



Lesson Plan

CSX Trains: Carbon Calculator

Created: 04/2016 by the National FFA Organization

STUDENT LEARNING OBJECTIVES

After completing these activities students will...

1. Use a Carbon Calculator to evaluate the CO₂ emissions produced by shipping goods via train versus trucks.
2. Compare the benefits of transporting goods by train versus trucks.
3. Articulate why they believe it's important to understand production of CO₂ emissions.

TIME REQUIRED: 30 minutes

RESOURCES:

1. FFA.org
2. Website: CSX: Carbon Calculator: <https://www.csx.com/index.cfm/about-us/responsibility/environment-and-efficiency/carbon-calculator/>

EQUIPMENT AND SUPPLIES NEEDED:

1. A copy of the "Further for Less by Train" worksheet for each student.
2. Internet access for students to complete the worksheets.

THIS QUICK LESSON PLAN WOULD WORK WELL AS:

1. A portion of an environmental service systems curriculum.
2. A portion of a food products/processing systems curriculum.
3. A portion of a power, structural and technical systems curriculum.
4. A portion of an agricultural companies lesson/unit.

THESE ACTIVITIES ARE ALIGNED TO THE FOLLOWING STANDARDS:

AFNR Performance Element

- CS.06: Analyze the interaction among AFNR systems in the production, processing and management of food, fiber and fuel and the sustainable use of natural resources.

FFA Precept

- FFA.PG-J.Mental Growth: Embrace cognitive and intellectual development relative to reasoning, thinking and coping.
- FFA.CS-M.Communication: Effectively interact with others in personal and professional settings.

Common Career Technical Core

- AG6: Analyze the interaction among AFNR systems in the production, processing, and management of food, fiber, and fuel and the sustainable use of natural resources.

NASDCTec

- AGC05.02 Identify how key organizational systems affect organizational performance and the quality of products and services to demonstrate an understanding of how AFNR systems are managed and improved.

Common Core- Reading: Informational Text

- CCSS.ELA-Literacy.RI.9-10.3: Analyze how the author unfolds an analysis or series of ideas or events, including the order in which the points are made, how they are introduced and developed, and the connections that are drawn between them.

Common Core- Writing

- CCSS.ELA-Literacy.W.9-10.1 Write arguments to support claims in an analysis of substantive topics or texts, using valid reasoning and relevant and sufficient evidence.

Common Core- Speaking and Listening

- CCSS.ELA-Literacy.SL.9-10.1: Initiate and participate effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on grades 9-10 topics, texts and issues, building on others' ideas and expressing their own clearly and persuasively.

Common Core- Science & Technical Subjects

- CCSS.ELA-Literacy.RST.9-10.4: Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 9-10 texts and topics.

Common Core- Literacy in Science & Technical Subjects: Writing

- CCSS.ELA-Literacy.WHST.9-10.6: Use technology, including the Internet, to produce, publish, and update individual

or shared writing products, taking advantage of technology's capacity to link to other information and to display information and to display information flexibly and dynamically.

AFNR Career Ready Practices

- CRP.02.: Apply appropriate academic and technical skills. Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive.

Partnership for 21st Century Skills

- Critical Thinking and Problem Solving
- Information, Communications and Technology Literacy

LESSON PLAN:

1. Introduction:

We know that many of the foods that we eat and products that we use aren't grown or made anywhere near where we live. Based on demand, those goods have to get to us somehow. Some methods of delivery are more earth friendly than others.

Ask students the following (or similar) questions to begin talking about product delivery and its effects:

- "What are methods of product transport?"
- "Which do we think are the most efficient? Consider time, fuel and emissions."
- "Which do we think takes the most fuel and thus emits the most CO₂ into the air?"

Include other similar questions to gauge the awareness and understanding level of transportation emissions.

- a. *Transition:* CSX, a transportation supplier, does a good job introducing us to the transportation of goods and raising awareness of the effects of different methods.....

- 2. Activity:** Distribute the handout "Further for Less by Train" to each student. Give instructions for them to fill out the worksheet.
 - a. They will need to utilize the accompanying website in order to complete the handout. The link is provided on this lesson plan.
- 3. Follow-up:** Have students discuss the last questions about what they thought was interesting from the results, and why they think it's important to consider emissions is important with another student. Facilitate a class wide discussion revolving around their thoughts and their reasoning.
- 4. Leveling Up:** As an additional activity, have students research the emissions and effects resulting from other methods of transportation, including airplane, ship and trucks. Students can present findings to compare the information.

NAME: _____

Aligned to the following standards:
CS.06; AG6; AGC05.02; CCSS.RI.9-10.3; CCSS.W.9-10.1; CCSS.RST.9-10.4;
CCSS.WHST.9-10.6; CRP.02

Further for Less by Train

DIRECTIONS:

Check out CSX's tool Carbon Calculator by following the link, <https://www.csx.com/index.cfm/responsibility/environmental-stewardship/carbon-calculator/>. Using the calculator, complete the sections below. Work through one commodity (column) at a time to record accurate data.

Step 1: Goods			
For each column, click the appropriate commodity button.			
Bricks	Groceries	Electronics	Rubber
Step 2: Distance			
Select an origin city and destination city. Record them here, as well as the approximate rail miles between the two.			
Origin City:	Origin City:	Origin City:	Origin City:
Destination City:	Destination City:	Destination City:	Destination City:
Approximate Rail Miles:	Approximate Rail Miles:	Approximate Rail Miles:	Approximate Rail Miles:
Step 3: Freight Volume			
Select one of the three options. Record it here.			
Freight Volume:	Freight Volume:	Freight Volume:	Freight Volume:
Step 4: Results			
Record the results from your choices below.			
How many rail cars would it take to haul this load?	How many rail cars would it take to haul this load?	How many rail cars would it take to haul this load?	How many rail cars would it take to haul this load?
Releasing how much CO2 emissions?	Releasing how much CO2 emissions?	Releasing how much CO2 emissions?	Releasing how much CO2 emissions?
How many trucks would that be?	How many trucks would that be?	How many trucks would that be?	How many trucks would that be?
CO2 emissions from those trucks?	CO2 emissions from those trucks?	CO2 emissions from those trucks?	CO2 emissions from those trucks?
Saved CO2 emissions:	Saved CO2 emissions:	Saved CO2 emissions:	Saved CO2 emissions:
Record one way this equals either homes, forests, or vehicles:	Record one way this equals either homes, forests, or vehicles:	Record one way this equals either homes, forests, or vehicles:	Record one way this equals either homes, forests, or vehicles:
Click RESET	Click RESET	Click RESET	Click RESET
Step 5: Reflecting			
Record your answer to the following questions.			
What do you find interesting about the results? Why is it important to think about emissions?			

NAME: _____

Further for Less by Train - Key

DIRECTIONS:

Check out CSX's tool "Carbon Calculator" by following the link, <https://www.csx.com/index.cfm/responsibility/environmental-stewardship/carbon-calculator/>. Using the calculator, complete the sections below. Work through one commodity (column) at a time to record accurate data. (SAMPLE ANSWERS – Answers will vary per selections of students).

Step 1: Goods			
For each column, click the appropriate commodity button.			
Bricks	Groceries	Electronics	Rubber
Step 2: Distance			
Select an origin city and destination city. Record them here, as well as the approximate rail miles between the two.			
Origin City: <i>Baltimore</i>	Origin City: <i>Birmingham</i>	Origin City: <i>Boston</i>	Origin City: <i>New York City</i>
Destination City: <i>Maryland</i>	Destination City: <i>Jacksonville</i>	Destination City: <i>Washington D.C.</i>	Destination City: <i>Atlanta</i>
Approximate Rail Miles: <i>207 rail miles</i>	Approximate Rail Miles: <i>490 rail miles</i>	Approximate Rail Miles: <i>491 rail miles</i>	Approximate Rail Miles: <i>969 rail miles</i>
Step 3: Freight Volume			
Select one of the three options. Record it here.			
Freight Volume: <i>2,500 tons</i>	Freight Volume: <i>5,000 tons</i>	Freight Volume: <i>2,500 tons</i>	Freight Volume: <i>10,000 tons</i>
Step 4: Results			
Record the results from your choices below.			
How many rail cars would it take to haul this load? <i>32 rail cars</i>	How many rail cars would it take to haul this load? <i>63 rail cars</i>	How many rail cars would it take to haul this load? <i>32 rail cars</i>	How many rail cars would it take to haul this load? <i>114 rail cars</i>
Releasing how much CO ₂ emissions? <i>12 tons</i>	Releasing how much CO ₂ emissions? <i>59 tons</i>	Releasing how much CO ₂ emissions? <i>29 tons</i>	Releasing how much CO ₂ emissions? <i>232 tons</i>
How many trucks would that be? <i>179 trucks</i>	How many trucks would that be? <i>278 trucks</i>	How many trucks would that be? <i>139 trucks</i>	How many trucks would that be? <i>1111 trucks</i>
CO ₂ emissions from those trucks? <i>54 tons</i>	CO ₂ emissions from those trucks? <i>198 tons</i>	CO ₂ emissions from those trucks? <i>99 tons</i>	CO ₂ emissions from those trucks? <i>1566 tons</i>
Saved CO₂ emissions: <i>41 tons</i>	Saved CO₂ emissions: <i>139 tons</i>	Saved CO₂ emissions: <i>70 tons</i>	Saved CO₂ emissions: <i>1334 tons</i>
Record one way this equals either homes, forests, or vehicles: <i>CO₂ emissions from the electricity use of 5 homes in 1 year.</i>	Record one way this equals either homes, forests, or vehicles: <i>27 acres of pine forests absorbing carbon 1 year</i>	Record one way this equals either homes, forests, or vehicles: <i>Removing the greenhouse gas emissions of 12 passenger vehicles for 1 year.</i>	Record one way this equals either homes, forests, or vehicles: <i>CO₂ emissions from the electricity use of 147 homes in 1 year.</i>
Click RESET	Click RESET	Click RESET	
Step 5: Reflecting			
Record your answer to the following question.			
What do you find interesting about the results? Why is it important to think about emissions? <i>Student opinion. Protects the environment. Sustainability. Being wise with resources.</i>			

NAME: _____