



DELIVERING RESPONSIBLY

2020

CDP Climate Change Response



The following report contains the data and information CN disclosed in response to CDP's 2020 climate change questionnaire.

CDP is a global non-profit that runs the world's leading environmental disclosure platform. CDP drives companies and governments to reduce their greenhouse gas emissions, safeguard water resources and protect forests. Over 9,600 companies with over 50% of global market capitalization disclosed environmental data through CDP in 2020.



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Executive Vice-President
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Signee of CN's CDP Climate Change Response

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COVER PHOTO:
Ron Worobec, Locomotive Engineer
Canoe River, British Columbia

Introduction

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An Introduction to CN

CN is a North American transportation and logistics company. Our 20,000-mile rail network spans Canada and Mid-America, connecting ports on three coasts: the Atlantic, the Pacific and the Gulf of Mexico. We offer fully integrated rail and other transportation services, including intermodal, trucking, freight forwarding, warehousing and distribution. Our freight revenues are derived from seven commodity groups representing a diversified and balanced portfolio of goods transported between a wide range of origins and destinations. As an enabler of the economy, we handle over C\$250 billion worth of goods and carry more than 300 million tons of cargo annually. We are the originating carrier for over 85%, and the originating and terminating carrier for over 65%, of traffic moving along our network, which allows us to capitalize on service advantages and build on opportunities to efficiently use assets.

In support of keeping the global temperature increase below 2 degrees Celsius compared to pre-industrial temperatures, we continue to work towards our science-based target to reduce our GHG emission intensity (tCO₂e/million tonne kilometres) by 29% by 2030 based on 2015 levels. This target covers emissions from all aspects of our business, including rail locomotives, other fleets, and our buildings and yards. With approximately 85% of our GHG emissions generated from rail operations, we believe the best way to reduce our carbon footprint is by continuously improving our rail efficiency. Our operating model, Precision Scheduled Railroading, allows us to use fewer railcars and locomotives to ship more freight in a tight, reliable and efficient operation. Collaborations with ports and terminal operators are helping to minimize dwell times and further drive supply chain efficiency. We also continue to purchase new locomotives that meet stricter regulatory emission standards while being more fuel efficient. In addition, we rely on our Fuel Management Excellence program, and through the installation of fuel-efficient technologies and big data management analytics capabilities, we are further reducing our carbon footprint. Our new locomotive technologies, equipped with GE Transportation's GoLINC™ Platform, Energy Management System, data telemetry systems, and Distributed Power LOCOTROL expanded Architecture, are helping us maximize locomotive operating effectiveness and efficiency. Through on-the-job training, we are working closely with our train crews and rail traffic controllers on best practices for fuel conservation – from locomotive shutdowns in our yards to streamlined railcar handling, train pacing, coasting

and braking strategies. Our in-house built Horsepower Tonnage Analyzer (HPTA) also instructs crews on how to optimize a locomotive's horsepower-to-tonnage ratio. As a result of these programs, since 1993, we have reduced our locomotive emission intensity by 40% avoiding 46 million tons of carbon compared to shipping by truck. Today, CN is the fuel-efficiency leader in the North American rail industry, consuming approximately 15% less fuel per gross tonne mile than the industry average.

The growth of the renewable fuel market is also presenting important opportunities to further reduce our emissions by using fuel blends in our locomotive fleet. In 2019, the use of renewable fuels in our fleet saved almost 80,000 tonnes of carbon, which is an important milestone as we continue to work with our suppliers to explore the greater of renewable fuels. We are also working to provide cleaner, more sustainable transportation services to our customers. Shipping heavy goods by rail over long distances is four to five times more fuel-efficient than trucks and has tremendous potential to reduce the environmental impact of transportation and help the fight against climate change. As part of our role in the transition to a low-carbon economy, we are working with many of our customers to help them reduce their transportation supply chain emissions, leveraging rail for the long haul and trucking over shorter distances. We are also supporting the growth in sustainable products and markets, including our positioning within cleaner energy markets such as wood pellets, wood chips, turbine components, solar panels and biofuels.

Through our EcoConnexions engagement program, launched in 2011, our 25,975 employees are provided with practical knowledge and tools to reduce energy consumption, minimize waste and improve good housekeeping practices in our yards. Launched in 2012, our EcoConnexions *From the Ground Up* and reforestation program promotes the greening of communities and First Nations situated adjacent to our rail network. Working together with our partners, Tree Canada and America in Bloom, we have assisted community groups to establish green spaces, tree plantings and mass reforestation projects in a sustainable, environmentally responsible manner. In total, since 2012, our EcoConnexions programs have planted more than two million trees – offsetting carbon emissions, improving air quality and the national landscape for future generations to enjoy.

CN - Canadian National Railway Company and its operating railway subsidiaries - spans Canada and mid-America, from the Atlantic and Pacific oceans to the Gulf of Mexico, serving the ports of Vancouver, Prince Rupert, B.C., Montreal, Halifax, New Orleans, and Mobile, Ala., and the key metropolitan areas of Toronto, Buffalo, Chicago, Detroit, Duluth, Minn./Superior, Wis., Green Bay, Wis., Minneapolis/St. Paul, Memphis, and Jackson, Miss., connections to all points in North America. For more information on CN, visit the company's website at www.cn.ca. Information on delivering responsibly, including climate change is available at <http://www.cn.ca/en/delivering-responsibly>

C0 Introduction

Boundary

C0.5
Our reporting boundary

CN's climate-related impacts are reported using a consolidated approach within an operational control reporting boundary.

Organizational Activities: Transport Services and Transport OEMS

C-TS0.7
Transport modes

The transport modes for which we are providing data include rail, heavy-duty vehicles (HDV), marine, and light-duty vehicles (LDV).

Governance

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C1 Governance

Board Oversight

C1.1 - C1.1b

Board-level oversight of climate-related issues and roles

AUDIT COMMITTEE

The Audit Committee of the Board of Directors has responsibility for monitoring our risk management and internal controls approach, which includes climate-related risks. Specifically, the Audit Committee reviews risk management policies and provides oversight of our compliance with applicable legal and regulatory requirements.

Having oversight for climate-related risks is an important responsibility for the Audit Committee ensuring that appropriate risk management processes are in place across the organization, including the risk oversight and risk management policies under the ERM program.

This year, the Audit Committee reviewed the results of our Enterprise Risk Management (ERM) program and made the decision to approve the identification of 19 net risks, which included the identification of climate change physical risks. Specifically, they approved our climate risk mitigation controls, MD&A disclosure, initiatives to integrate climate risk management activities into the 2020-2022 business plan, as well as other climate-related disclosure commitments such as our support for the Taskforce on Climate-related Financial Disclosure recommendations.

ENVIRONMENT, SAFETY AND SECURITY COMMITTEE

The Environment, Safety and Security (ESS) Committee of the Board of Directors has responsibility for overseeing the development and implementation of environmental policies, assessing practices, and reviewing the business plan to ascertain whether environmental issues, are adequately taken into consideration. This role is important in ensuring the ESS Committee provide the right level of oversight on our environmental programs.

In 2019, the ESS Committee continued its responsibility of overseeing the development and implementation of environmental policies, assessing practices and reviewing the business plan to ensure environmental issues were adequately taken into consideration.

Board Committees meet on a quarterly basis. Climate-related issues, such as the monitoring and oversight of progress against goals and targets for addressing climate-related issues or the review of climate-related corporate disclosures, are scheduled agenda items for some of those meetings.

For example, the Environment, Safety and Security (ESS) Committee of the Board of Directors, meets to review performance on environmental compliance, strategies, risks, and performance. Board members also review CN's sustainability report, which includes specific information on the company's carbon management strategy and performance.

In addition, all Board directors receive regular updates on the company's climate change and fuel efficiency strategies and performance towards targets as part of the briefing materials provided before each Board meeting, approximately ten times per year.

C1 Governance

Management Responsibility

C1.2 - C1.2a

Highest management-level position(s) or committee(s) with responsibility for climate-related issues below board level

Name of the position(s) and/or committee(s)	Responsibility	Frequency of reporting to the board on climate-related issues
Chief Financial Officer (CFO)	Both assessing and managing climate-related risks and opportunities	Quarterly
Chief Operating Officer (COO)	Both assessing and managing climate-related risks and opportunities	Quarterly
Vice-President Financial Planning	Both assessing and managing climate-related risks and opportunities	Quarterly
Sustainability Committee	Both assessing and managing climate-related risks and opportunities	As important matters arise

EXECUTIVE VICE-PRESIDENT AND CHIEF OPERATING OFFICER (COO)

The Executive Vice-President and Chief Operating Officer (COO), is the highest-level management position with direct responsibility for climate-related issues. As part of the Executive Leadership Team, the COO reports directly to the President and Chief Executive Officer (CEO) and the Board on climate-related risks and opportunities, including fuel efficiency, winter readiness plans and rail network resiliency and safety.

With approximately 85% of our direct greenhouse gas emissions generated from fuel consumption during rail operations, the COO's responsibilities must include fuel and carbon efficiency as part of the mandate to drive operational and service excellence. Specific to climate-related issues, the COO is responsible for ensuring we establish programs to meet fuel efficiency targets and enable the company to run a safe, fluid, reliable, and efficient railroad. This includes providing executive management oversight on the fuel efficiency strategy which aligns with the Canadian rail industry emission intensity reduction target of 6% by 2022 from a 2017 baseline, as well as the company's longer-term science-based target. This responsibility has also included oversight on our investments in innovative rail technologies, as well as fuel conservation practices, such as locomotive shutdowns in yards, streamlined railcar handling, train pacing, coasting and braking strategies. Furthermore, in 2019, the COOs responsibility also included oversight on our capital program, which in 2019 was approximately \$3.9 billion, of which \$0.9 billion was on equipment capital expenditures including the acquisition of 154 new and efficient high-horsepower locomotives, as well adding network capacity and fluidity to accommodate our solid pipeline of growth in diverse markets and bringing technology to our Precision Scheduled Railroad.

CHIEF FINANCIAL OFFICER (CFO)

In parallel, the Chief Financial Officer (CFO), working with the Vice-President Financial Planning provides executive management oversight on our carbon strategies. With constantly changing climate-related risks and opportunities impacting the business, the Financial Planning and Sustainability function needs to have direct responsibility for ensuring CN proactively identifies climate-related risks and opportunities, and for ensuring the company establishes the right policies and programs to meet regulatory compliance obligations, corporate targets, and effectively mitigate potential risks. For example, in 2019, the CFO and the Vice-President Financial Planning continued to play an important role in ensuring the company took a strategic approach to understand the impact of carbon pricing in Canada on our business, as well as the impact of emerging clean fuel regulations. They also ensured the development of strategies to mitigate these risks and to capitalize on longer-term opportunities by supporting the use of renewable fuels and by collaborating with Transport Canada on a study of the freight rail sector electrification.

SUSTAINABILITY COMMITTEE

The mandate of CN's Sustainability Committee is to monitor, assess, propose and initiate mitigation measures for sustainability risks and opportunities, including climate-related matters. The committee comprises Director- and Senior Management-level representatives from relevant Business Units and Corporate Functions that have oversight over or can influence critical levers in managing CN's environmental or social impact. These include, but are not limited to, Operations, Facilities Management, Fuel Management, Procurement, and Sales and Marketing. CN's Director of Sustainability chairs the quarterly meetings and reports directly to the Vice-President Financial Planning. Critical matters are reported up to the Board as part of the quarterly reports by the CFO and COO.

C1 Governance

Employee Incentives

C1.3 - C1.3a

Incentives for the management of climate-related issues

All employees are responsible for upstream and operations cost control, which includes energy efficiency, and are educated on energy management best practices through our EcoConnexions employee engagement program. Fuel efficiency, emission and energy reduction initiatives can be recognized through CN's People Awards for Excellence within the Rail Operations and Supply Chain Service Excellence category. Employees are also recognized for their efforts through the CN EcoConnexions program and many other internal communications.

For select roles we provide monetary incentives for the management of climate-related issues, including the attainment of efficiency and emission reduction targets.

EXECUTIVE VICE-PRESIDENT AND CHIEF OPERATING OFFICER (COO)

The Executive Vice President and Chief Operating Officer (COO) has included in his Employee Performance Scorecard (EPS) improvements in CN's fuel efficiency, in line with the Canadian rail industry medium-term emission intensity reduction target of 6% by 2022 from a 2017 baseline and also in line with the company's long-term science-based target to reduce GHG emission intensity (tCO₂e/million tonne kilometres) by 29% by 2030, based on 2015 levels.

CHIEF FINANCIAL OFFICER (CFO)

The Chief Financial Officer (CFO) has included in his Employee Performance Scorecard (EPS) improvements in CN's fuel efficiency, in line with the Canadian rail industry medium-term emission intensity reduction target of 6% by 2022 from a 2017 baseline and also in line with the company's long-term science-based target to reduce GHG emission intensity (tCO₂e/million tonne kilometres) by 29% by 2030, based on 2015 levels.

VICE-PRESIDENT FINANCIAL PLANNING

At the executive level, the Vice-President Financial Planning has included in her EPS direct performance on the company's climate-related objectives and target to reduce GHG emission intensity (tCO₂e/million tonne kilometres) by 29% by 2030, based on 2015 levels. This includes fuel consumption from locomotives, shipping vessels, trucks, company vehicles and operating equipment, and buildings and yards energy consumption. Oversight for managing potential climate-related risks and opportunities to the business, such as climate change policy impacts, renewable fuel use and stakeholder engagement is also included.

MANAGEMENT EMPLOYEES

Various management employees are responsible for executing our emissions and energy efficiency strategy. Performance indicators are included in their respective EPS objectives.

CN works collaboratively across the value chain to support sustainable production and consumption. Our employees are highly engaged in working together to optimize materials and minimize waste in our operations. We are committed to sourcing more environmentally friendly products and services, working together with our suppliers to consider better alternatives across the entire product life cycle. For example, we've introduced innovative biodegradable degreasers at our maintenance centres, worked with suppliers to advance the use of renewable energy in our rail and non-rail fleet, and collaborated on packaging optimization such as boomerang boxes, pallets and bulk packaging. For example, the Fuel Management team performance score is tied to the company's Canadian rail industry emission intensity reduction target of 6% by 2022 from a 2017 baseline and we engage with our suppliers to obtain key information on and optimize our fuel blends in alignment with the Canadian Renewable Fuel Standard and impending Clean Fuel Standard.

FACILITY MANAGEMENT TEAM

The Facility Management team performance score is tied to the year-over-year target of reducing our overall energy spend by 2%. Furthermore, the Sustainability team's performance score is tied to the implementation of the emissions and energy efficiency strategy and the execution of the company's climate change communications. The achievement of the above performance indicators is linked to employee recognition as well as the individual's annual compensation and bonus reward. These targets align with the company's overall science-based target to reduce our GHG emission intensity (tCO₂e/million tonne kilometres) (which includes fuel consumption from locomotives, shipping vessels, trucks, company vehicles and operating equipment, and buildings and yard energy consumption) by 29% by 2030, based on 2015 levels.

Risks and Opportunities

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C2 Risks and Opportunities

Definitions

C2.1

Our definition of short-, medium- and long-term time horizons

Time horizon	From (years)	To (years)	Comments
Short-term	0	2	The short-term time horizon aligns with our annual performance targets.
Medium-term	2	3	The medium-term horizon aligns with our three-year strategic plan.
Long-term	3	15	The long-term horizon aligns with our 2030 science-based target.

C2.1b

Our definition of substantive financial or strategic impact on your business

When identifying or assessing climate risk, the determination of whether it has a substantive financial impact is aligned with our corporate risk management framework taking into consideration the likelihood and the severity of the impact.

For operational and business-level risks, including climate-related risks, a substantive financial or strategic impact is defined as having a financial impact that is greater than 1% of revenue or is otherwise perceived as significant and could result in irreparable damage to CN's reputation and/or assets.

Management Processes

C2.2

Process(es) for identifying, assessing and responding to climate-related risks and opportunities

A specific climate-related risk management process is used to assess short-, medium-, and long-term risk more than once a year.

Value chain stage(s) covered	Description of process
Upstream	<p>Process to Determine Substantive Financial or Strategic Impact</p> <p>At a company level, CN uses enterprise and operational risk management processes to identify, prioritize, assess, respond to, and disclose risks, including climate-related risks that have the potential to affect business strategy. For each risk (inherent or residual), a ranking is provided ranging from high to low, based on financial, operational, environmental, and reputational impacts (worst-case) and the associated likelihood of occurring. Current and planned mitigation activities are captured and assigned ownership at the appropriate level. For example, ownership for enterprise-level risks resides at the executive level. We regularly report on our risks internally, highlighting substantive risks/opportunities that have the potential financial impact that is greater than 1% of revenue or is otherwise perceived as significant and could result in irreparable damage to CN's reputation and/or assets. In response to increasing public and investor concerns over climate change, we have been strengthening the transparency and credibility of the information we publish publicly on climate-related issues, including concerning governance, risks, opportunities and performance. In 2019, climate-related disclosures were included as part of our 2019 Annual Report, Delivering Responsibly Sustainability Report, Investor Fact Book and on our website.</p> <p>The processes for upstream climate-related risks and opportunities, which typically refer to the impacts on our supply chain, take place on an ongoing basis at the operational level, and more formally on an annual basis during our climate risk assessment leading up to the business planning cycle and voluntary ESG disclosure events.</p> <p>Case Study of Application to Physical Risks/Opportunities</p> <p>The Company is susceptible to the volatility of fuel prices due to changes in the economy or supply disruptions. Fuel shortages can occur due to refinery disruptions, production quota restrictions, climate impacts such as severe weather events, and labour and political instability. Increases in fuel prices or supply disruptions may materially adversely affect the Company's results of operations, financial position or liquidity. For example, severe weather conditions in February/March 2019 caused significant delays to the Tank car logistics network. To avoid fuel shortages in Northern BC, CN deployed trucks to deliver diesel fuel from Edmonton and Vancouver to Prince George and Kamloops. The change in delivery method from Tank car to truck due to the severe winter weather conditions on an emergency basis added unexpected costs to CN and put additional tanker trucks on the road which are more carbon-intensive than their equivalent rail tank cars. In response, we regularly review the opportunity for geographical diversification of our fuel supplier locations.</p> <p>Case Study of Application to Transition Risks/Opportunities</p> <p>From a transition risk perspective, we assess the risks associated with the availability and accessibility to renewable fuel compliance units that we are required to purchase as part of our compliance obligations under the Federal Renewable Fuel Regulations. These climate-related regulatory obligations could impact our use of renewable fuels, and increase costs related to purchasing renewable fuel compliance units where renewable fuels cannot be used in our trains based on supplier specifications. To help better assess the impacts on CN's fuel supply and operations, our Fuel Procurement team is working with suppliers to gain greater transparency into blend rates for the fuel we receive. In 2019, we continued to work with our locomotive manufacturers to assess the potential risks of sourcing and using renewable fuels for our locomotives allowing us to gain critical information to integrate mitigation strategies into our procurement approach, while also informing our technology and innovation needs.</p>

C2 Risks and Opportunities

Management Processes (continued)

Value chain stage(s) covered	Description of process
Direct operations	<p>Process to Determine Substantive Financial or Strategic Impact</p> <p>At a company level, CN uses enterprise and operational risk management processes to identify, prioritize, assess, respond to, and disclose risks, including climate-related risks that have the potential to affect business strategy. For each risk (inherent or residual), a ranking is provided ranging from high to low, based on financial, operational, environmental, and reputational impacts (worst-case) and the associated likelihood of occurring. We capture current and planned mitigation activities and assign ownership at the appropriate level. For example, ownership for enterprise-level risks resides at the executive level. We regularly report on our risks internally, highlighting substantive risks/opportunities that have the potential financial impact that is greater than 1% of revenue or is otherwise perceived as significant and could result in irreparable damage to CN's reputation and/or assets. In response to increasing public and investor concerns over climate change, we have been strengthening the transparency and credibility of the information we publish publicly on climate-related issues, including concerning governance, risks, opportunities and performance. In 2019, climate-related disclosures were included as part of our 2019 Annual Report, Sustainability Report, Investor Fact Book and on our website.</p> <p>The processes for climate-related risks and opportunities on our direct operations, which typically refer to existing and emerging regulations, technology changes, market, reputation and both chronic and acute physical weather events, take place on an ongoing basis at the operational level, and more formally on an annual basis during our climate risk assessment leading up to the business planning cycle and voluntary ESG disclosure events.</p> <p>Case Study of Application to Physical Risks/Opportunities</p> <p>From a physical risk perspective, we consider risk exposure to our operations from extreme weather events, including flooding, heat and cold extremes, cyclones and tornadoes. Specifically, when temperatures fall below 25 degrees Celsius, railway technologies (steel rail, steel wheels, and long compressed air brake systems) become more vulnerable to problems that can disrupt normal operations, such as reduced effectiveness of brakes, broken rail tracks, broken wheels, and frozen switches. The main mitigation option is to reduce the train length to maintain the safe operation of a train's air braking system. Shorter trains mean more crews and locomotives required to move the same amount of traffic. This leads to an increased number of trains on the network, which in turn results in slower speeds and overall reduced efficiency. During extreme cold weather events, for example in February 2019 when temperatures fell below -40 degrees Celsius, we are forced to halt operations of our trains for safety reasons, which impacted our bulk grain movements and associated revenues.</p> <p>The impact of extreme heat, specifically the combination of high air temperature, humidity and direct sun, on steel rails causes the steel to expand. This places a lot of stress on ties, ballast and rail anchors that keep the tracks fixed to the ground. If they heat up enough, the tracks buckle under the force. Buckling of tracks, or "sun kinks" constrain speeds causing train delays; and increase the potential for derailment, track-sensor malfunction, overheated cargo, and hazardous material spills. We have observed an increase in the number of days with extreme heat. For example, sixty-one percent of major Southeast cities are exhibiting some aspects of worsening heatwaves, which is a higher percentage than any other region of the country. We also assess the impact of episodes of flash flooding, which could result in landslides in unstable mountainous regions and mudslides further damaging rail bed support structures and cause overflows onto our tracks. For example, in early 2019, the section of CN rail between Edmonton and Jasper was impacted by unusually heavy and persistent rain. Mud on the track resulted in over 60 minutes of slow orders over most of the spring, causing delays and cancellations of shipments across one of CN's busiest subdivisions. Vulnerability and risks of tornado and cyclones are also assessed, particularly at our sites and network within the U.S. Tornado Belt, the Midwest and New Orleans area.</p> <p>In response, we are considering these risks in our continuity and resiliency planning and work with our customers to limit service interruptions. We can also leverage existing solutions such as our Precision Scheduled Railroading to maintain the fluidity of our network.</p> <p>Case Study of Application to Transition Risks/Opportunities</p> <p>From a transition risk perspective, through our climate-related risk assessments, we consider the risks of climate-related events on our customers. Specifically, we assess the extent to which climate-related policy and regulatory risks could affect our customers, making it difficult for our customers to produce products in a cost-competitive manner that would in turn impact the markets we serve. For example, through our assessments, we have identified certain commodities moved by CN that could be adversely affected, including our utility coal customers due to thermal coal capacity being replaced with natural gas generation. In response, we monitor relevant regulations as well as market development. Simultaneously, we work to develop opportunities in the growth of cleaner energy markets such as wood pellets, wood chips, turbine components, solar panels and biofuels.</p>

C2 Risks and Opportunities

Management Processes (continued)

C2.2a

Risk types considered in climate-related risk assessments

RISK TYPES

The following risk types are relevant and always included in climate-related risk assessments:

Current Regulation

At a company level, CN uses enterprise and operational risk management processes to identify, prioritize, and assess risks, including climate-related risks, that have the potential to affect business strategy. Specifically, we monitor the potential impact of current federal and provincial regulations in Canada and the U.S. as they may affect our revenues, costs, and operational process requirements. In addition, CN targets zero non-compliance, to avoid the associated financial burden, risk to our license to operate, and damage to our reputation.

We have dedicated resources in relevant departments to support our on-going commitments. For example, members of our fuel procurement department in collaboration with the Director of Sustainability and Manager, Climate Change, manages the regular reporting on our fuel purchases and the associated ETS allowance. These reports are also used internally to assess the risk of increasing direct costs and opportunities to manage them. Specifically, in 2019, we integrated obligations associated with the Federal Carbon Backstop, which took effect on April 1, 2019, imposing a carbon price on fossil fuels in jurisdictions without a carbon pricing system and making CN subject to new carbon taxes in Saskatchewan, Manitoba, Ontario and New Brunswick.

Emerging Regulation

At a company level, CN uses enterprise and operational risk management processes to identify, prioritize, and assess risks, including climate-related risks, that have the potential to affect business strategy. Specifically, we monitor the potential impact of emerging federal and provincial regulations in Canada and the U.S. as they may affect our revenues, costs, and operational process requirements. For example, we monitor and assess the potential impact of emerging regulations such as the Clean Fuel Standard, which the Federal government is developing to reduce Canada's GHG emissions through the increased use of lower-carbon fuels, energy sources and technologies. A draft regulatory design paper was released with final regulations to be released in 2020, coming into force in 2022. In response, we are assessing the impacts of increasing renewable fuel blend rates in our locomotive diesel fuel supply to determine impacts on locomotive fuel efficiency as well as impacts on fuel costs.

Technology

Technology is being monitored as a transitional risk driver in our enterprise and operational risk management processes. For example, we assess technology risks in the context of stringent locomotive air emission standards set by the U.S. Environmental Protection Agency (EPA) and Canada that require newly manufactured and re-manufactured off-road engines to be Tier 4 compliant and have idle emission controls. We use the information for the risk and opportunities assessment to inform our strategy to acquire, upgrade and retire locomotives. For example, in 2019, our capital spending included \$0.9 billion on equipment capital expenditures that covered the acquisition of 154 new high-horsepower locomotives and 560 new grain hopper cars, among other expenditures.

We also assess technology risks in the context of fuel efficiency improvements, taking into consideration the financial costs associated with installing technologies on our locomotives with enhanced analytical capabilities, such as Trip Optimizer, Automatic Engine Start/Stop devices, Locomotive Telemetry, which wirelessly communicates operational data from locomotives to a central system, and Horse Power Tonnage Analyzer (HPTA) which uses the data collected by Locomotive Telemetry to optimize a locomotive's horsepower-to-tonnage ratio.

Legal

Legal risks to the company are always included in the risk assessment process. Specifically, we monitor the risks associated with the violation of or potential non-compliance with laws and regulations such as, for example, discharges to air, land, and water or handling, storage, use, generation, transportation, and disposal of waste and other materials. We monitor these risks as well as the effectiveness of related mitigation strategies in alignment with our efforts to avoid non-compliances and potential lawsuits.

Market

Through our climate-related risk assessments, we consider climate-related risks that could impact the markets we serve. Specifically, we assess the extent to which climate-related physical and transition risks could affect our customers, making it difficult for our customers to produce products in a cost-competitive manner that would in turn impact the markets we serve. For example, through our assessments, we have identified certain commodities moved by CN that could be adversely affected, including our utility coal customers due to thermal coal capacity being replaced with natural gas generation. Meanwhile, we also consider opportunities in the growth of cleaner energy markets such as wood pellets, wood chips, turbine components, solar panels, lithium, and biofuels.

C2 Risks and Opportunities

Management Processes (continued)

Reputation

Climate-related events, such as floods, washouts, or extreme weather events that could lead to derailments or delays, have the potential to negatively impact CN's reputation with shareholders and stakeholders. Therefore, we include the potential impact of climate-related events and the associated disclosure and communication process in the risk assessment and mitigation process. We also recognize that with increasing public and investor concerns over climate change, a lack of disclosure on how we identify and manage climate change risks could expose us to potential reputational risk. For example, over the past few years, there has been an increase in investor interest on environmental, social and governance factors, which includes responding to and mitigating climate risks. As a result, we have been strengthening the transparency and credibility of the information we publish publicly on climate-related issues, including concerning governance, risks, opportunities and performance. In 2019, climate-related disclosures were included in our 2019 Annual Report, Sustainability Report, Investor Fact Book and on our website.

Acute Physical

Through our climate-related risk assessments, we consider risk exposure to extreme weather events, including flooding, heat and cold extremes, cyclones and tornadoes. For example, we assess the impacts of extreme cold on our operations. Below 25 degrees Celsius, railway technologies (steel rail, steel wheels, and long compressed air brake systems) become more vulnerable to problems that can disrupt normal operations. We also assess the impact of episodes of flash flooding, which could result in landslides in unstable mountainous regions and mudslides further damaging rail bed support structures and cause overflows onto our tracks. Vulnerability and risks of tornado and cyclones are also assessed, particularly at our sites and network within the U.S. Tornado Belt, the Midwest and New Orleans area. For example, in 2019, during the unprecedented cold period in February when temperatures fell below -40 degrees Celsius, we were forced to halt operations of our trains for safety reasons, which impacted our bulk grain movements.

Chronic Physical

Through our climate-related risk assessments, we consider exposure to changes in chronic physical impacts, such as long-term weather change and increasing temperatures, which affect our infrastructure and our train operations significantly. To mitigate chronic physical risks associated with the increasing frequency of extreme weather, we refine our business resiliency and continuity plans to ensure the continuity of train operations.

In addition, shifts in climate patterns can also impact the markets and commodities we move. For example, the cold temperatures in early January and February caused unprecedented harvest delays, impacting the entire Western Canadian grain supply chain. Through resiliency planning, CN and its supply chain partners were able to adapt to move historically strong grain shipment volumes in November when the crop was finally harvested and ready to ship.

C2 Risks and Opportunities

Risk Disclosure

C2.3

Climate-related risks with potential for a substantive financial or strategic impact on our business

Identifier • Risk type	Company-specific description	Time horizon • Likelihood • Magnitude of impact	Potential financial impact figure and explanation	Response and explanation of cost calculation
Risk 001 • Acute physical	<p>The risk that an increased severity and frequency of extreme weather events yields increased direct costs:</p> <p>Extreme temperatures can present a risk to our network and infrastructure. For example, rail misalignments and track buckling are possible from thermal rail expansion, and extreme cold can result in track freezing leading to greater frequency of broken rails, frozen switches, and high rates of wheel replacements. Further, flash floods can result in landslides and mudslides, and cause overflows damaging the rail bed support structures and tracks. Temperature extremes can also impact our sites and networks in the U.S. Tornado Belt, Midwest and New Orleans area, making us vulnerable to increases in tornado occurrences and intensity.</p> <p>For example, in February 2019, when temperatures fell below -40 degrees Celsius in the prairies, we were forced to halt operations of our trains for safety reasons, which impacted our bulk grain movements.</p> <p>In May 2019, a key bridge that connects the Northwest Territories to southern Canada burned down during wildfires in Alberta. The closure threatened a vital resupply route for the territory's remote communities. The bridge has been rebuilt in August to ensure rail cars will be able to ship diesel fuel north to barges that carry it to communities that rely on diesel generators for electricity.</p>	<p>Short term</p> <p>•</p> <p>Virtually certain</p> <p>•</p> <p>High</p>	<p>We calculate the financial costs we have incurred from extreme weather events (e.g. harsh winter conditions, flooding, and wildfires) on our business, including damage to our assets, infrastructure and operations. In 2019, the financial impact of extreme weather events on our business was estimated to be between C\$75 million and C\$100 million. Specifically, our network was impacted by harsh cold weather conditions adversely affecting network fluidity and productivity, flooding and washouts requiring infrastructure repairs, and one of the busiest wildfire seasons in Alberta in a decade.</p>	<p>To manage the risk, we have in place several programs to respond to the physical impacts of climate change, including extreme weather readiness plans, an emergency response planning program, inspection programs and strategies to deploy non-rail modes of transport. For example, we have established rapid-deployment teams to quickly take action when a service disruption occurs. These teams include staff to rework train schedules, as well as develop work and contingency recovery plans to deploy and manage needed equipment and repair crews.</p> <p>Year over year, we expend considerable costs towards the maintenance of our infrastructure to protect the company assets from wear and tear that could be attributable to changes in climate. In 2019, between C\$50-100 million of our operating expenditures were directed towards proactive inspections, maintenance, readiness plans, emergency response planning, and network infrastructure upgrades to manage the risks of extreme weather events.</p>
Risk 002 • Market	<p>The risk that the decline in demand for products currently representing a significant percentage of CN's commodity portfolio due to changes to consumer behaviours and climate change regulations will yield decrease revenues:</p> <p>Increasing consumer preference for cleaner energy sources to limit the impacts of climate change, further accelerated by federal and provincial commitments to clean electricity, could affect certain commodities moved by CN, including our petroleum and chemicals or utility coal markets in Canada. As non-emitting sources and energy technologies get cheaper and improvements to equipment and buildings reduce energy requirements, Specifically, Canadian energy use could decline by over 15% from current levels. And the fossil fuel portion of the fuel mix could decline to 30% lower than current levels by 2040.</p>	<p>Medium term</p> <p>•</p> <p>About as likely as not</p> <p>•</p> <p>Medium - high</p>	<p>Within North America, policies and use of renewable energies expect to spark the decline of coal. In Canada, this declining trend is driven primarily by retirements of coal-fired generation capacity resulting from regulations to phase out traditional coal-fired power plants by 2030.</p> <p>In Canada, thermal coal is expected to contract by 10% over the next ten years.</p> <p>If consumer preference was to impact our thermal coal customers to the extent that all coal shipments ceased, it would reduce our rail freight revenues by approximately 5% (658/14,198), equivalent to an estimated C\$ 658 million in 2019.</p>	<p>From a commodity perspective, CN freight revenues are derived from the movement of a diversified and balanced portfolio of goods, including petroleum and chemicals, grain and fertilizers, coal, metals and minerals, forest products, intermodal and automotive. This commodity and geographic diversity better positions the Company to face changing GHG regulations. To manage this risk, we continue to maintain a diversified and balanced portfolio of goods. For example, in 2019, no individual commodity group accounted for more than 25% of total revenues. Furthermore, we also engage with existing and potential customers to promote the environmental benefits of rail and increase our market share in other commodity groups.</p> <p>The costs associated with communicating with our customers, and exploring opportunities to position CN's carbon-efficient rail service is included in the Marketing and Sustainability functional budgets. Specifically, we have estimated the costs associated with internal resource time, advertising, and consultants to be approximately C\$500,000.</p>

C2 Risks and Opportunities

Risk Disclosure (continued)

Identifier • Risk type	Company-specific description	Time horizon • Likelihood • Magnitude of impact	Potential financial impact figure and explanation	Response and explanation of cost calculation
Risk 003 • Technology	<p>The risk that mandates on and regulations of services yield increased direct costs to transition to lower emissions technology:</p> <p>With approximately 85% of our GHG emissions generated from rail operations, we believe the best way to reduce our carbon footprint is by continuously improving our rail efficiency. Over the years, this focus has resulted in significant progress decoupling growth from carbon emissions, making us one of the most fuel-efficient railroads in North America. New mandates and regulations, such as the Canadian Fuel Standard that is proposed to come into effect in 2021, will require us to continuously review our fleet and invest in new technology.</p>	<p>Medium-term • Very likely • Medium - high</p>	<p>Cleaner, more fuel-efficient rail and non-rail equipment will be important in helping us continue to decouple growth from GHG emissions. Already, we are making significant investments in Tier 4 locomotives, new-generation railcars, hybrid and electric vehicles.</p> <p>In recent years, we have invested between C\$0.5 and C1.0 billion dollars in new high-horsepower locomotives and new cars.</p>	<p>In addition to the capital-intensive renewal of our fleet, the installation of fuel-efficient technologies and big data management analytics capabilities are helping us further reduce our carbon footprint and are part of our low-carbon transition plan in alignment with our science-based target reduction of 29% GHG emission intensity by 2030.</p> <p>Building on our foundational Precision Scheduled Railroading model, we are also focused on providing on-the-job training on practices to optimize fuel efficiency. Providing information to track performance in real-time to enable fuel conservation through notch limiting, idling reduction and horsepower optimization.</p> <p>We estimate the costs associated with the management of this risk considering operational expenses for fuel-efficiency technologies made in 2019 as well as resource and operational costs for our fuel management department to be \$4,600,000.</p>

C2 Risks and Opportunities

Opportunity Disclosure

C2.4 - C2.4a

Climate-related opportunities with the potential to have a substantive financial or strategic impact

Identifier • Where in the value chain does the risk driver occur? • Opportunity type • Primary climate-related risk driver	Company-specific description	Time horizon • Likelihood • Magnitude of impact	Potential financial impact figure and explanation	Strategy to realize opportunity and explanation of cost calculation
OPP001 • Direct operations • Products and services • Development and/ or expansion of low emission goods and services	<p>The opportunity to increase revenues resulting from increased demand for low emission goods and services:</p> <p>The movement towards carbon pricing in North America coupled with the growing pressures on CN customers to reduce their supply chain carbon emissions present important opportunities for us to position the environmental benefits of rail.</p> <p>Specifically, positioning the environmental benefits of shipping heavy freight by rail over long distances versus by other more carbon-intensive modes, such as transport trucks, could present opportunities to grow revenue within our intermodal and carload segments, with customers looking to reduce their transportation supply chain emissions.</p> <p>Railroads are the most environmentally sound way to move freight over land. Shipping freight by rail instead of trucks can reduce GHG emissions by up to 75% on average according to the Association of American Railroads (AAR).</p>	Medium • More likely than not • Medium-High	<p>Modal shift provides an opportunity to grow revenues within our intermodal and carload business segments, with customers looking to reduce their supply chain emissions by shifting freight shipments from truck to rail.</p> <p>CN cannot specifically quantify the amount of that opportunity due to restrictions governing public disclosure of sensitive forward-looking financial information; therefore, CN is estimating the opportunity to be more than \$1.00 and up to the \$9.1 billion. CN made this range estimation based on our truck-competitive business revenue which accounted for 57% percent of the revenue in 2019.</p> <p>Over time, revenues from this business segment could continue to increase as we grow our market share from truck to rail freight.</p>	<p>We actively engage with existing and potential customers to position the environmental benefits that rail offers for long haul shipments of freight over other modes of transport. We also invest significantly in the growth of our intermodal business, which is part of the overall 2019 C\$3.9 billion in spend allocated to our capital program and includes both infrastructure and equipment investments.</p> <p>Specifically, in 2019, we started investing in our inland terminals to accommodate greater anticipated demand in key consumer markets. These include major investments in Southern Ontario where we are planning to build a new \$250-million logistics hub in Milton. We also welcomed Canada's first privately operated intermodal terminal located in the Chuka Creek Business Park in Regina, SK, exclusively served by CN, which opened in November 2019. CN is also actively working with other class 1 railroads to enable new intermodal service offering to convert long-haul trucks to interline rail services. For example, in 2019, CN and CSX announced a new intermodal service offering between CN's greater Montreal and Southern Ontario areas, and the CSX-served ports of Philadelphia, New York, New Jersey and the New York City metropolitan area.</p> <p>Finally, in 2019, we completed and closed two acquisitions strengthening our intermodal business, including TransX and H&R Transport Intermodal division.</p> <p>The cost to realize the opportunity is included in the company's spend allocated to our capital program and has been estimated using the 2019 annual equipment and infrastructure investment.</p>
OPP002 • Direct operations • Markets • Access to new markets	<p>The opportunity to increase revenues through access to new and emerging markets:</p> <p>Concerns over price volatility, potential scarcity of non-renewable fuels, and environmental concerns have led to the rapidly growing adoption of renewable and alternative sources of energy. Assuming government policies evolve at a similar speed as in the past, renewables share is expected to triple to ~13% of global energy generation by 2036.</p> <p>Although the base is smaller, CN's clean energy revenues have been growing faster than fossil fuel revenues in the period from 2009 to 2019. Specifically, for the five years starting 2014 clean energy has grown by ~7% CAGR vs fossil fuels (~2% CAGR). In 2019, CN clean energy's share of CN's energy portfolio was 12%.</p>	Long-term • More likely than not • Medium	<p>Based on global market predictions, CN's "Clean Energy" CAGR could increase to about 7% out to 2036. This would imply a growth of revenues from clean energy from about \$260 million in 2019 to over \$780 million by 2036.</p>	<p>We are working closely with our customers to further develop these business opportunities. This includes pro-actively engaging with these customers to market the environmental benefits of shipping by rail.</p> <p>For example, CN is working closely with our customers to provide supply chain solutions to transport wind turbines. Due to their large size, standing at least 262 feet tall, unique shape and weight, CN transports wind turbines as a dimensional load using specialized equipment for heavyweight and oversized products. Wind turbines convert the kinetic energy of wind into electric energy that powers homes, farms, commercial, industrial operations, and more. According to the Canadian Wind Energy Association, Wind energy currently supplies approximately six percent of Canada's electricity demand, generating enough power to meet the needs of over three million Canadian homes.</p> <p>The costs associated with communicating with our customers, and exploring opportunities to position CN's service is included in the Marketing and Sustainability functional budgets.</p> <p>The total costs associated with internal resource time, advertising, and consultants are estimated to be approximately C\$500,000.</p>

C2 Risks and Opportunities

Opportunity Disclosure (continued)

Identifier • Where in the value chain does the risk driver occur? • Opportunity type • Primary climate-related risk driver	Company-specific description	Time horizon • Likelihood • Magnitude of impact	Potential financial impact figure and explanation	Strategy to realize opportunity and explanation of cost calculation
OPP003 • Upstream • Resource Efficiency • Move to more efficient buildings	<p>The opportunity to reduce direct cost by moving to more efficient buildings:</p> <p>Opportunities exist from the increasing availability of government and utility company subsidies for the implementation of energy efficiency projects such as building and technology retrofits. Our Sustainability and Facilities Management teams leverage subsidies to implement technology retrofit projects in buildings and yards. The projects increase operational efficiency, reduce energy consumption and contribute to lowering emissions and reducing capital and operating costs. Specific types of projects implemented include Heating Ventilation and Cooling (HVAC) system upgrades, installation of more efficient air compressors and yard air lines to charge our train braking systems, and lighting upgrades to LED in our yards and buildings.</p>	Short • Virtually certain • Medium	In 2019 CN received approximately \$283,000 in subsidies from various government and utility company programs for energy efficiency projects.	<p>To maximize the opportunity, we continue to monitor funding opportunities from government and utility company subsidy programs that align with our procurement strategy. We actively submit project proposals and continue to collaborate with key utilities on identifying energy efficiency project opportunities. Specifically, in 2019, CN received subsidies from BC Hydro, Manitoba Hydro, Efficiency Nova Alberta, and Bluewater Power Distribution for energy efficiency projects implemented across our network. These projects mainly involved indoor and outdoor lighting upgrades from older technology to energy-efficient LEDs.</p> <p>The costs associated with this opportunity are integrated into CN's Sustainability and Facilities Management department budgets, which are estimated at C\$50,000.</p>

Business Strategy

CO₂



C3 Business Strategy

Scenario Analysis

C3.1 - C3.1b

Our use of climate-related scenario analysis to inform our business strategy and financial planning

We use both qualitative and quantitative analysis to inform our strategy.

CN collaborated with the Science-Based Targets Initiative (SBTI) on a science-based target setting approach within the freight rail sector, using IEA's World Energy Outlook 2DS scenario. In setting our target, we made business growth projections, applied key assumptions on efficiency gains that could be made through the use of existing and yet-to-be-developed fuel efficiency technologies, and incorporated growing emissions reductions resulting from increasingly stringent regulations on life-cycle emissions from fuels. These assumptions enabled us to set a 2-degree climate science target to reduce our GHG emission intensity (tCO₂e/million tonne kilometres) by 29% by 2030 based on 2015 levels. This target anchors our future low-carbon transition plan, to continuously improve our efficiency and to use cleaner more sustainable fuels in our rail locomotive operations. Details of the model are presented below.

AREAS OF ORGANIZATION CONSIDERED AND TIME HORIZONS

Our climate scenario analysis is based on our Scope 1 and 2 direct GHG emissions related to all aspects of our business. The climate scenario analysis was conducted using a 15-year time horizon from 2015 to 2030, inclusive. The time horizon of 2030 is relevant as it aligns with Canada's GHG 2030 reduction target as well as the expected time required to apply less GHG intensive fuels for our rail locomotives.

METHODOLOGY

Inputs: The key inputs into the model included a sector target based on the International Energy Agency (IEA) – Energy Technology Perspectives 2016 document; CN company-specific emissions and activity data in tonne kilometres for the 2015 baseline year; CN forecasted emissions and rail transportation activity in tonne kilometres for the target year of 2030.

Assumptions: We assumed business growth in line with forecasts developed by CN's Finance department, taking into consideration CN's business mix, as well as relevant market and economic factors. We also incorporated ambitious efficiency gains over the 2017-2030 period, along with increasing volumes of renewable fuel blending.

Analytical Methods: The SBTi rail freight sector model provided the basis for determining the target pathway. The model applies transportation mode-specific emission and activity forecasts and targets from the IEA – Energy Technology Perspective 2016 document.

RESULTS AND OUTCOMES

The scenario analysis model resulted in a reduction target of 29% of our GHG emission intensity (tCO₂e/million tonne kilometres) by 2030 based on 2015 levels. We obtained formal approval from the SBTi for the target and use of their scenario analysis, and now publicly report the target through our CDP submission along with tracking and monitoring performance annually in our sustainability reporting through our GRI Data Supplement.

HOW RESULTS HAVE INFORMED OUR BUSINESS OBJECTIVES AND STRATEGY

The results of the scenario analysis have informed our ability to set an ambitious 29% GHG emission intensity target by 2030. To achieve our target, we recognize we will need to make transformational changes in our business and strategy. As such, the target informs our low-carbon transition plan and business strategy to accelerate reductions by focusing on locomotive fleet renewals, installing innovative fuel-efficient technologies, leveraging big data, promoting better fuel conservation and increasing renewable fuel blends.

CASE STUDY OF HOW THE RESULTS HAVE DIRECTLY INFLUENCED OUR BUSINESS OBJECTIVES AND STRATEGY

The results of our scenario analysis directly influenced the pace at which we are installing fuel-efficient technologies and big data to further reduce our carbon footprint. Specifically, in 2019, we acquired 154 new high-horsepower locomotives, and equipped our locomotives with GE Transportation's GoLINCTM Platform, Energy Management System, data telemetry systems, and Distributed Power LOCOTROL eXpanded Architecture, to maximize locomotive operating effectiveness and efficiency and reduce emissions.

C3 Business Strategy

Business Strategy

C3.1d

Climate-related risk and opportunities are integrated into our business strategy

Business area	Description of influence
Products and services	<p>Influence on Strategy in the Time Horizon Market risks and opportunities have a direct influence on our products and services strategy. For example, our intermodal and carload business growth strategy has been influenced by the ability to position the environmental benefits of rail with our customers. Specifically, the movement towards carbon pricing in North America, coupled with growing pressures on our customers to reduce their supply chain emissions presents opportunities for us. We conservatively estimated the magnitude of this opportunity in 2019 to be C\$322 million based on the revenue increase of 9% in our intermodal business segment, of which a portion is attributable to truck to rail conversion. Over time, revenues from this business segment could continue to increase as we grow our market share from truck to rail freight.</p> <p>Case Study In 2019, the most substantial strategic decisions influenced by this opportunity were the investments we made in the growth of our intermodal business, which is part of the C\$3.9 billion we allocated to our capital program. For example, we invested in our inland terminals to accommodate greater demand in key consumer markets. These include investments in Milton, Ontario where we will build a new \$250-million logistics hub, and welcomed Canada's first privately operated intermodal terminal in Regina, SK. Our supply chain collaboration and consistent service help our customers compete in a global environment. For example, our full membership in the Equipment Management Pool (EMP), since March 2019, is reducing empty container movements and extending our reach. As well, since August 2019, in partnership with CSX, we have been offering a new intermodal service between CN's Greater Montreal and Southern Ontario markets, and the CSX-served ports of Philadelphia, New York and New Jersey. Finally, we completed and closed strategic acquisitions, including TransX and H&R Transport Intermodal division in 2019.</p>
Supply chain and/or value chain	<p>Influence on Strategy in the Time Horizon Regulatory risks and opportunities associated with the decrease of carbon and air emissions and the increase of renewable fuel sources have a significant influence on our fuel procurement and management strategy, which includes the active engagement of our locomotive manufacturers as well as our fuel suppliers.</p> <p>Case Study As part of our lower carbon transition plan, we made the strategic decision to engage our suppliers to explore the use of renewable fuels as an important part of how we meet our regulatory compliance obligations and efficiency objectives in line with our science-based target. For example, we worked with key fuel suppliers to obtain more detailed insights on industry biodiesel and renewable fuel blends. This information allowed us to further engage with equipment manufacturers and our mechanical team to understand the potential mechanical and fuel efficiency implications and usage. In 2019, the use of renewable fuels in our fleet saved almost 80,000 tonnes of carbon.</p>
Investment in R&D	<p>Influence on Strategy in the Time Horizon Regulatory risks and opportunities associated with the increase in fuel efficiency and the use of renewable fuel sources have also a significant influence on our R&D investment decisions. With more than 85% of our GHG emissions resulting from rail operations, the best way to reduce our carbon footprint is by continuously improving our rail fuel efficiency. Over the years, this focus has led us to strategically focus on investing in new technologies to drive even greater efficiency through investments in research and development.</p> <p>Case Study As part of our R&D strategy, we decided to collaborate with the Université de Montréal to develop mathematical models that have the potential to improve operational and fuel efficiency (and reduce carbon emissions). These models focus on two key areas for efficiency improvements: optimized locomotive power on trains, and improved aerodynamics of intermodal trains. Preliminary results have been produced and are under review. CN is in year 3 of this 5-year optimization research project and thus the business impacts have not yet been realized.</p>
Operations	<p>Influence on Strategy in the Time Horizon Regulatory risks and opportunities associated with the increase of fuel efficiency and use of renewable fuel sources, among other climate risks and opportunities, also influence our operations strategy. As part of CN's comprehensive sustainability action plan and to comply with CN's environmental policy, we engage in several initiatives, such as increasing operational and building efficiencies; investing in energy-efficient data centers and recycling programs for information technology systems; or reducing, recycling and reusing waste and scrap at our facilities and on our network. The Company combines its expert resources, environmental management procedures, training and audits for employees and contractors, and emergency preparedness response activities to help ensure that it conducts its operations and activities while protecting the natural environment. The Company's environmental activities include monitoring CN's environmental performance in Canada and the U.S., identifying environmental issues inside the Company, and managing them following CN's environmental policy, which is overseen by the Environment, Safety and Security Committee of the Board of Directors. Certain risk mitigation strategies, such as periodic audits, employee training programs and emergency plans and procedures, are in place to minimize the environmental risks to the Company.</p> <p>Case Study The most substantial strategic decisions dealing with rail fuel efficiency included our capital and operational spending. Over the years, our operating model, Precision Scheduled Railroading, has enabled us to use fewer railcars and locomotives to ship more freight in a tight, reliable and efficient operation. Our strategy to continuously improve our fuel efficiency has been influenced by carbon prices as well as changing customer preferences for low-carbon freight transportation modes. To drive even greater fuel and carbon efficiency into our operations in 2019, we continue to invest in new locomotives, leveraging new technologies and promoting fuel conservation practices with our locomotive engineers.</p>

C3 Business Strategy

Financial Planning

C3.1e

Climate-related risks and opportunities influence our financial planning

Financial planning elements that have been influenced include:

REVENUE

As part of our financial planning processes, we assess the potential revenues and growth projections from individual commodity groups, which include impacts of climate-related risks and opportunities. Specifically, as part of the review of our intermodal business segment, taking into consideration market trends and customer demands for more environmentally friendly and fuel-efficient options for freight transportation through modal shift, we established growth targets and investment strategies. The time horizon for our financial planning related to revenues covers three years. For example, in our intermodal business, we forecast our revenues over three years to inform the financial plans e.g., procurement, market and sales as well as investment and acquisition decisions, such as the addition of TransX to our organization in 2019.

CAPITAL EXPENDITURES

On an annual basis, as part of our financial planning process, we allocate a significant budget to our capital program. This includes capital expenditures to acquire a new fleet that is compliant with U.S EPA and Canada emission limit standards for locomotives, as well as fleet purchases for growing lower-carbon business segments like intermodal. In 2019, CN spent approximately \$3.9 billion in its capital program, with \$1.6 billion invested to maintain the safety and integrity of the network, particularly track infrastructure. CN's capital spending also included \$1.2 billion on strategic initiatives to increase capacity, enable growth and improve network resiliency, including line capacity upgrades and information technology initiatives, \$0.9 billion on equipment capital expenditures, including the acquisition of 154 new high-horsepower locomotives and 560 new grain hopper cars, and \$0.2 billion on implementation of Positive Train Control (PTC), the safety technology system mandated by the U.S. Congress. The new locomotives will enable us to meet emission standards and drive even greater emission reductions across our business.

ACQUISITIONS AND DIVESTMENTS

As part of our financial planning process, we target acquisitions that support our business growth strategy, including those that could allow us to take advantage of positioning the environmental benefits of rail through modal shift. Specifically, in 2019, we complied and closed two strategic acquisition decisions to strengthen our intermodal business, including TransX and H&R Transport Intermodal division. Already, these acquisition investments are contributing to increased revenues. In 2019, our intermodal business segment saw an increase of approximately C\$322 million in revenues vs 2018 (9%).

DIRECT COSTS

As part of our financial planning process, we track the potential impact of climate-related events on our operating costs on an annual time horizon. Specifically, in 2019, we took into consideration the financial impact associated with compliance costs related to carbon pricing regulatory regimes (including fuel distributor flow-through costs, carbon taxes, and Cap and Trade allowance purchases associated with the import of fuel), operational costs from extreme weather events on our network, and operating costs to position the environmental benefits of rail with our customers. As part of the financial planning process, we allocate the necessary funds through departmental operating budgets. In 2019, the magnitude of the operating costs (taking into consideration both the financial impact and management costs of climate-related risks) were estimated to be approximately C\$140,000 annually to ensure our compliance with carbon regulatory requirements, C\$100 million for weather events, approximately C\$500,000 for marketing the environmental benefits of rail, and approximately C\$4,600,000 on fuel management to execute and improve current practices and develop and leverage supporting technologies.

ASSETS

As part of our financial planning process, our Network Transportation and System Engineering Function will assign specific budgets to ensure we plan for potential disruptions to our network and impact on our assets from extreme weather events. In 2019, the magnitude of the impact, taking into account both financial impact and management costs, was approximately C\$150 million for extreme weather events.

ACCESS TO CAPITAL

As part of our financial planning process, we factored access to capital from various state and provincial government efficiency incentive programs into our 2019 budget. CN's Sustainability and Facilities Management teams leverage these subsidies to implement energy efficiency projects in our buildings and yards. To maximize the opportunity, we continue to monitor funding opportunities from government and utility company subsidy programs. In 2019, the magnitude of the impact of these incentives was approximately C\$283,000, through subsidies from BC Hydro, Manitoba Hydro, Efficiency Nova Alberta, and Bluewater Power Distribution. The added capital from these programs allowed us to complete several indoor and outdoor lighting upgrades from older technology to energy-efficient LED technology.

C3 Business Strategy

Low-Carbon Transition Plan

C3.1f

Our low-carbon transition plan

We have developed a low-carbon transition plan in alignment with our science-based target reduction of 29% GHG emission intensity by 2030. Through our low-carbon transition plan, we are working to mitigate and adapt to climate risks and opportunities. Innovations in fuel-efficient locomotives, rail technology, and data analytics, combined with enhanced operating practices and cleaner fuels will help us realize further emission reductions. Specifically, our strategy is focused on the following key initiatives:

FLEET RENEWAL

Cleaner, more fuel-efficient rail and non-rail equipment will be important in helping us continue to decouple growth from GHG emissions. Already, we are making significant investments in Tier 4 locomotives, new-generation railcars, hybrid and electric vehicles.

INNOVATIVE TECHNOLOGY

We continue to explore and invest in innovative technologies. From locomotive telemetry systems to distributed power, to energy management systems, we are aiming for significant improvements in train handling, braking performance, and overall fuel efficiency.

BIG DATA

Through our locomotive telemetry systems, we are collecting data to improve performance and fuel conservation. In addition, our in-house built Horsepower Tonnage Analyzer uses the data from the systems to optimize a locomotive's horsepower-to-tonnage ratio.

OPERATING PRACTICES

Building on our foundational Precision Scheduled Railroading model, we are focused on providing on-the-job training on practices to optimize fuel efficiency. Providing information to track performance in real-time to enable fuel conservation through notch limiting, idling reduction and horsepower optimization.

CLEANER FUELS

Driven by regulatory requirements, the growth of clean fuels presents an opportunity for us to further reduce our emissions. Specifically, we are focused on testing and exploring the greater use of renewable fuel blends in our locomotives to meet efficiency objectives and compliance obligations.

Targets and Performance

CO₂



C4 Targets and Performance

Emissions Targets

C4.1 - C4.1b

Emissions target active in the reporting year

Our emissions target during the reporting year was defined as an intensity target.

Target reference number • Year target was set • Target coverage • Scope(s) • Percentage of total base year emissions in selected Scope(s) (or Scope 3 category) covered by this intensity figure	Base year • Intensity figure that year	Target year • Target reduction from base year • Intensity figure in target year • Percentage change anticipated in absolute Scope 1 and 2 emissions • Is this a science-based target?	Target status in reporting year • Intensity figure in reporting year • Percentage achieved	Explanation, including target coverage
Int1 • 2017 • Company-wide • Scope 1 and 2 (location-based) • 100%	2015 • 15.98 tCO ₂ e/million tonne km	2030 • 29% • 11.35 tCO ₂ e/million tonne km • 9% • Yes, approved	Underway • 15.61 tCO ₂ e/million tonne km • 8.1%	<p>CN has completed the third year of our 15-year science-based target approved by the SBTi. CN has set an approved science-based GHG emissions intensity (tCO₂e/million tonne km) target of 29% reduction by 2030, based on 2015 levels, covering total Scope 1 and 2 emissions.</p> <p>In 2019, total Scope 1 and 2 emissions combined were 5,801,578 tCO₂e, a decrease of 163,597 tCO₂e, or 2.7%, when compared to the year 2018. On a tonne-km basis, it was approximately 8.1% less emission intensity than our base year of 2015.¹</p> <p>Absolute emissions for the year were in line with our projected target pathway given the operational challenges encountered in 2019. The early part of the year was characterized by prolonged cold weather, followed by a decrease in volumes due to weak demand across the rail industry, and a work stoppage in November in connection with the conductor strike. In 2019, we completed a record capital expenditure program of \$3.9 billion to increase capacity and improve operational efficiency, particularly in our Western Region. CN's capital spending also included the acquisition of 154 new high-horsepower locomotives to accommodate future growth opportunities and further drive fuel and operational efficiency.</p>
Int2 • 2019 • Business division (Rail) • Scope 1 • 100%	2017 • 14.06 kg CO ₂ e/1,000 revenue km	2022 • 6% • 13.21 kg CO ₂ e/1,000 revenue km • 4.1% • No, but we are reporting another target which is science-based	Underway • 14.05 kg CO ₂ e/1,000 revenue km • 0.7%	<p>Through the recent renewal of a long-standing Memorandum of Understanding (MOU) with Transport Canada, we've committed to a 6% intensity-based reduction in GHG emissions, measured against a 2017 baseline and over five years ending in 2022. Refer to page 3 of the RAC MOU at https://www.railcan.ca/wp-content/uploads/2019/07/TC-RAC-MOU-2018-22.pdf. Emission targets will be measured against 2017 carrier-class emissions intensity levels as reported in the 2017 Locomotive Emissions Monitoring Report (https://www.railcan.ca/wp-content/uploads/2019/12/2017_LEM_Report-1.pdf).</p>

¹ In alignment with guidelines from the Science-based Target Initiative (SBTi) that recommend a recalculation of targets to reflect significant operational changes that compromise relevance and consistency of the existing target, CN is excluding statistics related to TransX operations from this year's progress reporting. CN acquired TransX, a transportation and logistics company, in 2018. The acquisition closed in 2019 and TransX continues to operate independently.

C4 Targets and Performance

Low-Carbon Energy Targets

C4.2 - C4.2a

Target(s) to increase low-carbon energy consumption or production

Also active in the reporting year were climate-related targets including target(s) to increase low-carbon energy consumption or production.

Target reference number • Year target was set • Target coverage	Type (absolute or intensity) • Target type: energy carrier • Target type: activity • Target type: energy source	Base year • Percentage in base year	Target year • Percentage in target year	Figure or percentage in reporting year • Target status in reporting year	Explanation
Low1 • 2018 • Business division	Absolute • Other: Renewable fuel • Consumption • Renewable energy source(s) only	2018 • 1.5%	2019 • 2%	2% • Achieved	CN works collaboratively across the value chain to support sustainable production and consumption. Our employees are highly engaged in working together to optimize materials and minimize waste in our operations. We are committed to sourcing more environmentally friendly products and services, working together with our suppliers to consider better alternatives across the entire product life cycle. Specifically, we're working with suppliers to advance the use of renewable energy in our rail and non-rail fleet. The growth of the renewable fuel market is presenting important opportunities to further reduce our emissions by using biodiesel blends in our locomotive fleet. In 2019, the use of renewable fuels in our fleet saved almost 80,000 tonnes of carbon, which is an important milestone as we continue to work with our suppliers to improve our use of renewable fuels. Furthermore, the Federal government is developing a Clean Fuel Standard to reduce Canada's greenhouse gas emissions through the increased use of lower-carbon fuels, energy sources and technologies. As we work to assess the impacts of increasing renewable fuel blend rates in our locomotive diesel fuel supply to determine impacts on locomotive fuel efficiency as well as impacts on fuel costs, we have set a year-on-year rolling target of 2% renewable fuel consumption of our Canadian rail fleet, in alignment with the expected requirements that will come into effect in 2021.

C4.2b

Other climate-related targets, including methane reduction targets

Target reference number • Year target was set • Target coverage	Type (absolute or intensity) • Target type: category	Metric (target numerator if reporting an intensity target)	Base year • Figure or percentage in base year	Target year • Figure or percentage in base year	Figure or percentage in reporting year • Percentage of target achieved • Target status in reporting year	Explanation
Oth1 • 2019 • Business division (Truck)	Absolute • Low-carbon vehicles	Other, number of low-carbon HDV vehicles in the company fleet	2018 • 0	2021 • 8	0 • 0% • New	As part of our sustainability strategy to reduce emissions through innovation, we recently launched a pilot project to use electric trucks. Working with Lion Electric Co., we committed to eight zero-emission electric trucks to be deployed in cities across our network, such as Vancouver, Greater Toronto, Montreal and Hamilton. They will be tested for various tasks such as urban delivery, container shuttle service to port operations and cross-town service. The trucks are custom-built, produce no noise pollution and are estimated to remove 100 tonnes of GHG from the road annually. By using the zero-emission trucks in different settings, we want to identify where these trucks can make the most impact on how we service our customers and reduce emissions. The project is also spurring innovation and creating jobs in nearby communities (https://www.cn.ca/en/news/2019/04/cn-launches-new-pilot-project-using-electric-trucks/).

C4 Targets and Performance

Emission Reduction Initiatives

C4.3 - C4.3b

Emissions reduction initiatives active within the reporting year

Stage of development	Number of initiatives	Total estimated annual CO ₂ e savings in metric tons CO ₂ e (only for rows marked *)
Under investigation	0	0
To be implemented*	4	268,382
Implementation commenced*	5	276
Implemented*	17	270,676
Not to be implemented	0	0

C4.3b

Initiatives implemented in the reporting year

Initiative category	Initiative type Estimated annual CO ₂ e savings (metric tons CO ₂ e)	Scope(s) Voluntary or mandatory?	Annual monetary savings Investment required	Payback period Estimated lifetime of the initiative	Comments
Energy efficiency in production processes	Process emission reductions	Scope 1	C\$77,400,000	4 - 10 years	The estimated emissions savings relate to Scope 1 emissions covering our rail locomotives. In 2019 we continued to implement projects related to our rail locomotive emissions and energy efficiency strategy, which represent almost 85% of our direct greenhouse gas emissions. This includes new locomotive acquisitions, fuel efficiency training for our locomotive engineers, installation of new locomotive technologies such as Trip Optimizer and CN's locomotive telemetry system, and installation of anti-idling devices. Our locomotive engineers receive real-time information on train characteristics, performance and terrain, through an Energy Management System (EMS), which helps to compute the most efficient train settings and regulate speed. Our in-house built Horsepower Tonnage Analyzer (HPTA) also instructs crews on how to optimize a locomotive's horsepower-to-tonnage ratio. These projects will help us achieve our science-based emissions intensity reduction target of 29% in 2030, based on 2015 levels.
	270,400	Voluntary	C\$376,000,000	>30 years	
Energy efficiency in buildings	Other: various projects	Scope 2 (location-based)	C\$650,000	4 - 10 years	We continue to work to reduce Scope 2 emissions from electricity consumption at our buildings and yards. We invest in energy efficiency projects including HVAC, lighting and air compressor upgrades. This includes a \$5 million EcoFund to support energy and emission reduction projects.
		Voluntary	C\$3,500,000	11 - 15 years	

C4 Targets and Performance

Emission Reduction Initiatives (continued)

C4.3c

Methods driving investment in emissions reduction activities

COMPLIANCE WITH REGULATORY REQUIREMENTS/STANDARDS

Through the U.S. EPA and Environment Canada Locomotive Emission Standards, CN continues to follow-through on its commitment to acquire, retire and upgrade locomotives to improve air quality, enhance rail fuel efficiency and reduce rail GHG emission intensity. Based on this obligation, we assess our locomotive fleet annually through financial optimization calculations to determine the budget that would be necessary to meet our commitments in the context of our business needs. For example, in 2019 we spent approximately C\$0.9 billion on equipment capital expenditures, including the acquisition of 154 new high-horsepower locomotives.

DEDICATED BUDGET FOR ENERGY EFFICIENCY

We invest in the efficiency of our locomotive fleet beyond our regulatory compliance obligations. This includes new rail technologies such as Trip Optimizer, Automatic Engine Start/Stop devices, Locomotive Telemetry, which wirelessly communicates operational data from locomotives to a central system, and Horse Power Tonnage Analyzer (HPTA), which uses the data collected by Locomotive Telemetry to optimize a locomotive's horsepower-to-tonnage ratio.

EMPLOYEE ENGAGEMENT

Our employees are integral to our ability to reduce energy consumption. Our EcoConnexions employee engagement program, launched in 2011, is focused on embedding environmental sustainability into our culture, including targeted initiatives to reduce energy consumption and emissions. Through the EcoConnexions program, our employees are engaged to make a difference. With the help of dedicated EcoChampions across our network, we are working collaboratively to share best practices and reduce our environmental impact.

DEDICATED BUDGET FOR ENERGY EFFICIENCY

Energy efficiency is part of our science-based target to reduce our GHG emission intensity by 29% by 2030, based on 2015 levels. To meet this objective, we identified processes and equipment where the biggest reductions were possible by reviewing our energy management data information. Once identified, we conducted a business analysis to determine the key projects that could support our reduction initiatives.

We then assessed the projects based on saving potentials, investment needs and return on investment calculations. Feasible projects are financed through a dedicated energy management budget, facility-specific budgets and subsidies/grants. We have also established a dedicated EcoFund budget of C\$5 million annually for our emission and energy reduction activities as identified through our EcoConnexions employee engagement program.

INTERNAL INCENTIVES/RECOGNITION PROGRAM

Through our Employee Performance Scorecard, a percentage of the bonus structure is allocated to meeting corporate objectives, including our fuel efficiency objectives. These incentive contributions vary according to employee levels within the organization and the extent to which the employee contributes to meeting objectives.

C4 Targets and Performance

Low-Carbon Products

C4.5 - C4.5a

We classify some of our existing services as low-carbon products

The rail freight service we provide is on average four to five times more fuel-efficient than highway freight transportation. One single freight train can carry the cargo load of over 300 trucks. As a result of this efficiency, CN allows customers to avoid and/or reduce GHG emissions that would otherwise be generated from more carbon-intensive modes of transportation. This equates to a 75% reduction in CO₂e for freight transportation that could have been moved by truck or rail.

57% of our revenue were associated with low-carbon products and services in the reporting year.

We are working with many of our customers to help them reduce their transportation supply chain GHG emissions, by leveraging rail for the long haul and trucking over shorter distances. The greater use of combined modes helps lower transportation costs by allowing each mode to be used for the portion of the trip to which it is best suited. It also helps reduce emissions, traffic congestion, accidents and the burden on transportation infrastructure.

Through Precision Scheduled railroading, we are using fewer railcars and locomotives to ship more freight in a tight, reliable and efficient operation for our customers. By fostering better end-to-end service performance, working closely with customers and supply chain partners, including ports, we are driving further emission reductions across the entire supply chain.

Emissions Methodology

CO₂



C5 Emissions Methodology

Base Year Emissions

C5.1

Base year and base year emissions (Scope 1 and 2)

Scope	Base year start	Base year end	Base year emissions (metric tons CO ₂ e)
Scope 1	January 1, 2015	December 31, 2015	5,339,172
Scope 2 (location-based)	January 1, 2015	December 31, 2015	193,613
Scope 2 (market-based)	N/A	N/A	N/A

Emissions Methodology

C5.2

Protocol used to calculate Scope 1 and 2 emissions

We use the *Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)*.

Emissions Data

CO₂



C6 Emissions Data

Scope 1 Emissions Data

C6.1
Gross global Scope 1 emissions

Year	Gross global Scope 1 emissions (metric tons CO ₂ e)
Reporting year	5,771,894

Scope 2 Emissions Reporting

C6.2
Our approach to reporting Scope 2 emissions

Scope 2, location-based	Scope 2, market-based
We are reporting a Scope 2, location-based figure.	We have no operations where we are able to access electricity supplier emission factors or residual emission factors, and are unable to report a Scope 2, market-based figure.

Scope 2 Emissions Data

C6.3 - C6.4
Gross global Scope 2 emissions in metric tons CO₂e

Year	Scope 2, location-based	Scope 2, market-based (if applicable)	Start date	End date
Reporting year	162,202	N/A	January 1, 2019	December 31, 2019

C6 Emissions Data

Scope 3 Emissions Data

C6.5

Our organization's gross global Scope 3 emissions (no exclusions)

RELEVANT AND CALCULATED SCOPE 3 EMISSIONS

Percentage of emissions calculated using data obtained from suppliers or value chain partners equals 100%.

Scope 3 category	Metric tons CO ₂ e	Emissions calculation methodology	Explanation
Purchased goods and services	297,614	Emissions for purchased goods were calculated using volumes of key purchased goods by type of material applied against applicable emission factors from the Greet 2019 and ICE 2.0 models. Emissions for purchased services were calculated following an environmental economic input-output methodology using data from the World Input-Output Database. Emission factors on a tCO ₂ e per \$ basis were calculated by economic sector. The sector-appropriate emission factor was then applied against the 2019 expenditures for that sector to calculate total emissions.	Volumes of purchased goods by type of material as well as dollars spent on purchased services were obtained directly from supplier invoice data in our SAP system. Note: Methodology for extracting volumes of rail and other track material was updated to reflect the year the goods were received by CN, vs previous years' data which was extracted based on the year the purchase order was issued. There can be a lag of several months between purchase order date and receipt of goods.
Capital goods	288,725	Emissions for capital goods were calculated using volumes of key capital goods by type of material applied against applicable emission factors from the Greet 2019 and ICE 2.0 models.	Volumes of capital goods by type of material were obtained directly from supplier invoice data in our SAP system. Note: Methodology for extracting volumes of rail and other track material was updated to reflect the year the goods were received by CN, vs previous years' data which was extracted based on the year the purchase order was issued. There can be a lag of several months between purchase order date and receipt of goods.
Fuel- and energy-related activities (not included in Scope 1 or 2)	1,609,712	Upstream emissions from the production of diesel fuel used to operate our locomotives were calculated using the GHGenius version 5.0 calculation tool.	Litres and gallons of fuel purchased by jurisdiction were obtained directly from supplier invoice data in our SAP system.
Upstream transportation and distribution	56,373	Emissions were calculated following an environmental economic input-output methodology using data from the World Input-Output Database. Emission factors on a tCO ₂ e per \$ basis were calculated by economic sector. The sector-appropriate emission factor was then applied against the 2019 expenditures for upstream transportation to calculate total emissions.	Dollars spent on upstream transportation and distribution were obtained directly from supplier invoice data in our SAP system.
Waste generated in operations	46,225	Emissions were estimated using standard emission factors multiplied by activity level formulas. Tons of waste generated by disposal method for 2019 were obtained from internal data sources. Emission factors were obtained from various sources including <i>Canada's National Inventory Report, 1990-2018</i> , <i>2006 IPCC Guidelines for National Greenhouse Gas Inventories Metal Industry Emissions</i> , and the Ecoinvent database V3.	Tons of waste generated by disposal method was obtained directly from our suppliers.

C6 Emissions Data

Scope 3 Emissions Data (continued)

SCOPE 3 EMISSIONS THAT ARE NOT RELEVANT AS PER PROVIDED EXPLANATION

Scope 3 category	Explanation
Business travel	In 2018, business travel emissions represented less than 2% of Scope 3 emissions. They were considered immaterial in the 2019 reporting year and excluded from our Scope 3 emissions estimate.
Employee commuting	Employees travel to and from work using road transport (car or bus) or commuter train or subway. These Scope 3 emissions are not considered significant when compared to other sources of Scope 3 emissions such as fuel and energy-related activities.
Upstream leased assets	We lease rail cars and some rail equipment. These Scope 3 emissions are not considered significant when compared to other sources of Scope 3 emissions such as fuel and energy-related activities.
Downstream transportation and distribution	As a transport and logistics services company, all distribution and transportation-related emissions are included in our Scope 1 and 2 emissions.
Processing of sold products	As a transport and logistics services company, we do not process a sold product.
Use of sold products	We do not process a sold product that is then used by third parties. We offer a transportation and logistics service.
End of life treatment of sold products	We do not process a sold product where the end of life treatment of sold products is relevant.
Downstream leased assets	We do not lease assets downstream.
Franchises	We do not own any franchises.
Investments	Investments of pensions are conducted through the pension committee. These Scope 3 emissions are not considered significant when compared to other sources of Scope 3 emissions such as fuel production.

C6 Emissions Data

Biogenic Carbon Data

C6.7 - C6.7a

Carbon dioxide emissions from biogenic carbon

Carbon dioxide emissions from biogenic carbon are relevant to our organization. The biologically sequestered carbon we have reported – 86,153 metric tons CO₂e – relates to volumes of renewable fuel consumed by our locomotives.

Emissions Intensities

C6.10

Gross global combined Scope 1 and 2 emissions

Intensity figure	Metric numerator (Gross global combined Scope 1 and 2 emissions, metric tons CO ₂ e)	Metric denominator Metric denominator: Unit total	Scope 2 figure used	Percentage change from previous year Direction of change	Reason for change
0.000398	5,934,095	Unit total revenue 14,197,000,000	Location-based	-4.5% Decreased	On a unit total revenue basis, CN's emissions intensity decreased due to a combination of continued emissions reduction activities relating to fuel efficiency for our locomotives and other fleets, as well as energy reduction projects at our key yards, and an overall increase in our annual revenues. These initiatives are described in detail in response to question 4.3b), for example, lighting improvement in our yards and increased locomotive fuel efficiencies through new equipment and operational improvements and behaviours.

Emissions Intensities: Transport Services

C-TS6.15

Intensity (activity-based) metrics for our emissions from transport activities in Scope 1

Activity	Intensity figure	Metric numerator: emissions in metric tons CO ₂ e per t.km	Metric denominator: unit total Percentage change from previous year	Explanation
HDV	0.00008525	273,278	1,713,488,200 4.37%	The reported intensity figure covers 100% of the Scope 1 emissions from our truck fleet. Overall, our truck emissions intensity in 2019 increased vs 2018 due to the addition of the TransX fleet to our CNTL fleet. TransX continues to operate independently. Emission reduction measures and initiatives that have been successfully deployed at CNTL have therefore not been implemented.
Rail	0.00001405	4,962,923	353,240,109,045 -0.01%	The reported intensity figure covers 100% of our Scope 1 rail transport emissions. Overall, in 2019 our rail emissions intensity on a tonne-km basis remained relatively flat due to a combination of low network resiliency in some high-volume areas and extremely harsh cold weather conditions impacting our rail operational efficiency vs 2018.
Marine	0.00001139	191,557	16,813,121,822 2.7%	The reported intensity figure covers 100% of the Scope 1 emissions from our Great Lakes Vessel fleet. Overall, our marine emissions intensity in 2019 increased vs 2018 due to a decline in volumes that led to lower revenues per thousand kilometres.
All	0.00001454	5,427,758	371,766,719,066 2.1%	The reported figure covers 100% of the Scope 1 emissions from our freight transportation fleet. In 2019 our overall freight transportation fleet emissions intensity remained relatively flat vs 2018, mainly due to the efficiency decrease of our trucking fleet following the acquisition of TransX.

Emissions Breakdown

CO₂



C7 Emissions Breakdown

Scope 1 Breakdown: GHGs

C7.1 - C7.2

Scope 1 emissions by greenhouse gas type

Greenhouse gas	Scope 1 emissions (metric tons in CO ₂ e)	GWP Reference
CO ₂	5,300,710	IPCC Fifth Assessment Report (AR5 – 100 years)
CH ₄	8,299	IPCC Fifth Assessment Report (AR5 – 100 years)
N ₂ O	464,034	IPCC Fifth Assessment Report (AR5 – 100 years)

Scope 1 Breakdown: Country

C7.2

Scope 1 emissions by country/region

Country/Region	Scope 1 emissions (metric tons CO ₂ e)
Canada	4,070,648
U.S.	1,660,765

Scope 1 Breakdown: Business Breakdown

C7.3 - C7.3c

Gross global Scope 1 emissions breakdowns by activity

Activity	Scope 1 emissions (metric tons CO ₂ e)
Locomotives	4,962,923
Intermodal trucks	273,278
Marine fleet	191,557
On Company Service fleet	95,552
Miscellaneous fuel consumption	187,749
Intermodal equipment	60,834

Scope 1 Breakdown: Sector Production Activities

C-TS7.4

Gross global Scope 1 emissions by sector production activity

Sector production activity	Gross Scope 1 emissions (metric tonnes CO ₂ e)	Comment
Transport services activities	5,523,310	Our Scope 1 emissions that are dependent on being part of the transport services sector include emissions from our locomotive, marine and truck fleets, as well as emissions from the combustion of fuels to operate ancillary equipment in our yards. Excluded from this figure are the emissions from the operation of our company vehicles used mainly for work activities along our rail network.

C7 Emissions Breakdown

Scope 2 Breakdown: Country

C7.5

Gross global Scope 2 emissions by country/region

Country/Region	Scope 2, location-based (metric tons CO ₂ e)	Purchased and consumed electricity, heat, steam or cooling (MWh)
Canada	46,318	325,210
U.S.	115,883	232,051

Scope 2 Breakdown: Business Breakdowns

C7.6 - C7.6a

Gross global Scope 2 emissions breakdowns by business division

Business Division	Scope 2, location-based (metric tons CO ₂ e)
Western	37,264
Eastern	9,055
Southern	115,883

Scope 2 Breakdown: Sector Production Activities

C-TS7.7

Our transport service activities: global Scope 2 emissions

Sector production activity	Scope 2, location-based, (metric tons CO ₂ e)	Comment
Transport services activities	162,202	CN's Scope 2 emissions are related to the consumption of electricity in our buildings and yards, which are part of our services activities. Most of CN's offices are part of our industrial buildings and the electricity used for administrative purposes is not material compared to the electricity use for transportation services activities. CN currently doesn't operate any electric rail locomotives due to technical and economic feasibility challenges in North America.

C7 Emissions Breakdown

Emissions Performance

C7.9 - C7.9b

Gross global emissions (Scope 1 and 2 combined) compared to previous reporting year

Compared to the previous year, our gross global emissions have decreased.

Reason	Change in emissions (metric tons CO ₂ e)	Direction of change and emissions value percentage	Explanation
Change in renewable energy consumption	6,029	Decreased by 0.1%	CN increased emissions saved through the use of biodiesel blends for our locomotives. Specifically, CN increased the absolute volume of biodiesel used for locomotive engines, yielding an additional saving of 6,028 tCO ₂ e in fuel emission compared to 2018. Based on the carbon reductions, we decreased our gross carbon emissions by 0.1% $(6,028/5,965,175) * 100 = 0.1\%$ through the change in renewable energy consumption.
Other emissions reduction activities	270,676	Decreased by 4.5%	The carbon emissions from locomotives decreased due to continued implementation of projects in 2019 related to our rail locomotive emissions and energy efficiency strategy, which represent 85% of our Scope 1 and 2 greenhouse gas emissions. This includes new locomotive acquisitions, anti-idling devices and practices, and the installation of new locomotive technologies such as Trip Optimizer, CN's RTBI locomotive telemetry system, and Distributed Power Locomotives to allow running longer train. In addition, we achieved emissions savings from energy efficiency projects implemented at our key yards. This includes lighting and HVAC upgrades, as well as upgrades to air compressors. We calculated a reduction of approximately 270,676 tCO ₂ e from emission reduction activities related to locomotive fuel efficiency and energy efficiency in our buildings and yards. Based on the carbon reductions, we calculated a 4.5% reduction in emissions $(270,676/5,965,175) * 100 = 4.5\%$ decrease compared to 2018 emissions.
Acquisitions	132,518	Increased by 2.2%	In March 2019, CN closed the transaction announced on October 30, 2018, according to which CN acquired Winnipeg-based The TransX Group of Companies, one of Canada's largest and oldest transportation companies. TransX continues to be based in Winnipeg and operates independently. The increase in Scope 1 emissions from TransX operations amounts to a 2.2% increase in emissions compared to the combined Scope 1 and 2 emissions in 2018 $(132,518/5,965,175) * 100 = 2.2\%$ increase).
Change in output	91,519	Decreased by 1.5%	CN experienced decreases in emissions due to lower freight volumes. We calculated a decrease of approximately 91,519 tCO ₂ e from changes in output. Based on the changes in output, we calculated a 1.5% decrease in emissions compared to the combined Scope 1 and 2 emissions in 2018 $(91,519/5,965,175) * 100 = 1.5\%$ decrease).
Other: loss of network fluidity	204,625	Increased by 3.4%	CN experienced increases in emissions due to a combination of the significant increase in trucking operations, the low network resiliency in some high-volume areas and extremely harsh cold weather conditions at the beginning of 2019, which impacted our productivity and network fluidity. We calculated an increase of approximately 204,625 tCO ₂ e from loss of network fluidity. Based on the estimated productivity impacts, we calculated a 3.4% increase in emissions $(204,625/5,965,175) * 100 = 3.4\%$ increase).

Our calculations in C7.9 and C7.9a are based on Scope 1 and location-based Scope 2 emissions figures.

CO₂

Energy



C8 Energy

Energy Spend

C8.1 - C8.2

Percentage of total operational spend on energy-related activities

More than 15% but less than or equal to 20%.

Energy Consumption

C8.2 - C8.2a

Energy consumption totals for our energy-related activities

Activity	Heating value	MWh from renewable sources	MWh from non-renewable sources	Total (renewable + non-renewable) MWh
Consumption of fuel (excluding feedstock)	HHV (higher heating value)	287,156	21,334,214	21,621,370
Consumption of purchased or acquired electricity	N/A	177,234	380,027	557,261
Total energy consumption	N/A	464,390	21,714,241	22,178,631

C8.2b

Applications of our consumption of fuel

We only consume fuel for the generation of heat (including combustion for engines). We don't consume fuel for the generation of electricity, steam, or cooling, or for co-generation or tri-generation.

C8 Energy

Fuel Consumption by Type

C8.2c

Fuel consumed by fuel type

Fuel type (Heating value is HHV)	Total MWh consumed by the organization	MWh consumed for self-generation of heat	Emission factor (KgCO ₂ e per litre)	Emission factor source
Other: Diesel (locomotives)	18,203,164	18,203,164	2,950.2	<i>Env. Canada National Inventory Report 1990-2018, Part 2, Table A6.1-13.</i> The emission factor reported here is specific to locomotive diesel fuel.
Diesel (others)	2,346,748	2,346,748	2,724.1	<i>Env. Canada National Inventory Report 1990-2018, Part 2, Table A6.1-13, HDDV Advanced Control.</i> The emission factor reported here is for diesel consumed by our trucks and other yard equipment requiring diesel fuel to operate (excludes locomotives - emission factor provided under "other").
Propane liquid	123,380	123,380	1,544.3	<i>Env. Canada National Inventory Report 1990-2018, Part 2, Table A6.1-3.</i>
Gasoline (motor)	232,413	232,413	2,374.6	<i>Env. Canada National Inventory Report 1990-2018, Part 2, Table A6.1-13.</i>
Furnace Oil (fuel oil #2)	3,950	3,950	3,176.3	<i>Env. Canada National Inventory Report 1990-2018, Part 2, Table A6.1-4.</i>
Stove Oil (fuel oil #1)	1,028	1,028	2,761.4	<i>Env. Canada National Inventory Report 1990-2018, Part 2, Table A6.1-4.</i>
Kerosene	1,073	1,073	2,568.4	<i>Env. Canada National Inventory Report 1990-2018, Part 2, Table A6.1-4.</i>
Natural Gas	709,613	709,613	1,903.9	<i>Env. Canada National Inventory Report 1990-2018, part 2, Table A6.1-1 and A6.1-2.</i>

C-TS8.2f

Energy from the grid

We do not currently have any transport movements that directly source energy from the grid.

Transport-Related Energy Efficiency Metrics

C-TS8.5

Relevant efficiency metrics

Activity	Metric figure	Metric numerator: Unit total	Metric denominator: Unit total	Percentage change from previous year	Explanation
Rail	1,070	482,890 million gross ton miles	451.4 million gallons of fuel	0.9%	CN and other Class 1 railroads in North America often benchmark fuel efficiency using the metric of gross ton miles per gallon of fuel consumed. (A gross ton of freight includes the weight of the rail car + the weight of its contents). Our rail locomotive efficiency in 2019 vs 2018 improved by approximately 1% as a result of locomotive efficiency gains as well as overall and network fluidity improvements.

Additional Metrics

CO₂



C9 Additional Metrics

Other Climate-Related Metrics

C9.1

Additional relevant climate-related metrics

Description	Metric value	Metric numerator	Metric denominator (intensity metric only)	Percentage change from previous year	Direction of change	Explanation
Other: MWh renewable fuel energy/million tonne km	0.81	Renewable fuel energy consumption in MWh	Tonne km (millions)	11.22%	Increased	Renewable fuel regulations in Canada require an average of 2% renewables in all diesel produced or imported to Canada. Compliance with these regulations contributes to the achievement of emission reduction targets across the rail sector. In 2019, renewable fuel energy consumption per million tonne km increased vs 2018 due to an increase in the overall percentage of renewable fuel blended in the locomotive fuel we obtained from fuel suppliers. The average percentage of renewable fuel content increased from 1.5% in 2018 to 1.7% in 2019.

Low-Carbon Technology Implementation

C-TS9.3

Tracking metrics for the implementation of low-carbon transport technology

Activity	Metric	Technology	Metric figure	Unit	Explanation
Rail	Fleet adoption	Other: New high horsepower locomotives with reduced GHG and particulate matter emissions.	154	Number of locomotives	We continue to upgrade existing locomotives and acquire new locomotives enabling us to not only meet our compliance objectives but also benefit from even greater fuel efficiencies. For example, in 2019 we added 154 new high-horsepower locomotives to our fleet, and expect to take delivery of an additional 41 high-horsepower locomotives in 2020.
HDV	Fleet adoption	Other: Trucks using diesel blended with renewable fuels	2132	Number of trucks	CN's owner operated CNTL truck fleet uses diesel blended with renewable fuels when operating in Canada, in compliance with Federal and provincial clean fuel regulations. As these regulations increase in stringency, emissions from our trucks will continue to decrease in intensity.
Marine	Fleet adoption	New skewed propeller blades	1	Number of marine vessels upgraded	CN owns a fleet of seven marine vessels operating on the Great Lakes. In 2019, CN installed new skewed propeller blades on one of these vessels. These new blades reduce engine vibration, which will extend their life, and the fuel efficiency of the vessel, contributing to reduced carbon emissions from its operation.
LDV	Fleet adoption	New electric vehicles	1	Number of electric LDVs	As part of our sustainability strategy to reduce emissions through energy efficiency projects at our yard, CN purchased a fully electric light-duty vehicle and a level II charging station in 2019. The vehicle will be used for the transportation of mechanical engineers between our yards in the Lower Mainland, BC.

C9 Additional Metrics

Low-Carbon Investments

C-TS9.6 - C-TS9.6a

Investment in research and development of low-carbon products or services over the last three years

With approximately 85% of our GHG emissions generated from rail operations, we believe the best way to reduce our carbon footprint is by continuously improving our rail fuel efficiency. Over the years, this focus has led us to strategically focus on investing in new technologies to drive even greater efficiency through investments in research and development. For example, CN has invested in a 5-year optimization research project with the Université de

Montréal to develop mathematical models that have the potential to improve operational and fuel efficiency (and reduce carbon emissions). These models focus on two key areas for efficiency improvements: optimized locomotive power on trains, and improved aerodynamics of intermodal trains. Preliminary results have been produced and are under review. CN is in year 3 of this research project and thus the business impacts have not yet been realized.

Activity	Technology area	Stage of development	Average percentage of total R&D investment over the last 3 years	Investment in the reporting year	Comments
Rail	Smart systems	Large scale commercial deployment	41 - 60%	C\$4,600,000	In addition to the capital-intensive renewal of our fleet, the development and deployment of smart systems such as fuel-efficient technologies and big data management analytics capabilities are helping us further reduce our carbon footprint and are part of our low-carbon transition plan in alignment with our science-based target reduction of 29% GHG emission intensity by 2030. We estimate the annual R&D costs associated with the development and deployment of smart systems to be \$4,600,000.
Rail	Smart systems	Applied research and development	≤20%	C\$200,000	CN has invested in a 5-year optimization research project with the Université de Montréal to develop mathematical models that have the potential to improve operational and fuel efficiency (and reduce carbon emissions). These models focus on two key areas for efficiency improvements: optimized locomotive power on trains, and improved aerodynamics of intermodal trains. Preliminary results have been produced and are under review. CN is in year 3 of this research project and thus the business impacts have not yet been realized.
HDV	Electrification	Pilot demonstration	21 - 40%	C\$4,800,000	As part of our sustainability strategy to reduce emissions through innovation, we recently launched a pilot project to use electric trucks. Working with Lion Electric Co., we committed to eight zero-emission electric trucks to be deployed in cities across our network, such as Vancouver, Greater Toronto, Montreal and Hamilton. They will be tested for various tasks such as urban delivery, container shuttle service to port operations and cross-town service. The trucks are custom-built, produce no noise pollution and are estimated to remove 100 tonnes of GHG from the road annually. By using the zero-emission trucks in different settings, we want to identify where these trucks can make the most impact on how we service our customers and reduce emissions. The project is also spurring innovation and creating jobs in nearby communities (https://www.cn.ca/en/news/2019/04/cn-launches-new-pilot-project-using-electric-trucks/).
LDV	Electrification	Small scale commercial deployment	≤20%	C\$55,000	As part of our sustainability strategy to reduce emissions through energy efficiency projects at our yard, CN purchased a fully electric light-duty vehicle and a level II charging station in 2019. The vehicle will be used for the transportation of mechanical engineers between our yards in the Lower Mainland, BC.

CO₂

Verification



C10 Verification

Verification

C10.1

Verification applying to reported emissions

Scope	Verification/assurance status
Scope 1	Third-party verification or assurance process in place.
Scope 2 (location-based or market-based)	Third-party verification or assurance process in place.
Scope 3	Third-party verification or assurance process in place.

C10.1a - C10.1c

Verification/assurance undertaken for Scope 1, 2 and 3 emissions

Scope	Verification or assurance cycle in place	Status in the current reporting year	Type of verification or assurance	Relevant standard	Proportion of reported emissions verified (%)
Scope 1	Annual process	Complete	Limited assurance	ISAE 3410	86%
Scope 2 location based	Annual process	Complete	Limited assurance	ISAE 3410	100%
Scope 3 categories, including:	Annual process	Complete	Limited assurance	ISAE 3410	100%
<ul style="list-style-type: none"> • Purchased goods and services • Capital goods • Fuel and energy-related activities (not included in Scope 1 or 2) • Upstream transportation and distribution 					

Other Verified Data

C10.2 - C10.2a

Other verified climate-related information

Disclosure module verification relates to	Data verified	Verification standard	Explanation
C6. Emissions data	Year on year change in emissions (Scope 1)	Limited assurance in accordance with the ISAE 3410 standard	A third party has verified the change in our Scope 1 emissions from locomotive fuel consumption included in our total Scope 1 emissions figure reported in C6.1 vs the corresponding figure for 2019. Emissions from locomotive fuel consumption account for almost 90% of our total direct emissions. We complete this verification on an annual basis to track our emissions performance.
C6. Emissions data	Year on year change in emissions (Scope 2)	Limited assurance in accordance with the ISAE 3410 standard	A third party has verified the change in our 2019 location-based Scope 2 emissions from consumption of electricity in our buildings and yards in C6.3 vs the corresponding figure for 2018. Data verified accounted for 100% of our Scope 2 emissions. We complete this verification on an annual basis to track our emissions performance.
C6. Emissions data	Year on year change in emissions (Scope 3)	Limited assurance in accordance with the ISAE 3410 standard	A third party has verified the change in our 2019 Scope 3 emissions from diesel fuel production included in our total Scope 3 emissions reported in C6.5 vs the corresponding figure for 2018. Data verified accounted for 98% of our Scope 3 emissions. We complete this verification on an annual basis to track our emissions performance.
C8. Energy	Other: Energy consumption for locomotive diesel fuel	Limited assurance in accordance with the ISAE 3410 standard	A third party has verified the 2019 diesel locomotive fuel consumption in MWh reported in C8.2c. Fuel consumption for our locomotives accounts for 86% of our total direct fuel consumption. We complete this verification on an annual basis to track our energy performance.
C8. Energy	Other: Energy consumption for electricity	Limited assurance in accordance with the ISAE 3410 standard	A third party has verified the 2019 energy consumption from purchased electricity C8.2a. The figure reported accounts for 100% of our electricity consumption in our buildings and yards. We complete this verification on an annual basis to track our energy performance.

Carbon Pricing

CO₂



C11 Carbon Pricing

Carbon Pricing Systems

C11.1 - C11.1b Applicable carbon trading regulations

System name	Percentage of Scope 1 emissions covered by the ETS . Percentage of Scope 2 emissions covered by the ETS	Period start and end date	Allowances purchased	Verified Scope 1 emissions in metric tons CO ₂ e	Details of ownership	Comments
Ontario Cap and Trade	4.1% . 0%	January 1, 2019 - December 31, 2019	548	548	Purchases and imports of fossil fuels	In Cap and Trade jurisdictions, all purchases of fossil fuels within the jurisdiction include a carbon price component that is flowed through to CN by our fuel suppliers. In addition, CN must purchase emission allowances for any imports of fossil fuels from outside the Cap and Trade jurisdiction to be consumed within the jurisdiction. Allowance purchases reported here reflect fossil fuel imports ONLY as per the regulation. Coverage of Scope 1 emissions reflects total propane imported in Quebec subject to the carbon price flow through.
Nova Scotia Cap and Trade	0.8% . 0%	January 1, 2019 - December 31, 2019	183	183	Purchases and imports of fossil fuels	In Cap and Trade jurisdictions, all purchases of fossil fuels within the jurisdiction include a carbon price component that is flowed through to CN by our fuel suppliers. In addition, CN must purchase emission allowances for any imports of fossil fuels from outside the Cap and Trade jurisdiction to be consumed within the jurisdiction. Allowance purchases reported here reflect fossil fuel imports ONLY as per the regulation. Coverage of Scope 1 emissions reflects total propane imported to Nova Scotia subject to the carbon price flow through.

C11.1c Tax systems in which we participate

Tax system	Period start date	Period end date	Percentage of total Scope 1 emissions covered by tax	Total cost of tax paid	Comment
BC carbon tax	January 1, 2019	December 31, 2019	12.7%	C\$30.5 million	Carbon tax obligations are tracked and paid monthly by Accounts Payable with support from the Taxation group.

C11.1d Strategy for complying with the systems we are regulated by

DESCRIPTION OF STRATEGY FOR COMPLYING WITH THE SYSTEM

Our strategy to comply with the emission trading and tax systems is to ensure we effectively monitor, forecast and plan for the impacts of carbon pricing and regulations on our business. On an annual basis, we report and verify our emissions, track our fuel consumption and import volumes to calculate regulated emissions, and submit the required verified reports, and pay our carbon tax and Cap and Trade liabilities promptly.

EXAMPLE OF HOW THE STRATEGY HAS BEEN APPLIED

For example, within each of the jurisdictions, we track our monthly fuel purchases and consumption data to estimate carbon cost impacts to the company, as well as to determine our regulatory compliance obligations under the respective Cap and Trade or tax systems. Cap and Trade compliance

obligations are tracked by the Sustainability department, who arrange to participate in the quarterly emissions allowance auctions as required. Carbon tax obligations are tracked and paid monthly by Accounts Payable with support from the Taxation group. Furthermore, to minimize our compliance risks and carbon price costs, our Fuel Procurement department has continued to follow a strategy to eliminate fuel imports across jurisdictions and source fuel locally as much as possible (except in emergencies where local fuel is unavailable). For example, in 2019 CN had no diesel fuel imports into the provinces of Quebec or Nova Scotia. Emissions allowance purchase requirements were minimized to cover imports of propane to fuel switch heaters, which could not be sourced locally. In addition, we continue to focus on our fuel efficiency and carbon management strategy, which will further enable us to minimize our exposure to carbon costs.

C11 Carbon Pricing

Project-Based Carbon Credits

C11.2

Project-based carbon credits

We have not originated or purchased any project-based carbon credits within the reporting period.

Internal Price on Carbon

C11.3 - 11.3a

How our organization uses an internal price on carbon (GHG Scope 1)

CN has established an internal shadow price of carbon of \$25 per metric ton.

CN's objective for implementing an internal carbon price include:

- Navigate GHG regulations
- Stakeholder expectations
- Change internal behaviour
- Drive energy efficiency
- Drive low-carbon investment
- Identify and seize low-carbon opportunities
- Supplier engagement

CN has established an internal price on carbon as a strategic planning tool, considering that addressing climate change is a business cost and opportunity. The development of an internal price of carbon helps to identify revenue opportunities, risks, and creates an incentive to drive energy efficiencies to reduce costs. The use of a shadow price across the jurisdictions where we operate simplifies planning.

VARIANCE OF PRICE(S) USED

To account for the range of carbon costs across Canadian provinces that have implemented carbon price mechanisms through carbon taxes and Cap and Trade markets, or that have to adhere to the federal backstop, we review our internal price on carbon annually. The annual review considers changes to the pricing schemes as well as our operations.

For business decisions that pertain to a single jurisdiction, such as the decision to import fuel vs purchasing local, we consider the actual carbon cost, yielding a variance of the price from C\$18 per tCO₂e (QC/ON) to C\$35 per tCO₂e (BC).

IMPACT AND IMPLICATION

The use of the carbon price is critical for the development of a sound low-carbon transition plan in support of our carbon emissions reduction target. It is also a key input for scenario planning purposes.

For example, the carbon price is applied by our corporate procurement group to inform business decisions related to the purchase of fuel and propane. Our sustainability and tax groups apply the carbon price to ensure we meet our compliance obligations under Canadian GHG regulatory requirements. We internalize the cost of carbon based on current and projected carbon tax and Cap and Trade carbon pricing analysis. Based on our analysis up until 2022, we have estimated our carbon price to be on average \$25 per tonne of carbon in 2019, with an increase to \$50 per tonne of carbon by 2022 for our Canadian operations.

Engagement

CO₂



C12 Engagement

Supplier Engagement

C12.1 - 12.1a

Climate-related supplier engagement strategy

Type of engagement	Details of engagement	Percentage of suppliers by number	Percentage total procurement spend (direct and indirect)	Percentage of supplier-related Scope 3 emissions as reported in C6.5	Rationale for the coverage of our engagement	Impact of engagement, including measures of success
Information collection (understanding supplier behaviour)	Collect climate change and carbon information at least annually from suppliers	5%	34%	70%	<p>In 2019, we continued to engage with our major fuel suppliers to collect information on the type and percentage renewable blend composition of our fuel supply.</p> <p>Understanding the fuel composition and the associated GHG emissions is critical for us to ensure we comply with renewable fuel regulations in Canada and to continue to work towards our GHG reduction targets.</p> <p>Engaging our suppliers in pilot studies also enables us to continuously explore how we can enhance the renewable content in our blends and thereby decrease our emissions.</p> <p>Major fuel suppliers account for approximately 5% of our 59 tier 1 critical suppliers. However, fuel is CN's third-biggest operating expense and makes up 34% of our operational expenses on raw materials, goods and services procured. Scope 3 emissions from the production of fuel account for 70% of our total Scope 3 emissions reported in C6.5.</p>	<p>Key measures of success of this engagement include the percentage of renewable fuels in our blends as well as our overall fuel efficiency. These two success factors need to be balanced to ensure sustainable and economically viable operations.</p> <p>In 2019, the continued collaboration with our suppliers enabled our fuel management team and operators to increase our emissions savings from the use of renewable fuels to 78,291 tonnes CO₂e, while simultaneously improving our fuel efficiency by 1%.</p> <p>The data and information we obtain from monitoring these metrics inform our engagement with our fuel suppliers e.g., concerning refined data/information requests as well as procurement decisions.</p>

C12 Engagement

Customer Engagement

C12.1b

Climate-related customer engagement strategy

Type of engagement	Details of engagement	Percentage of customers by number	Percentage customer-related Scope 3 emissions as reported in C6.5	Rationale for selecting this group of customers and scope of engagement	Impact of engagement, including measures of success
Education/information sharing	Run an engagement campaign to educate customers about the climate change impacts of (using) our products, goods, and/or services	100%	0%	<p>We proactively engaged with customers committed to carbon management who were interested to learn more about CN's performance.</p> <p>We also provide public forums for our customers to understand how shipping their goods by rail will benefit their business. For example, our web-based carbon calculator – the first of its kind in the industry - is a public forum that allows customers and potential customers to estimate the emissions from rail, marine and truck transportation. As the carbon calculator is a public forum we assume all customers participate.</p> <p>In addition, we respond to numerous investor and customer requests about emissions associated with hauling customer freight and opportunities to further reduce them.</p>	<p>We assess the success of our engagement through different measures.</p> <p>For example, we track the use of our web-based calculator. Specifically, in 2019, we had over 3500 requests for carbon emissions calculations through our web calculator, an increase of more than 70% versus the previous year.</p> <p>In addition, we leverage the growth of our intermodal business segment as a measure of success as it exemplifies the value we create for our customers helping them to shift their freight transport from highway to rail. Specifically, in 2019, revenues from our intermodal business segment increased by C\$322 million or 9% vs 2018 of which a portion was market share gains from modal shift.</p>
Collaboration and innovation	EcoConnexions Partnership program	32%	0%	<p>Launched in 2014, CN's EcoConnexions Partnership Program aims to both partner with and recognize customers who are committed to building an efficient and more sustainable future, including leveraging the environmental benefits of shipping heavy freight over long distances by rail rather than truck, to reduce emissions.</p> <p>Each year, customers are invited to partake in the program and submissions are evaluated based on sustainable policies, energy efficiency, reporting to the CDP, and modal shift.</p>	<p>As a result of our engagements through the EcoConnexions Partnership Program, we have influenced performance on energy efficiency and carbon reporting. In addition, we contributed to increasing market share from customers shifting from truck to our more sustainable rail transportation for long haul shipments. We have also worked collaboratively with our customers to protect environmental ecosystems.</p> <p>For example, through the EcoConnexions Customer Partnership Program CN has planted more than 520,000 trees since 2014.</p> <p>A specific measure of success of this program is the number of participants. In 2019, the number of participants increased from 40 to 45 and we were able to increase the number of trees planted from 100,000 to 120,000 trees. 23 of the participants represent 15.3% of our top 150 customers.</p>

C12 Engagement

Public Policy Engagement

C12.3 - C12.3a

Direct engagement in activities to influence policy makers on climate-related issues

Focus of legislation	Corporate position	Details of engagement	Proposed legislative solution
Cap and Trade	Support	We engage with various Canadian federal and provincial governments (Quebec and Nova Scotia) on their Cap and Trade systems to position rail freight as a viable low-carbon transportation solution.	We support provincial and state carbon markets within Canada and the U.S. We believe that involvement with leading policymakers on carbon markets moves the transportation sector forward in identifying practical solutions that contribute to, and support, future policy developments in a manner that will foster low-carbon economic growth while ensuring significant GHG emission reductions.
Climate finance	Support	We engage with various Canadian federal and provincial governments on funding to support and grow the transportation of freight by rail as a means of decreasing emissions in the transportation sector. Rail is approximately 4 times more fuel efficient than truck, reducing GHG emissions by 75% for an equivalent volume of freight.	We advocate for the allocation funds to support modal shift from truck to rail (including investment in rail infrastructure) as a means of reducing freight transportation emissions. We also support investment in rail fuel efficiency technologies and innovation to further increase the efficiency benefits of shipping by rail.

C12.3b - C12.3c

Trade associations CN belongs to which are likely to take a position on climate change legislation

Trade association	Is our position on climate change consistent with theirs?	The trade association's position	How we have influenced, or are attempting to influence their position
Railway Association of Canada (RAC)	Yes	<p>The Railway Association of Canada (RAC) represents close to 60 freight and passenger railway companies. RAC's mission is to work with governments and communities across the country to ensure that Canada's rail sector remains globally competitive, sustainable, and most importantly, safe.</p> <p>The Railway Association of Canada, in April 2019, announced that it has signed a Memorandum of Understanding (MOU) with Transport Canada to establish voluntary reduction targets for emissions produced by locomotives in Canada. This is the fourth MOU signed by RAC and the federal government since 1995, and it demonstrates the rail industry's long-time commitment to reducing locomotive emissions (https://www.railcan.ca/news/fourth-memorandum-of-understanding-mou-signed-between-the-railway-association-of-canada-and-the-federal-government-for-reducing-locomotive-emissions/).</p>	<p>CN is a long-standing full member of RAC and actively engaged in initiatives such as the MOU with Transport Canada and the development of the emissions target.</p> <p>CN holds two seats on RAC's Board of Directors. One of CN's representative was recently appointed as RAC's Chair of the Board, the first female Board Chair in RAC's 103-year history.</p> <p>CN's Director of Sustainability is a co-chair of the Environment Committee and works closely with RAC's Policy Analyst and Program Coordinator on matters of policy, emissions regulations, and climate risks and opportunities.</p>
Association of American Railroads (AAR)	Yes	<p>Founded in 1934, AAR is the world's leading railroad policy, research, standard-setting and technology organization that focuses on the safety and productivity of the U.S. freight rail industry. AAR Full members include the seven Class I freight railroads in the United States, Canada and Mexico.</p> <p>Working with elected officials and leaders in Washington, DC, AAR advances sound public policy that supports the interests of the freight rail industry to ensure it will continue to meet America's transportation needs. The AAR positions freight rail as being ahead of other land modes of surface transportation when it comes to limiting its carbon footprint. Yet it also advocates and works with its members to enhanced operating practices and rail car components to minimize fuel usage by improving aerodynamics and reducing overall weight, friction between wheels and rail, and total horsepower required for moving the train.</p>	<p>We engage with the AAR as a member of the organization and support them in promoting cleaner, greener, efficient, and environmentally responsible transportation solutions.</p>

C12 Engagement

Public Policy Engagement (continued)

C12.3d
Public disclosure of research organizations we fund

Yes, we publicly disclose a list of all the research organizations we fund.

C12.3e
Details of other engagement activities we undertake

Description: We play an active role in the advocacy of rail as part of the climate change solution with federal, provincial and state governments in North America. Rail transportation is approximately four times more fuel-efficient than trucks, translating into a 75 percent reduction in greenhouse gas emissions for an equivalent volume of freight. CN firmly believes that solutions to meet Canada's emission reduction targets should include encouraging shippers to use the most carbon-friendly transportation option available.

Method of Engagement: We have engaged with the federal, provincial and state governments in North America through individual meetings, as well as through the Railway Association of Canada.

Topic of Engagement: The topic of engagement is how railways can help meet jurisdictional emissions reductions targets.

Nature of Engagement: Our engagement relates to educating the federal, provincial and state governments on the environmental benefits of shipping by rail vs truck through discussions as well as through the submission of a written brief outlining these benefits and the proposed actions that can be taken to encourage the shipment of freight by rail.

Action Advocated as Part of Engagement: Actions advocated include allocating funds to support modal shift from truck to rail, investment in rail fuel efficiency technologies and innovation, investment in rail infrastructure, harmonizing the regulatory regime for carbon regulations and markets in North America and climate adaptation.

C12.3f
Processes to ensure all direct and indirect activities that influence public policy are consistent with our overall climate change strategy

The direct and indirect activities that could influence public policy are typically reviewed by the Government and Public Affairs department on an annual basis to ensure alignment with the strategic direction of the business, including our climate change strategic focus areas. Public policy decisions that could impact

our overall climate strategy are communicated to the sustainability team to be validated for consistency with our climate strategy. Where inconsistencies are noted, recommendations are proposed to ensure alignment.

Communications

C12.4
Information CN has published relating to our response to climate change and GHG emissions performance

Publication	Status	Content elements	Comments
In mainstream reports	Complete	Governance; strategy; risks and opportunities; other metrics; and other fuel efficiency	We publish information on our sustainability initiatives, our fuel efficiency performance (directly relates to our locomotive emissions), as well as business risks related to climate change in our Annual Report and our Investor Fact Book, available on our website www.cn.ca .
In voluntary sustainability report	Complete	Emissions figures; emission targets; and other metrics	We publish statistics related to our carbon inventory, emissions intensity, emissions targets and other energy and fuel efficiency metrics in our Delivering Responsibly Data Supplement, available on our website www.cn.ca .