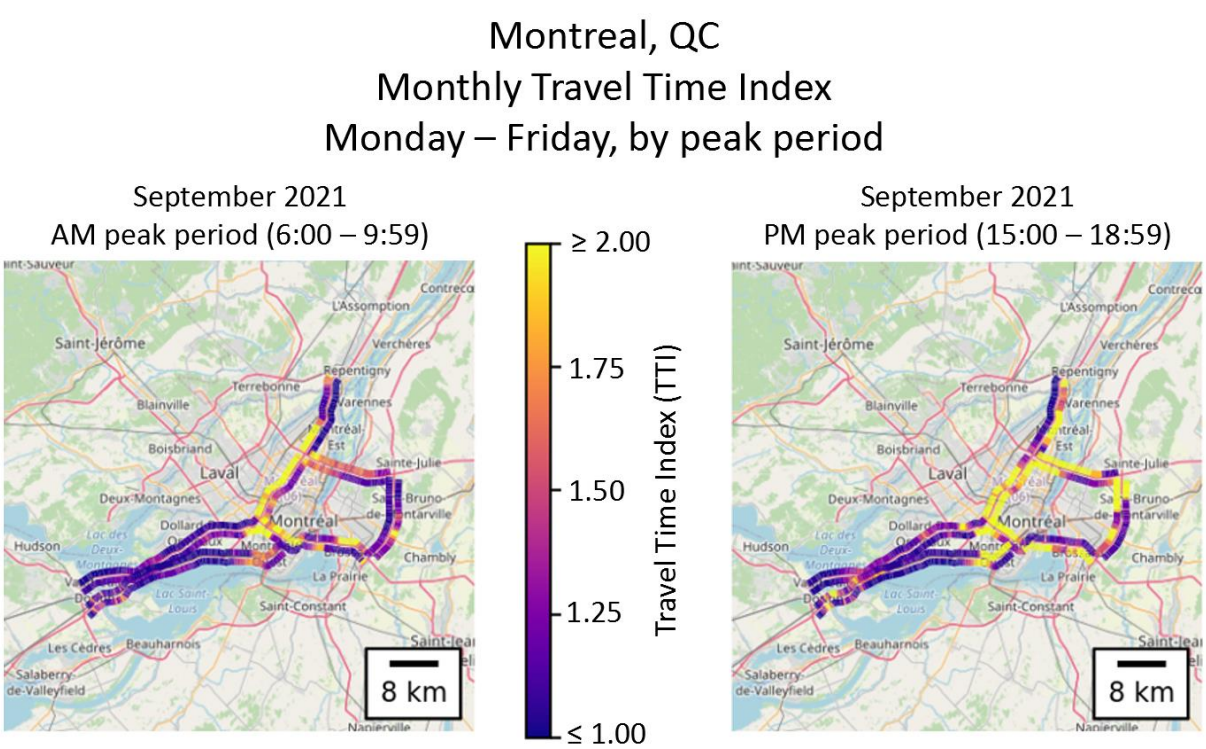
Map 1: Monthly Travel Time Index for Calgary (Alberta), Monday-Friday by Peak Period



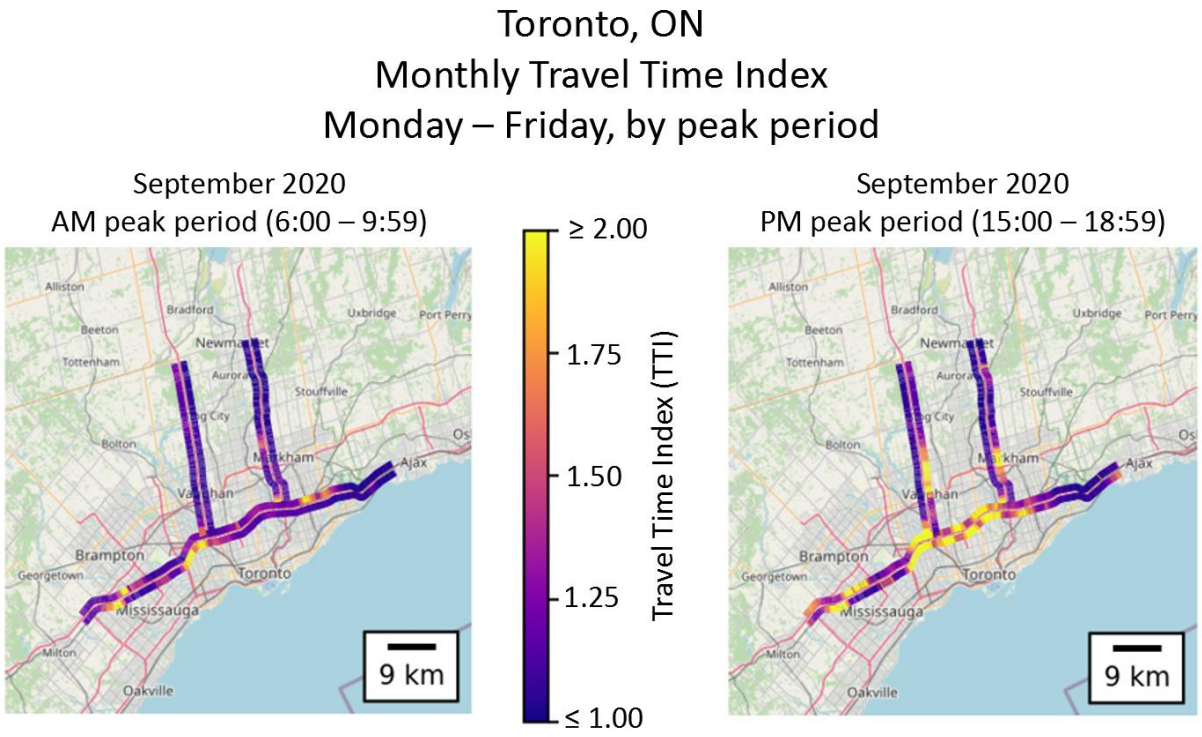


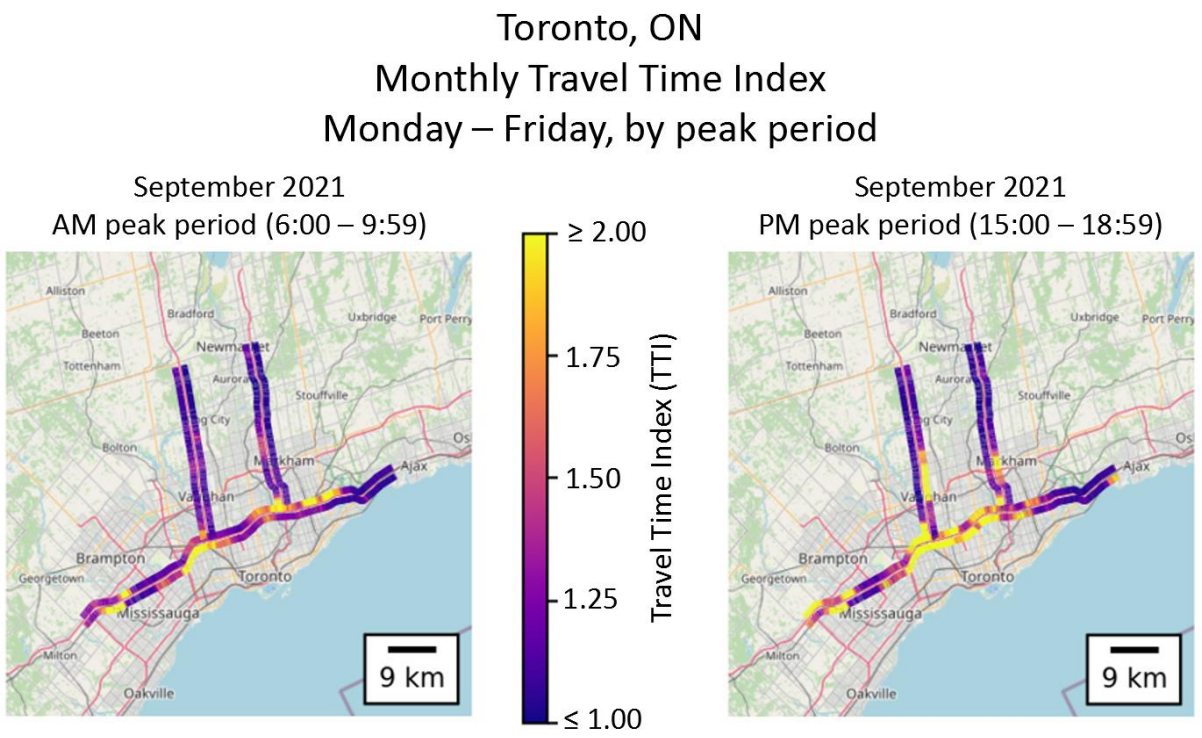
Map 2: Monthly Travel Time Index for Montréal (Québec), Monday-Friday by Peak Period



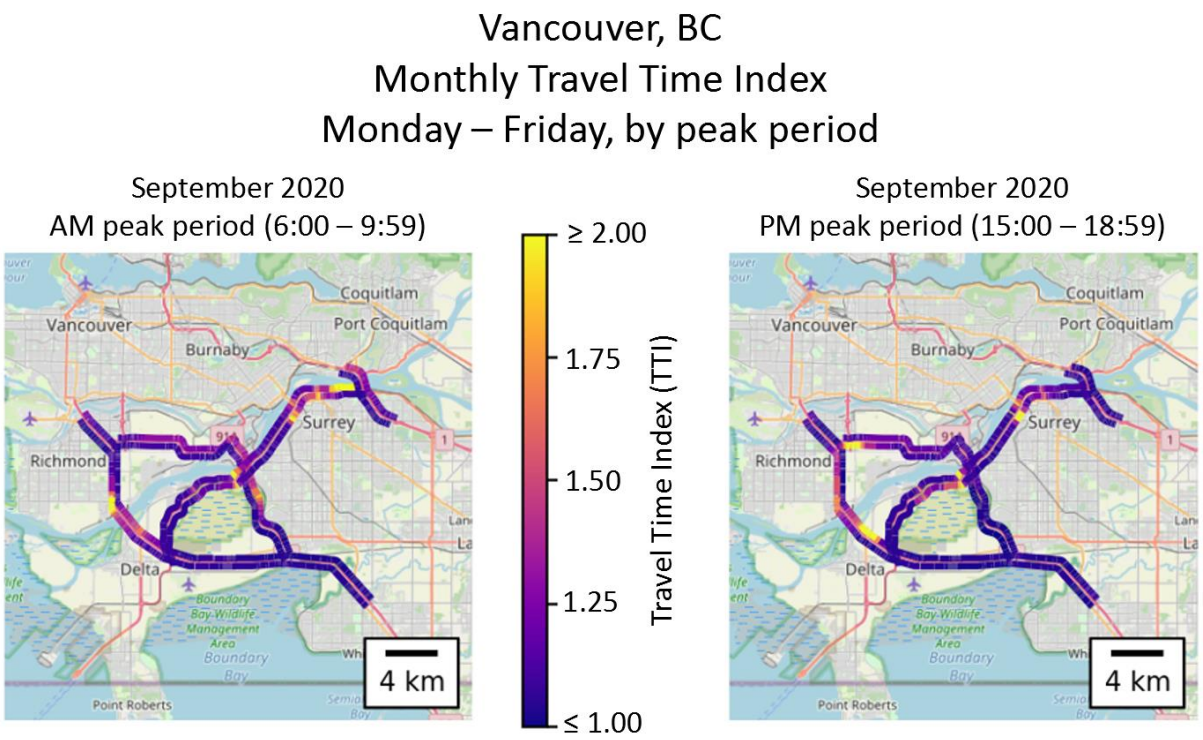


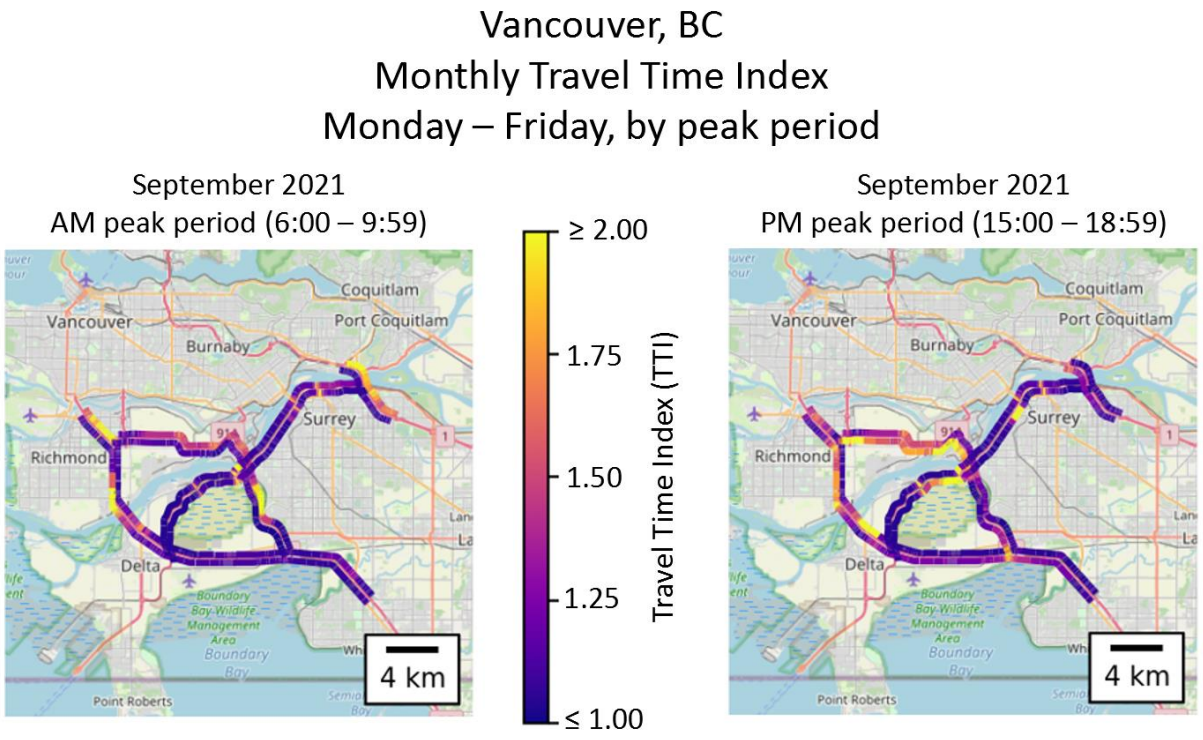
Map 3: Monthly Travel Time Index for Toronto (Ontario), Monday-Friday by Peak Period





Map 4: Monthly Travel Time Index for Vancouver (British Columbia), Monday-Friday by Peak Period





Passenger

Air

After being hit hard by the pandemic, the air passenger industry is still below the pre-pandemic levels. In 2021, the air sector served:

- 24 million passengers on domestic services (13.8% more than in 2020)
- 4 million passengers on services between Canada and the U.S. (38.2% less than in 2020), and
- 6 million passengers on other international services (37.8% less than in 2020)

Around 88.1% (37.3 million) of all air passenger traffic was handled at Canada's Top 20 airports:

- Toronto Pearson International served 11.1 million passengers (11.7% annual decline), representing 26.2% of national air passenger traffic
- Vancouver International served 6.3 million passengers (10.5% annual decline), representing 14.6% of national air passenger traffic
- Montréal-Trudeau International served 4.3 million passengers (8.7% annual decline), representing 10.1% of national air passenger traffic

Marine

During the onset of the pandemic, there were a number of COVID-19 outbreaks on cruise ships around the world. This ultimately led to a Canada-wide cruise ship ban. As a result, there was no cruise ship traffic at Canada's major ports over 2021. The Government of Canada worked closely with industry partners and other level of governments to prepare for the safe return of cruise ships in 2022.

In 2021, BC Ferries moved 14.2 million passengers and 6.7 million vehicles, up by 26% and 34% respectively. Ferry ridership recovery is well underway, with the last quarter of 2021 witnessing only 2% fewer vehicles and 14% fewer passengers than the same quarter in 2019.

Rail

Pandemic restrictions continued to cut into ridership at VIA Rail, which carried only 1.5 million passengers in 2021. With the rollout of vaccines and some restrictions lifted, passenger counts increased drastically during the second half of 2021, representing 80% of the 1.5 million total for 2021. Although up 32% over 2020, ridership was only 30% of the pre-pandemic level of 5 million in 2019. The Québec City - Windsor corridor was the busiest segment of VIA Rail's network, handling 96% of total passengers in 2021.

Road

Unlike commercial vehicle movement which has increased, the number of two-way passenger vehicle movements recorded at Canada-U.S. border crossings in 2021 was down 33% compared to 2020. In total, there were 8.6 million two-way passenger vehicle movements recorded in 2021 with around 59% of movements attributed to Canadian registered vehicles.

During the first quarter of 2021, two-way passenger movements were down 86% compared to first quarter of 2020 due to restrictions on non-essential travel which began in March 2020. The number of two-way passenger movements in December 2021 more than doubled from December 2020 but is still significantly lower than pre-pandemic volumes. Limitations on non-essential travel are the primary reason for the decline and recovery for the year 2021.

The travel time index presented within the freight section is also a useful indicator of passenger travel performance. The index's values display the changes in traffic and congestion on the urban road network, which is used by both freight and passenger vehicles.

Public transportation

Although transit ridership began to recover from the effects of the COVID-19 pandemic throughout 2021, overall ridership remained 9.1% lower than 2020 at 772 million passengers. Note that 49% of 2020's ridership came within the first quarter of the year, before the onset of the pandemic.

Ridership levels are recovering from the record low witnessed in April of 2020, when transit agencies carried only 26 million passengers, 16% of the total carried in 2019. As the year progressed and vaccination rates increased and restrictions began to ease, transit ridership rose, with November 2021 being the first month where ridership levels passed 50% of their pre-pandemic totals.

Overall, transit was on a steady path to recovery in 2021, with ridership as a percentage of the pre-pandemic 2019 levels increasing steadily from 27.1% in January to 56.1% in December. Despite this progress, there were 1.1 billion fewer riders in 2021 than in 2019, with agencies in Quebec and Ontario accounting for more than two-thirds (70.7%) of this drop.

Incident and accident rates

Air

In 2021, 156 aviation accidents (under the Canadian Aviation Regulations) that involved Canadian-registered aircraft were recorded, down 18% from the previous 10-year average. These accidents caused 26 deaths, an increase compared to 2020's 13 deaths.

In 2021, Canada continued to support the flow of legitimate air travellers and goods while maintaining a high level of aviation security. The Canadian Air Transport Security Authority screened over 65 million passengers and their belongings at Canadian airports.

Marine

Canada has a strong record of safe and secure marine shipping. Given the thousands of ships that operate in Canadian waters, there are relatively few accidents. In 2021, there were 156 reportable accidents that involved at least one Canadian registered vessel, down from the 10-year average of 228.

Rail

In 2021, there were around 1038 recorded railway accidents, up 5% from 2020. These accidents resulted in 60 deaths, down 15.4% compared to the previous 10-year average. Accidents that involved dangerous goods increased slightly to 86, up from 81 the year prior.

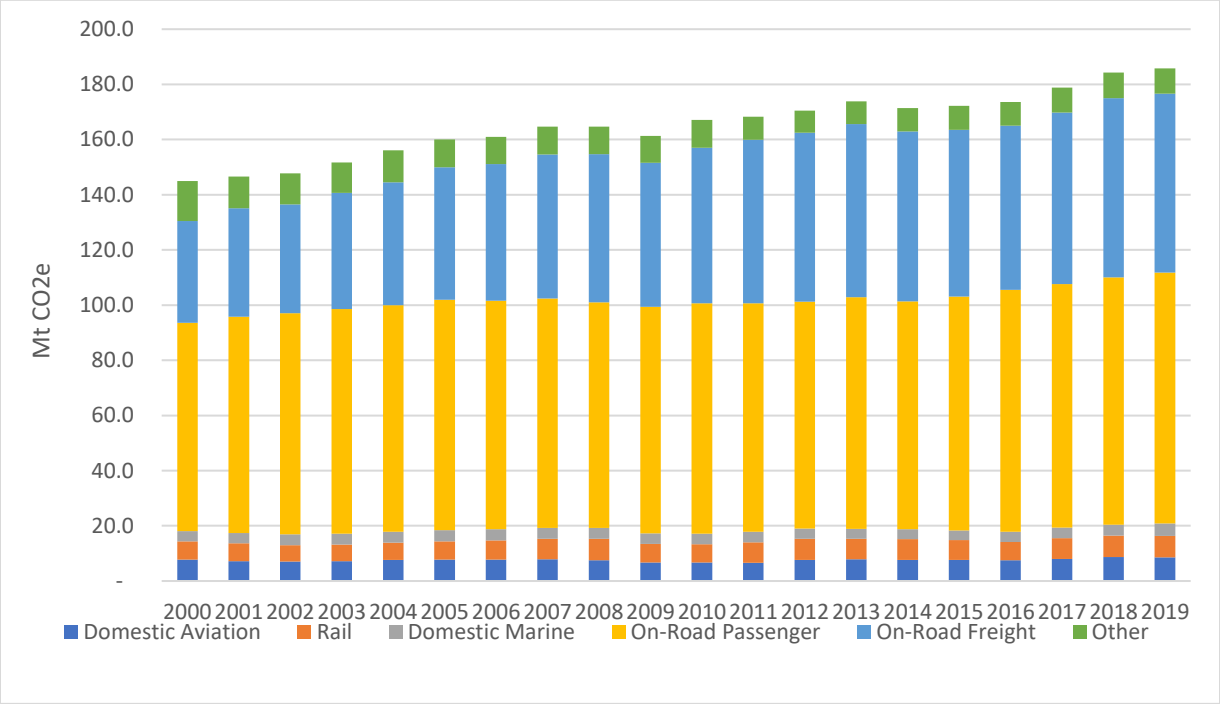
Road

In 2020, deaths from road collisions were around 15.2% lower compared to 2011, despite significant growth in the number of licensed drivers, vehicles registered, and vehicle kilometers driven. Canada's death rate per 10,000 registered motor vehicles was 0.7 in 2020. This rate has been relatively stable in recent years but significantly lower (-35%) than a decade earlier.

Greenhouse gas emissions

Overall, domestic transport-related greenhouse gas emissions have increased by 15% over the last decade (2010 to 2019). Canada's National Inventory Report 1990-2018 noted lower emissions for marine transportation, and higher emissions for aviation, rail, and road transportation (see Figure 4). For the latest historical emissions estimates for Canada, including for transportation, please consult Canada's official greenhouse gas inventory.

Figure 4: Total transportation greenhouse gas emissions from all modes, 2000 to 2019



Air sector

In 2019, domestic aviation emitted 8.6 megatonnes of CO_2e (carbon dioxide). This accounts for 4.6% of Canada's transportation-related greenhouse gas emissions. While emissions from air travel have increased since 2005 due to increased air traffic, reports note a steady improvement in air carrier emission intensity performance. Of note, a 1.77% average annual improvement or overall improvement of 17.8% from 2008 to 2019.

Between 2018 and 2019 Canadian air carriers saw a slight drop in fuel efficiency by 0.6%, due to grounding the Boeing 737 MAX 8 aircraft and a drop in reported cargo revenue-tonne-kilometers.

Marine sector

In 2019, the domestic marine sector emitted 4.5 megatonnes of CO_2e (carbon dioxide). This is 2.4% of Canada's transportation-related greenhouse gas emissions. Between 2005 and 2019, domestic marine greenhouse gas emissions increased by 9.8%

In 2021, the National Aerial Surveillance Program flew a total of 3,765 hours of surveillance over Canada's three coasts, including 304 hours monitoring the North Atlantic right whale. During these

patrols, they detected 673 pollution incidents and saw around 17,319 litres of oil observed in the marine environment.

Regular aerial surveillance has had a major impact on the drop of oil discharges from commercial vessels at sea. Ships are more and more aware their illegal polluting activities can be detected.

Rail sector

In 2021, the rail sector emitted 7. 8 megatonnes of CO_2e (carbon dioxide). This is 4.2% of domestic transportation related greenhouse gas emissions. Freight operations accounted for 98% of rail greenhouse gas emissions.

According to the latest annual *Locomotive Emissions Monitoring Report*, published in 2021, the total greenhouse gas emissions from rail operations (expressed as CO2e, or carbon dioxide) in Canada increased by 0.8% between 2018 and 2019.

This growth mostly reflects an increase in both freight and passenger traffic. Overall, the intensity of greenhouse gas emissions dropped slightly between 2018 and 2019. While Class 1 freight emissions increased by 0.3%, the intensity of intercity passenger emissions decreased by 8.37%, and the intensity of regional and shortline greenhouse gas emissions decreased by 1.72%.

Road sector

In 2019, the road transportation sector emitted 156 megatonnes of CO_2e (carbon dioxide), or 84% of Canada's transportation related greenhouse gas emissions, and 21% of all Canadian greenhouse gas emissions.

From 2005 to 2019, greenhouse gas emissions from road transportation grew by 18%. Despite fuel efficiency across all vehicle classes, this increase stems from:

- a growth in passenger and freight activity, and
- a shift towards more greenhouse gas-intensive transportation, including heavy duty trucks and larger passenger vehicles (like SUVs and light trucks)

Greenhouse gas emissions from on-road freight vehicles increased by 34.9% between 2005 and 2019, from 48 to 65 megatonnes. Over the same period, road freight activity, measured in tonne-kilometres, also increased by around 35%.

Greenhouse gas emissions from on-road passenger vehicles increased by 8.9% between 2005 and 2019, from 84 to 91 megatonnes. Over the same period, road passenger activity measured in vehicle passenger-kilometres increased by about 17%.

Federal regulations have set progressively stricter greenhouse gas emission standards for both new passenger automobiles and light trucks of model years 2017 to 2026, and new heavy-duty vehicles and engines of model years 2021 to 2027. This builds on existing standards covering earlier model years.

Trends and Outlook

The trends and outlook of the Canadian transportation sector will be largely affected by long-term structural drivers.

- Changes in demographics and societal norms
- Environment and climate Initiatives
- Technological advancement

This chapter will take a closer look into these long-term drivers and highlights the importance of understanding the impacts and implications they have on Canada's transportation sector. Furthermore, key factors affecting short-term recovery of the sector are also covered, such as emerging COVID-19 variants, the impact of public investment, and a shift in demand for transportation services across all modes.

Key Long-Term Drivers Affecting Transportation

Changing Demographics

Over the past two decades, the Canadian population has increased by more than 20% to 38.5 million in 2021. Looking ahead, the population is expected to increase by more than 2.5 million by 2036. As major urban centres absorb the bulk of that growth, the United Nations, through its World Urbanization Prospect, projects that urbanization in Canada will reach 88% in 2050, up from 83% today, increasing demand for urban travel and the risks of congestion. Higher urban congestion could also raise demand for public transit. According to the TomTom 2021 Traffic Index, which ranks urban congestion worldwide across 404 cities worldwide, Vancouver ranks as the most congested city in Canada, followed by Montreal and Toronto with extra overall travel time between 24% and 33%.

The growing population of Canadian seniors will also affect the nature of passenger transportation in the future by increasing the need for more flexible and accessible transportation. In 2036, Statistics Canada expects the population aged 65 and over to reach 24% of the population, up from 18.5% in 2021.

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.

Shifting Social Norms

The public response to the COVID-19 pandemic, and the changes Canadians had to make in their everyday lives has caused a shift in social norms, including the way Canadians travel. This has been compounded by the safety concerns surrounding mass transit use during the pandemic. Two notable societal changes affecting the recovery of the passenger sector are:

1. Shift towards remote work led to a reduced need for commuting
2. Reluctance towards using public transportation has led to increased personal vehicle use

The Traffic Injury Research Foundation found that prior to COVID-19, 42.2% of Canadians preferred personal vehicle use as their primary method of transportation, rising to 69.9% by November 2020. In contrast, 41.2% of Canadians preferred public transportation prior to COVID-19, dropping to a mere 4.4% in the same timeframe.

Better options in shared mobility, enhanced transit infrastructure and technological advancements could create incentives for a modal shift back towards collective/public transportation.

Green Transportation

In 2021, the Government of Canada continued to take action to advance zero-emission vehicle (ZEV) adoption across the country and instituted a mandatory target of 100% light duty vehicle ZEV sales by 2035.

Between the launch of the program in May 2019 and December 2021, over 127,000 Canadians and Canadian businesses benefitted from Transport Canada's iZEV Program. The program's popularity increased significantly in the 2021 calendar year, experiencing a 40.9% uptake over the same period in 2020, which saw a drop in demand due to the COVID-19 pandemic. The program, along with other federal zero-emission vehicle investments, helped to increase the zero-emission vehicle market share of light-duty vehicles to 5.6% in 2021, up from 3.8% in 2020 and 3.1% in 2019.

On December 17, 2021, consultations were launched on the commitment to require all new cars sold in Canada be ZEVs by 2035, which gave Canadians an opportunity to shape Canada's path towards 100 per cent ZEVs sales by 2035, including more ambitious interim target for 2030.

Technological Advance

Canada needs to position itself for a future characterized by emerging and disruptive technologies and new approaches. Connectivity and automation will have far-reaching impacts on the transportation sector, and the economy. Adapting to the exponential growth in the rate of change of technological advancement and applying the benefits of these advancements to improve the efficiency and safety of the transportation sector is key in maintaining a world class transportation network.

Significant advances in information, communication, and other technologies have taken place over the past two decades. These technologies have brought major change to nearly every sector of the economy, including transportation.

New technologies are being used for transportation infrastructure, equipment, and supply chain management to make them smarter and more efficient. Changes like ride sharing and "last-mile" delivery services have changed both how and where transportation occurs and will continue to disrupt transportation.

This trend shows no sign of slowing down, and in fact, is likely to speed up as the public and private sector adjust to new ways of working. Changes in technology and innovation will impact both demand and supply of transportation. Major upcoming disruptions include:

- recent technology (cloud logistics, internet of things)
- emerging technology (artificial intelligence, advanced analytics, blockchain), and
- advanced technology (automated vehicles, robotics)

These innovations could improve corridor flows, reduce costs, help with collaboration, reduce safety and environmental impacts, change the origin and destination of shipments, and the nature of transportation services.

Key Short-Term Drivers Impacting the Transportation Recovery

Air Passenger Recovery

While modest growth in air transportation activity in Canada was seen through the summer and early fall of 2021, the timeframe for a return to pre-pandemic levels remains uncertain and assets critical to recovery of the sector remain at risk. Canada's domestic air travel sector is recovering at a slower rate than in the U.S and other nations, this is largely attributed to a drastic reduction in business travel. It is expected that a permanent 20% loss in business travel will carry on post-pandemic.

Rapidly changing factors, such as the emergence of new COVID-19 variants, additional public health and safety measures and changing consumer confidence will continue to present ongoing operational and financial challenges for air carriers and airports throughout Canada. Air travel demand may grow slower after the pandemic with some business travel replaced by technology, but a faster recovery of leisure travel is expected due to pent up demand.

Freight Recovery

While the passenger sector faces a more difficult path to recovery due to the pandemic, the freight sector quickly recovered to pre-pandemic levels.

Global supply chain disruptions will continue to challenge the sector, as we saw throughout 2021. Microchip shortages have affected the manufacturing of technical goods across the globe. In Canada, the effects are felt deepest within the automotive industry, who struggle to meet consumer demand amid such shortages. 2021 bore witness to a trend of disruptions including the Suez blockage, labour disruptions, increasing shipping container demand and cost, and global conflict.

Canada's harsh winters and the increasing impact and frequency of extreme weather events require the transportation network to remain resilient. In 2021, we witnessed such climate related challenges the West suffered wildfires and flooding. These events, compounded with generally harsh winter conditions, led to slow downs and disruptions that are likely to persist into the future as we continue to face climate challenges related to GHG emissions.