

Back to the Future

**Energy Revealed
Activity**
Grade Level: 4-7



Main Objectives

Learners explore how the movement of goods has changed over time. They examine different means of transporting freight, which makes up 43% of transportation emissions in Canada. Learners take on the task of historically sorting a set of Moving Goods Cards. In analyzing the cards, they also consider speed and pollution to weigh the sustainability of different modes of transportation. After working with the Moving Goods Cards, learners also examine one of three case studies to identify transportation solutions and then create their own ideas for transporting goods. They reflect on options for the future and consider how decisions today impact the future.

Learning Outcomes

By the end of this activity, learners will:

- Investigate how their food reaches them via modes of transportation
- Explore the pros and cons of historical, present day, and future alternatives to how we move freight
- Consider how to revitalize older modes of transportation in ways that could reduce our impact on the environment
- Envision a different future and explore sustainable ways to transport freight

Length of Activity

3 hours

Materials List

Energy Needs: The Ways We Use Energy Backgrounder
 Energy and the Environment: The Impacts of Our Energy Use Backgrounder
 Taking Action: Personal Choices About Energy Use Backgrounder
 Moving Goods Cards Printout with Answer Key
 Three of the case studies from the Sustainable Transportation Case Studies Backgrounder: Go Fly a Kite, Building Bikes and Bearing Food, and Getting Charged About Electric

Step 1: Introduction

- Ask learners to bring in one favourite processed food snack or lunch item. Ask them to list all ingredients, and then create a mind map showing three or more steps of how three or more ingredients travelled from their source to learners' homes.
- Ask learners to consider questions like:
 - How might people have accessed their snacks or lunch in Canada 100 years ago?
 - How does the environmental impact of transportation differ for whole and processed foods?
 - How does the transportation of goods differ from personal travel?
 - What do you think has contributed to changing the way goods move and where they come from? (Cheap fuel and trade policy have both had a large influence)

- b. Explain or discuss the differences and connections between personal travel and the travel of the goods and services we use. The impact of personal travel is direct while the impact of transporting goods and services is indirect.
- c. Tell learners they will explore how the transportation of goods has changed and that knowing about the movement of goods we use can help inform the choices we will make in the near future.
- d. As a class, enjoy a sample of local food and ask learners how they would define local?

Step 2: Main Activity

Part A

- a. Put learners into groups of three and provide each group with a complete set of the Moving Goods Cards. Tell the learners they will be sorting the cards in three different ways. They will have five minutes to complete each sorting task, and they will have five minutes afterwards to make some observations. Using the information provided at the end of this lesson, review what information they will find on the cards, explain the concepts of distant versus recent past, and assign roles within each group. Each group will need a timekeeper to track time; a recorder to record the final sequence; and a gatekeeper to ensure that everyone gets to participate.
- b. Sorting historically: Ask learners to organize the cards into three categories - distant past, recent past, and present - to generally capture their historical sequence. You can ask the recorders to quickly jot down the card number sequence or to use a cell phone or digital camera to snap a picture of the cards in sequence.
- c. Sorting by speed: Next, ask learners to sort the cards according to speed by placing the cards in order from the slowest mode of transportation to the fastest.
- d. Sorting by impact: Ask learners to sort the cards again, this time by considering the amount of pollution associated with each type of transportation.
- e. Encourage learners to make observations and discuss their results using prompt questions:

- How have modes of transportation changed over time?
 - Which modes are fastest? Slowest?
 - Which pollute most? Least?
- f. Spend ten minutes with the class revealing the correct sequences on the board. To do so, see the answer key included at the end of this lesson. Lead a discussion with the class, using general questions:
 - What patterns did you see in the card values you explored?
 - What, if anything, surprised you about the sequences?
 - What modes have outlasted others? Do older modes still have use?
 - What do you think this says about the future of transporting goods?

Part B

- a. Show learners that the total emissions from shipping goods continue to rise despite more efficient modes of transportation. There are two main factors that cause emissions to rise: the increasing quantity of goods and the increasing speed at which they move. This is not a sustainable approach to transporting goods. With more efficient and less environmentally harmful technology, people around the world are finding better ways to transport goods.
- b. Tell learners that they are going to learn about some success stories that reduced emissions for moving goods, which will prepare them to explore their own ideas.
- c. Form groups of three learners and provide each group with a copy of one of these three case studies (from the Sustainable Transportation Case Studies Backgrounder):
 - Go Fly a Kite: Sailing Ships With Power
 - Getting Charged About Electric: Vehicles for Now and the Future
 - Building Bikes and Bearing Food: A School Where Food and Transport Meet
- d. Ask the groups to identify (a) how their case study relates to moving goods, (b) what solution is suggested in the case study, and (c) what they liked about the story.

- e. After 15 minutes, ask the class as a whole to share their insights and any other thoughts on how we move goods.
- f. After debriefing, tell learners that their final task is to form a design team to find or invent a way to make ONE mode of transporting goods (e.g., ship, rail, truck, zeppelin, airplane, bike) less harmful to the environment and more efficient. In their design teams, they will create a short case study of their own, using the list of solutions in Figure 1 for inspiration below.
- g. Ask learners to use the same basic format for their case study as they found in the sample case study. Tell them to be prepared to provide a brief class presentation that includes:
 - two benefits and one challenge of moving goods this way
 - a diagram, drawing or photograph of the technology/idea/design in use
 - an explanation of how this idea is being used, or could be used, far and wide
 - what they are most proud of in their design and why
 - the advice they would give to someone trying to create a solution for this mode of transportation
- h. Plan a period in the library and/or computer lab and allow at least one day out of class time for the groups to prepare their case.
- i. Ask the groups to make their presentations in class during the first half of class, keeping to the requested two-to-three-minute time limits, and allowing time for one or two questions from learners. With groups of three, there will be eight to ten presentations of case studies if all groups present.

Step 3: Conclusion

- a. After the case study presentations, lead a class discussion to debrief the learners' experiences and perspectives. Sample questions to explore include:
 - Of the designs you heard about, which ones sounded most promising? Why?
 - How do you think transportation patterns are changing now and will change in the future?

- How do you predict our needs and wants as consumers may change as a result?
 - What is the importance of putting less demand on transported goods? (i.e., by buying less or buying locally, you conserve energy and reduce emissions).
 - How has your thinking on the transportation of goods changed from this exercise?
- b. Collect the class case studies. As a class, you may wish to share your case studies in school or with GreenLearning. Contact us at info@greenlearning.ca for more information about sharing your case studies with us.

Teaching Tips

You may wish to prepare the Moving Goods Cards a few days in advance. If you make colour copies and have them laminated, you will have a lasting resource.

Extension Ideas

1. **See The Story of Stuff as a class.** Watch the movie *The Story of Stuff*, available online at www.storyofstuff.com. In twenty well-spent minutes, this animated film by Annie Leonard explores consumer society and the life cycle of material goods.
2. **Collaborate on solutions.** Explore emissions reductions strategies with learners at the Victoria Transportation Policy Institute: <http://www.vtpi.org/ster.pdf>.
3. **Conduct life-cycle analyses.** Ask learners to conduct a life-cycle analysis of a product or products that they use regularly and to focus particularly on transportation. This exercise could be tied to and would enrich the exploration of ecological footprints.
4. **Teach "Living Within Earth's Means."** Explore learners' needs and wants using Barbara Duncan's lesson "Living Within Earth's Means" (see p. 140–144 in *Teaching Green—The Middle Years*, edited by Tim Grant and Gail Littlejohn, Toronto, 2004). To view the table of contents or purchase the book, visit www.greenteacher.com, and <https://greenteacher.com/product/teaching-green-the-middle-years/>.

5. **Design a game.** Invite learners to design a game using the Moving Goods Cards (or portions of them). Ask them to devise a game that can be played with the Grade 3 class down the hall or shared at an information booth for families during a school open house. Learners write out rules and present them to the class. They may make multiple copies of the cards and/or design their own to expand upon the themes.
6. **Explore the benefits of local food.** Invite a local farmer to speak to the class or at an assembly on the benefits of local food. Include an opportunity for learners to taste-test samples of local produce. Alternatively, arrange a field trip to a local farm or to a community garden.

Ways to Reduce Transportation Emissions From Moving Goods	
	Avoiding Transportation
1	Reduce volume and/or weight in product design.
2	Reduce the volume and/or weight of product packaging (i.e., less containerization).
3	Concentrate products by removing some components (e.g., fruit juices).
4	Exchange data electronically rather than in print (e.g., via the internet rather than newspapers).
5	Relocate production or assembly closer to the point of consumption.
	Operations
6	Provide training in eco driving.
7	Reduce truck idling, especially overnight and at pickup/drop-off.
8	Reduce speed and generate less empty mileage (via ship, train or truck).
9	Use longer trains and double stacking containers or larger ships.
10	Minimize ship use of diesel power in ports.
11	Use collaborative transport networks.
	Technological Solutions
12	Retrofit: Add devices to remove engine emissions (e.g., diesel particulates filter).
13	Repower: Replace existing engines with new engines with lower emissions levels.
14	Refuel: Use cleaner alternative fuels (e.g., second generation biodiesel).
15	Repair/Rebuild: Better maintain engines to keep them at maximum performance.

Figure 1. Adapted from Erik van Agtmaal's "Ways of Evaluating and Mitigating CO₂ emissions in Goods Transport at Firm Level," Green Logistics Consultants Group, Transport and Energy: The Challenge of Climate Change, www.internationaltransportforum.org/Topics/Workshops/WS3vanAgtmaal.pdf