Carbon and Energy Efficiency
Improving Our Overall Performance

We recognize the importance of mitigating and adapting our business to changing climate conditions. Our strategies support keeping global temperature increase below 2 degrees Celsius, covering both our rail and non-rail carbon footprint.

Reducing Our Rail Carbon Footprint

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.

Operating More Efficiently

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. We continue to purchase new locomotives that meet stricter regulatory emission standards while being more fuel efficient. In 2018, we purchased 200 new high-horsepower locomotives. Routing protocols and collaborations with ports and terminal operators are helping to minimize dwell times and further drive fuel efficiency.

Leveraging New Technologies

The installation of fuel-efficient technologies and big data management analytics capabilities are helping us further reduce 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. With significant investments in big data management analytics, we expect to see even greater efficiency gains.

Introducing Renewable Fuels

The growth of the renewable fuel market has presented an important opportunity for us to further reduce our emissions by using biodiesel blends in our locomotive fleet. In 2018, the use of renewable fuels in our fleet saved almost 100,000 tonnes of carbon. In the coming years, we look forward to working with our suppliers to explore the greater use of renewable fuels.

45 million

TONS OF CARBON AVOIDED THROUGH FUEL EFFICIENCY GAINS SINCE 1993

Improving Fuel Conservation

"*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.*

In addition, 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."

CARLO PAGANO
Director, Mechanical Engineering and Technology

Collaborating to Reduce Rail Sector Emissions Progress Towards Our Mid-term Goals

We've had a long-term commitment, since 1995, collaborating with the Government of Canada through the Railway Association of Canada (RAC) to reduce locomotive emissions.

Over the past 25 years, we have reduced our locomotive emission intensity by 39%, avoiding over 45 million tons of carbon, while achieving record growth in the volume of freight we move.

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 a five-year period ending in 2022. We have also proactively set a target to reduce our Criteria Air Contaminants intensity by 6% over the same period.
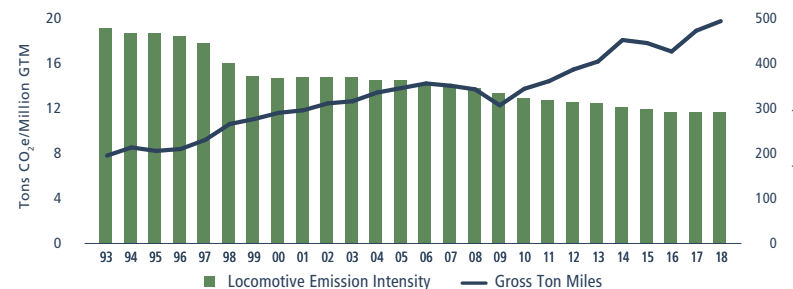
The MOU supports the Government of Canada's commitments under the Pan-Canadian Framework for Clean Growth and Climate Change, and its vision for green and innovative transportation. It also includes developing a comprehensive pathway for aligning government and industry efforts to reduce emissions produced by the railway sector, identifying opportunities to advance clean technology, clean fuels, and innovation in the sector through research, policy or programs.

Rail accounts for about 4% of Canada's transportation GHG emissions. By context, rail moves nearly 70% of intercity ground freight each year and is one of the least GHG intensive modes of transportation. CN shares the government's belief that rail can play an important role in the fight against climate change.

Decoupling Growth from Carbon Emissions

CARBON EMISSION INTENSITY vs. GROSS TON MILES (GTMs)
(Tons CO_2e/Million GTM vs. Traffic Billion GTM)

Y-axis (left): Tons CO_2e/Million GTM — 0, 4, 8, 12, 16, 20
Y-axis (right): GTMs (Billions) — 0, 100, 200, 300, 400, 500
X-axis: 93 94 95 96 97 98 99 00 01 02 03 04 05 06 07 08 09 10 11 12 13 14 15 16 17 18

■ Locomotive Emission Intensity　—— Gross Ton Miles

SINCE 1993:

39%

REDUCTION IN LOCOMOTIVE GHG INTENSITY

45 million

TONS OF CARBON AVOIDED
while achieving record growth in the volume of freight we move.

PICTURED:
Clearwater, BC
Photo by CN employee, Ryan Harris

OUR PLAN

Low Carbon Transition Plan
Mitigating and Adapting to Climate Risks and Opportunities

We support the Taskforce on Climate-related Financial Disclosures' recommendations. Through our climate transition plan, we are working to mitigate and adapt to climate risks and opportunities.

Governance: The Environment, Safety and Security Committee of the Board has the highest level of responsibility for climate-related issues, with executive oversight from our Chief Operating Officer and Vice-President of Financial Planning, who has direct oversight for sustainability at CN.

Strategy: We have developed a low carbon transition plan to meet our 2-degree climate science target. To achieve our 29% reduction target, we will be mainly focused on locomotive carbon efficiencies from installing fuel-efficient technologies, promoting better fuel conservation and increasing renewable fuel blends.

Risk Management: Climate change is integrated into our risk assessment processes, which considers both physical and transition risks and opportunities, including temperature extremes, flooding, hurricanes, and tornadoes, as well as legal, policy and market impacts.

Long-term Science-based Target: As we prepare for the future, we are committed to reduce air emissions and improve our carbon intensity consistent with stabilizing global temperatures. Two years ago, we were the first railroad in North America to set a climate science target of 29% reduction by 2030 based on 2015.

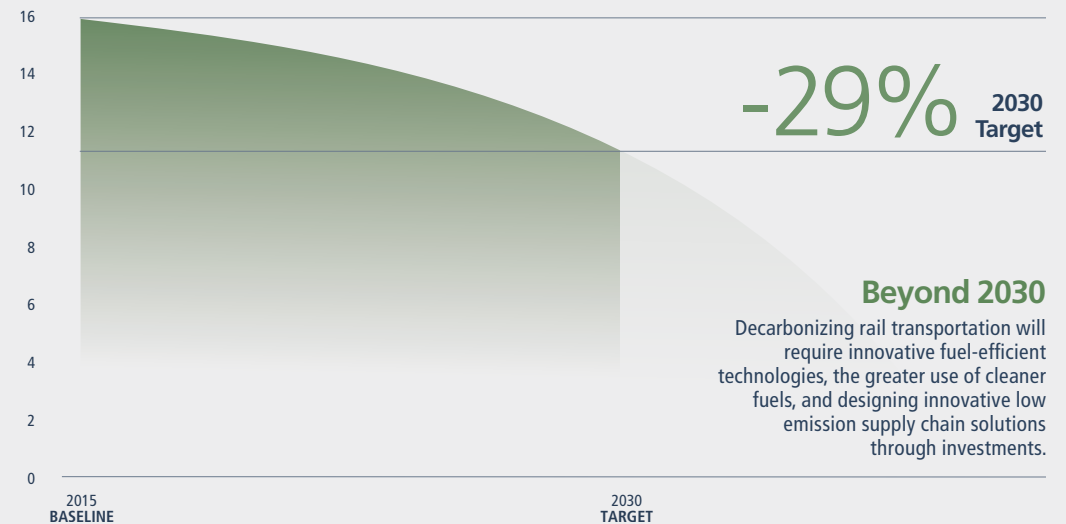**FURTHER READING ONLINE**

➕ 2019 Carbon Disclosure Project Report

Our Strategic Focus Areas

Investing in and Upgrading Our Fleets

Increasing Fuel-efficient Technologies

Leveraging the Use of Big Data

Enhancing Operating Practices

Expanding the Use of Cleaner Fuels

Science-based Target

EMISSIONS TRAJECTORY IN A 2°C SCENARIO
(tCO$_2$e/million tonne kilometres)

-29% **2030 Target**

Beyond 2030

Decarbonizing rail transportation will require innovative fuel-efficient technologies, the greater use of cleaner fuels, and designing innovative low emission supply chain solutions through investments.

Our Strategy
Advancing Our Carbon Positive Initiatives

Innovations in fuel-efficient locomotives, rail technology, and data analytics, combined with enhanced operating practices and cleaner fuels will help us realize further emissions reductions.

Investing in and Upgrading Our Fleets

Increasing Fuel-efficient Technologies

Leveraging the Use of Big Data

Enhancing Operating Practices

Expanding the Use of Cleaner Fuels

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.

Looking to the Future:
The Next Power Generation

Collaborating with governments and industry, we are looking to the future now. Discussions on the prospects of electrification and hydrogen power trains are underway. The rail industry in Canada has been actively working with the Government of Canada since 1995 to address the impacts of its activities on the environment, and recently, we participated in a study examining the opportunities and challenges of electrifying rail operations across the country.

Reducing Our Non-rail Carbon Footprint

Efficiency is in our DNA and we extend our mindset of rail operational efficiencies to our non-rail operations, enabling further carbon reductions in our ground and vessel fleets, buildings and yards.

The carbon footprint of our non-rail operations comprises approximately 15% of our total (Scope 1 and 2) emissions. By building on our leading rail fuel efficiency programs, we have been implementing best practice initiatives, including new equipment and technologies, to further reduce energy consumption.

Upgrading Our Ground Fleet

Our non-rail ground fleet, comprising intermodal equipment, trucking, On Company Service (OCS) vehicles and CNTL trucks, makes up approximately 11% of our Scope 1 and 2 emissions. Over the past few years, we have been focused on improving fuel efficiency, while exploring options to make the shift towards higher use of renewable fuels.

We have also started exploring electric vehicles in our OCS fleet, and have recently announced an innovative pilot project to use electric trucks for our intermodal services. Our teams also continued to be trained on fuel-efficient techniques, from aerodynamic components of trucks to innovative routing optimization initiatives.

Retrofitting Yards and Buildings

Our $5-million CN EcoFund combined with government and utility incentives and subsidies has enabled us to secure the necessary funding to drive energy-efficient upgrades in our buildings and yards. We have invested in retrofits to boilers, air compressors, HVAC systems, and LED lighting, enabling us to improve our carbon efficiency and save costs. Since 2011, we achieved 33% reductions in electricity at key yards, avoiding more than 86,000 tonnes of carbon.

Meeting Strict Requirements for Our Vessel Fleet

Our marine services extend beyond where track and trucks stop, offering marine shipping in regions like the Great Lakes and Alaska. Our shipping fleets offer safe, and highly fuel-efficient fleet transportation services and are continually upgraded to meet strict emission requirements. Ship operators are also trained on fuel conservation practices, including strict speed protocols and operating parameters.

33%
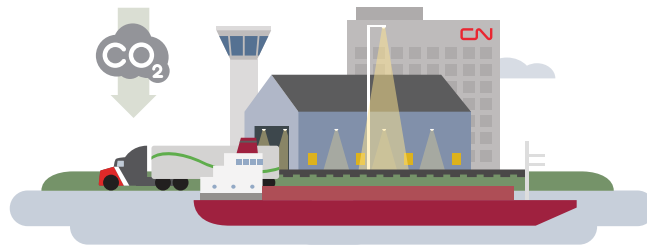
REDUCTION IN CARBON EMISSIONS AT KEY FACILITIES SINCE 2011

Lowering Energy Use in Our Facilities

EcoChampion Hamid Kazmi, Energy Manager with CN's Facility Management Group in Thornton Yard, BC, works with facilities managers and utilities across our network to reduce CN's energy costs and usage. He examines energy consumption patterns at each facility, then identifies and helps implement measures for improvement.

To date, in BC alone, these projects have saved about 6.4 million kilowatt-hours of electricity, eliminating an estimated 82 tonnes of GHG emissions and $500,000 in energy costs per year.

"I'm very proud of the work we're doing not only to improve CN's bottom line and change the culture in the company, but also to do our part in the fight against climate change," says Hamid.

HAMID KAZMI
Energy Manager, Facility Management Group
Thornton Yard, BC

PICTURED:
Prototype of CN's new
custom-built, Class 8, electric
truck. Delivery is expected in
the summer of 2020.

Sustainable Mobility:
Piloting the Use of Electric Trucks

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. "We are very pleased to support CN in its commitment to sustainable mobility," says Patrick Gervais, VP Marketing and Communications at The Lion Electric Co. "By purchasing zero-emission trucks from Lion, CN is also promoting local innovation and jobs. Lion Electric will have 200 employees by the end of 2019 and more than 1,000 within the next 10 years thanks to agreements like this one."

100 tonnes

**OF CARBON AVOIDED PER YEAR ESTIMATED THROUGH THE USE OF
NEW ELECTRIC TRUCKS**