Green Transportation

Welcome to ICTC's WIL eLearning: Green Transportation

ICTC's WIL Digital is an innovative Work Integrated Learning (WIL) program that helps students gain insight and skills to advance learning and meaningful work experience.

COURSE OVERVIEW

Addressing environmental concerns and sustainable practices has become more critical than ever. Implementing green transportation offers innovative solutions to reduce carbon emissions, enhance urban mobility, and create a cleaner planet.

Through this course, you will learn all about **green transportation**, from its fundamental concepts to its real-world applications.

Reserve your seat for the Lunch and Discovery networking event: https://calendly.com/c-reynolds-ictc/ictc-wil-e-learning-lunch-and-discovery-sessions

TARGETED AUDIENCE

The target audience for this course is post-secondary Work Integrated Learning (WIL) students currently in a subsidized work placement through ICTC's WIL Digital. This includes Canadian citizens, permanent residents or protected persons as defined by the *Immigration and Refugee Protection Act* enrolled in a program at a Canadian accredited post-secondary institution.

This course is recommended for post-secondary students in their second, third, or fourth year of study, who are interested in understanding the types of green transportation and the benefits, implementation, and infrastructure.

As a participant, you will:

- Have access to six unique micro-learning modules;
- Discover ways to potentially launch your future career in green transportation;
- Add new skills to your professional portfolio;

ABOUT THIS COURSE

Each module of this course lasts approximately 1-2 hours and should be completed during your work placement. Each module is broken into individual lessons highlighting specific learning objectives. It is advisable to devote one week to each module and four weeks to the case study. There is also a final case study module that will take approximately three to four hours of work over two weeks.

Participants in this course will benefit from:

- Access to six separate and self-guided learning modules including an end of course case study based on a hypothetical situation;
- Developing an appreciation for the many steps required to achieve net zero emissions;
- Gaining knowledge to help launch a career in green transportation.

Upon completion of this training, you will be able to:

- Explain what Net Zero is and identify ways in which carbon-reducing transportation can contribute to Net Zero;
- List traditional transportation methods, their impact on the environment, and compare green transportation methods and their impact;
- Speak to a variety of green transportation options and approaches, along with the significance of each;
- Highlight how green transportation can reduce emissions, the key benefits, drawbacks, production, and infrastructure requirements;
- Analyze green transportation solutions from a variety of perspectives.

COURSE OUTLINE

WIL e-Learning Course Outline Green Transportation - EN.pdf

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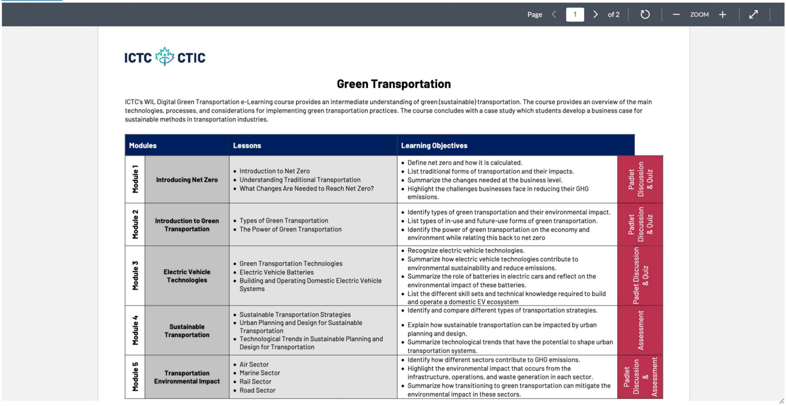

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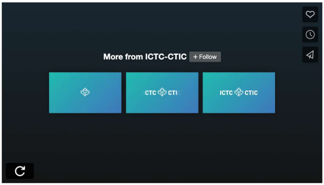
Green Transportation

ICTC's WIL Digital Green Transportation e-Learning course provides an intermediate understanding of green (sustainable) transportation. The course provides an overview of the main technologies, processes, and considerations for implementing green transportation practices. The course concludes with a case study which students develop a business case for sustainable methods in transportation industries.

Modules		Lessons	Learning Objectives	
Module 1	**Introducing Net Zero**	• Introduction to Net Zero • Understanding Traditional Transportation • What Changes Are Needed to Reach Net Zero?	• Define net zero and how it is calculated. • List traditional forms of transportation and their impacts. • Summarize the changes needed at the business level. • Highlight the challenges businesses face in reducing their GHG emissions.	Padlet Discussion & Quiz
Module 2	**Introduction to Green Transportation**	• Types of Green Transportation • The Power of Green Transportation	• Identify types of green transportation and their environmental impact. • List types of in-use and future-use forms of green transportation. • Identify the power of green transportation on the economy and environment while relating this back to net zero	Padlet Discussion & Quiz
Module 3	**Electric Vehicle Technologies**	• Green Transportation Technologies • Electric Vehicle Batteries • Building and Operating Domestic Electric Vehicle Systems	• Recognize electric vehicle technologies. • Summarize how electric vehicle technologies contribute to environmental sustainability and reduce emissions. • Summarize the role of batteries in electric cars and reflect on the environmental impact of these batteries. • List the different skill sets and technical knowledge required to build and operate a domestic EV ecosystem	Padlet Discussion & Quiz
Module 4	**Sustainable Transportation**	• Sustainable Transportation Strategies • Urban Planning and Design for Sustainable Transportation • Technological Trends in Sustainable Planning and Design for Transportation	• Identify and compare different types of transportation strategies. • Explain how sustainable transportation can be impacted by urban planning and design. • Summarize technological trends that have the potential to shape urban transportation systems.	Assessment
Module 5	**Transportation Environmental Impact**	• Air Sector • Marine Sector • Rail Sector • Road Sector	• Identify how different sectors contribute to GHG emissions. • Highlight the environmental impact that occurs from the infrastructure, operations, and waste generation in each sector. • Summarize how transitioning to green transportation can mitigate the environmental impact in these sectors.	Padlet Discussion & Assessment

TOPIC OVERVIEW

Watch this introductory video for a more in-depth synopsis of what this course offers.



[Media description: Animated video with illustrations in time with audio narration.]

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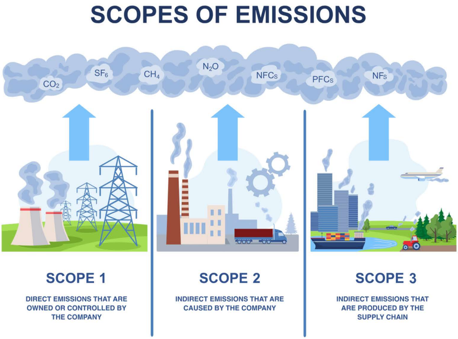
Green Transportation

Last-Mile Delivery Vehicles - Specialized vehicles designed and employed for the transportation of goods during the final leg of their journey from a distribution centre to their final destination.

Fossil Fuels - Non-renewable energy sources like diesel that release carbon emissions when burned.


SCOPES OF EMISSIONS
CO₂
SF₆
CH₄
N₂O
NFCs
PFCs
NFs
SCOPE 1
DIRECT EMISSIONS THAT ARE OWNED OR CONTROLLED BY THE COMPANY
SCOPE 2
INDIRECT EMISSIONS THAT ARE CAUSED BY THE COMPANY
SCOPE 3
INDIRECT EMISSIONS THAT ARE PRODUCED BY THE SUPPLY CHAIN

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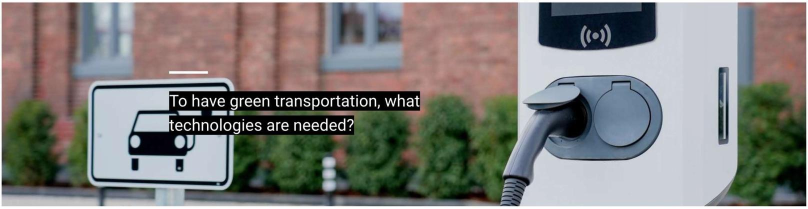
Green Transportation Technologies



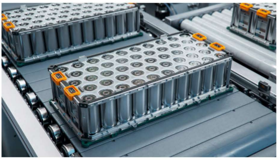
To have green transportation, what technologies are needed?

Green transportation can play a key role in reducing carbon emissions and promoting environmental sustainability in the transportation sector. There are many types of technology that are currently used or being introduced in green transportation.

Click ‘START’ to learn more about the types of technologies in green transportation.

Types of Technologies in Green Transportation

START



A lithium-ion battery is shown in production.

In some countries, these technologies are common and in others, they are just being introduced. In the first example below, meet a company that is introducing battery swap stations in Europe. Then, we'll consider how Canada is introducing zero-emission vehicles and incentivizing their adoption.

Europe

The European Union would like to see 30 million EVs on their roads by 2030. To aid in this goal, they plan to ban the sales of new petrol and diesel cars by 2035. To help the transition to EVs from petrol and diesel cars, one of the key concerns that will need to be addressed is long EV charging times. To overcome this challenge, an EV maker called NIO has opened their first “Power Swap Station” in Denmark. Drivers can replace their empty battery with a new, fully charged one. The previous battery is then charged in the station to prepare for its next use. This station will also allow those who do not have the proper charging infrastructure to use this new technology instead. The fastest battery charge time can be as little as thirty minutes, but a battery swap only takes five minutes.

NIO plans to open over 100 of these stations in Europe throughout 2023, which will contribute to their goal of having more than 2,300 stations globally. At this time, the NIO Power Swap Station will only be able to assist NIO vehicles.

Canada

In Canada's 2030 Emissions Reduction Plan: Clean Air, Strong Economy, the Canadian government is mandating more and more light-duty zero-emission vehicles (ZEVs) to be sold each year. The goal is to reach 100% ZEV sales by 2035, with interim targets of at least 20% by 2026 and at least 60% by 2030. To support and encourage Canadians and Canadian businesses to adopt ZEVs, the Canadian government initiated the Zero-Emission Vehicles (iZEV) Program in May 2019. The iZEV Program provides purchase incentives to consumers (depending on funding availability and vehicle eligibility) when they purchase or lease a ZEV, making ZEVs more affordable for consumers.

To keep up with **the growing demand for EVs**, **batteries are needed**. In the next lesson, you will explore **the different types of EV batteries**, their production, and their impact on performance and cost.

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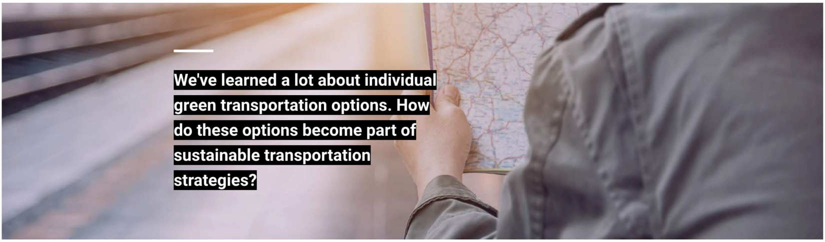
Sustainable Transportation Strategies



We've learned a lot about individual green transportation options. How do these options become part of sustainable transportation strategies?

In Module 1: Introduction to Green Transportation, we defined green transportation broadly as transportation options that result in reduced, minimal, or no environmental harm in comparison to traditional methods of transportation. In Module 3: Electric Vehicle Technologies, we learned a great deal about electric vehicles (EVs). Considering what we've covered, reflect for a moment on the potential of EVs.

Reflection Question - The Sustainability of EVs

Would replacing every internal combustion engine vehicle with an EV solve the environmental, social, and economic issues facing transportation?

In other words, are EVs alone a sustainable solution?

Why or why not?

In reflecting upon these questions, consider the following definition of sustainable transportation from the United Nations:

> "The provision of services and infrastructure for the mobility of people and goods—advancing economic and social development to benefit today's and future generations—in a manner that is safe, affordable, accessible, efficient, and resilient, while minimizing carbon and other emissions and environmental impacts."
>
> - **United Nations Secretary-General's High-Level Advisory Group on Sustainable Transport**

When you are done, click 'CONTINUE.'

Reflection Question - Debrief

Streets filled with EVs would look nearly the same as streets filled with internal combustion engine vehicles. Even if all internal combustion vehicles were changed to EVs, issues of congestion, collisions, parking demand, accessibility, and affordability would persist.

Let's consider the perspective of **Cariad Garratt**, an expert in the field of sustainability with 20 years of experience as a project manager, facilitator, and analyst. Cariad helps her clients achieve sustainability and climate change goals, including developing plans for net-zero emission transportation. Her recent work includes:

- Managing the development of Climate Action Plans for several local governments
- Leading the development of Electrification Roadmaps for the Ports of Vancouver and Prince Rupert
- Supporting the development of a plan to transition BC Automobile Association's operations to net-zero
- Working with staff at the University of British Columbia - Okanagan Campus to map out climate action pathways for their fleet, facilities, and commuters traveling to campus

Here are Cariad's thoughts on the reflection question:

> "Sustainable transportation has many facets to it. It's not as simple as swapping all the vehicles on the road to be electric. That will certainly help reduce emissions, but it won't address some fundamental needs in our transportation system. For truly sustainable transportation systems, we need to provide people options that are accessible, affordable, efficient, safe, and convenient to access their daily needs. Although cars have dominated the primary mode of transportation across Canada for decades, growing populations have been accompanied by lengthening commute times, meaning that people need to spend more time in their cars to get to the same places."
>
> - **Cariad Garratt, B. Sc., principal and founder of environmental**

consulting firm Pinna Sustainability

Additionally, enabling travel across Canada by EV will require investing heavily in updating infrastructure, particularly in remote and rural areas.

The longevity of existing infrastructure is also a concern because EVs are currently heavier than internal combustion engine vehicles. This extra weight could lead to roads degrading faster and requiring maintenance sooner than anticipated.

In sum, green transportation focuses on environmental impacts, while a truly sustainable transportation strategy must consider **environmental**, **social**, and **economic** impacts together.

To review some of the goals of sustainable transportation, click on the images of the flashcard stack below to reveal the text. Once completed, click the arrow to move forward.

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Intermodal Freight and Passenger Transportation

Canada's a big country, and moving goods from coast to coast to coast is a big business.

A truck, a plane, a train, and a cargo ship traverse a world map.

As we've learned in previous modules, the road sector (to which medium- and heavy-duty trucks belong) is the most polluting method of transportation. Trucks move most of the goods across Canada, as well as between Canada and the United States. Rail is the next most popular method, while air and water are used much less frequently.

This reality brings up a key question: **How can businesses ensure the reliable flow of goods across and between countries while reducing their impact on the environment?**

Intermodal Freight Transportation

One way for businesses to reduce their environmental impact while moving goods is to use intermodal freight transportation, in which two or more methods of transportation are used. Whether intermodal transportation is a green option depends on the mixture of modes and the optimization of containerization.

Containerization is central to the process of intermodal transportation. It involves packing freight into containers of a standard size that can be transported by multiple methods of transportation. Trucks, ships, and trains can all transport larger containers. If planes are used, the freight must be repacked into smaller containers. Keeping freight in the same container for as long as possible is more efficient than repacking.

A container handler, a specialized forklift, moves a shipping container.

Intermodal transportation can be a green option when the use of traditional trucks is reduced, the use of air is reduced or eliminated, and the use of marine and rail is increased. It becomes greener when it incorporates low- or zero-emission trucks, electric or hydrogen-powered trains, and ships that run on biofuel.

In intermodal transportation, trucks are primarily used at the beginning and end of the freight's journey. Let's explore how trucks can be combined with two other transportation modes for a more sustainable journey.

Truck-Marine Transportation

Combining trucks with ships can be one way to improve the sustainability of supply chains.

Click the tabs below to explore truck-marine transportation.

CONTEXT | PROCESS | KEY CONSIDERATIONS

Items are packed into containers at a warehouse and then loaded onto trucks. The trucks transport the containers to a port, where the containers are loaded onto the ship.

The ship leaves port. Throughout the journey, documentation will be provided to stakeholders and government authorities as needed.

Once the ship reaches its destination port, its contents might be inspected. Once cleared, the containers are unloaded and moved to trucks. The trucks take the containers to a warehouse or distribution centre.

Image Caption: A cargo ship docked at Halifax Harbour, Nova Scotia.

Now that you know more about the truck-marine process, let's explore one of the changes marine ports are making to operate more sustainably.

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