

Changing Lifestyles

Natural Resources

High School Guide

REACH Up

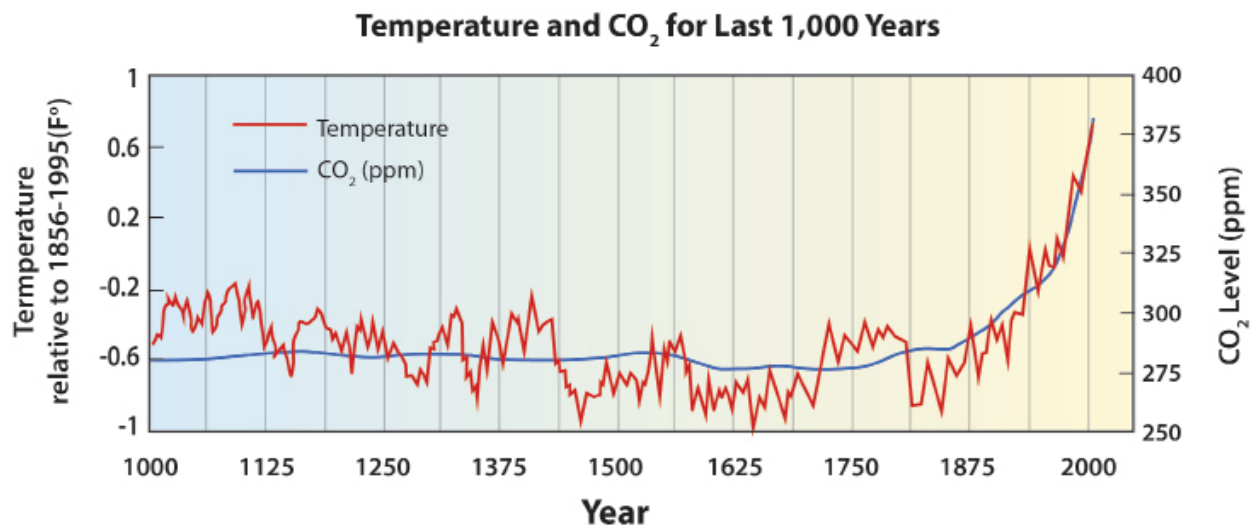
Raising Educational Achievement
through Cultural Heritage Up

Changing Lifestyles

Climate Change and Carbon Dioxide

Carbon dioxide (CO₂), like water vapor and methane, is a greenhouse gas that contributes to the warming of our global climate. It is naturally produced by volcanic eruptions and forest fires, as well as by the breathing of people and animals. It is also produced by burning any type of fuel. During the last two centuries, global carbon dioxide levels have increased.

The graph below shows that carbon dioxide in the atmosphere increased significantly starting in the 1800s. This coincides with the Industrial Revolution, when people began making things in factories. The factories burned coal and wood to run their machinery, and contributed carbon dioxide to the atmosphere from their smokestacks.



Graph showing increasing temperatures and CO₂ levels, modified from an article by Bill Chameides, PhD., Duke University. Data sources for CO₂: Law Dome ice core and Mauna Loa air samples. Data source for temperature: NOAA. Source: *Environmental Defense Fund*, 2007.

Today we contribute carbon dioxide in many ways. The factories that make the products we use, the airplanes that transport us and deliver our packages, the furnaces and woodstoves that heat our homes, and the vehicles we drive all produce carbon dioxide.

Changing Lifestyles

The landscapes in the northern part of the world are changing as a result of the warmer climate. People in the Bering Strait region are adapting their lifestyles to adjust to these changes. Some are also making lifestyle changes to reduce the amount of carbon dioxide and other pollution they create, so they do not further contribute to the greenhouse effect and warming of the climate. How does the warming climate impact lifestyles in your community?



What are Renewable and Nonrenewable Resources?

Natural resources are anything in the environment that humans use to meet their needs and wants. Natural resources can be divided into two categories: renewable and nonrenewable. A renewable resource is something that is either always available or can be naturally replaced in a relatively short period of time. A nonrenewable resource is defined as a natural resource that is being used up faster than it can be replaced by natural processes.



These wind turbines outside of Unalakleet capture wind energy, enabling the town to supplement their power grid with renewable energy. *Photo: Putt Clark, REACH Up.*



The Trans-Alaska Pipeline currently pumps about 500,000 barrels of oil a day, from Prudhoe Bay to Valdez. Petroleum is a nonrenewable resource. *Photo: Kelsey Skonberg, REACH Up.*



Activity

Ask an Expert

1. Watch the video *Impact on Energy* available at www.k12reach.org/videos.php.
2. Interview an elder or cultural knowledge bearer in your community. Some questions you may want to ask:
 - What natural resources did people in our community use in the past? What natural resources do people in our community use today?
 - How did people travel in the past compared to today? How often did barges and airplanes come to the village in the past compared to today?
 - How did people heat their homes in the past compared to today?
 - What types of clothing did people wear in the past compared to today?
3. If the person you interview speaks an Alaska Native language, ask them what language and dialects they are familiar with. Ask them to please translate the following words:
 - airplane
 - barge
 - clothing
 - fuel
 - nonrenewable resource
 - renewable resource

Compare your words with the translations on the Natural Resources Vocabulary page in this guide. Are any of the terms the same or similar?



Sheldon Katchatag of Unalkeet, speaks about our dependency on fossil fuels and how challenging it is to not use them. *Photo: Qian Li, REACH Up.*



Natural Resources Vocabulary

Would you like to know Alaska Native language terms related to natural resources?

Work with your classmates to practice natural resources vocabulary words in English and the indigenous language of your community. Your teacher will give you vocabulary cards with the English word and an illustration on one side. Write the corresponding indigenous term on the blank line on the back of each card. Use the words that you learned from a local elder or cultural knowledge bearer, or choose the translation below that is closest to your community.



Miriam Toolie - Siberian Yupik
 St. Lawrence Island Yupik dialect
 Savoonga, AK

airplane - **tengekayuk**
 barge - **angyaghpak**
 clothing - **atkaq**
 fuel - **mesiiq**
 nonrenewable resource - **navyaghqaq**
 renewable resource - **nutaghquq**



Becky Atchak - Yup'ik
 Northwest dialect
 Stebbins, AK

airplane - **tengsuun**
 barge - **kangiraulek**
 clothing - **akluq**
 fuel - **uquq**
 nonrenewable resource - **atunqiggngailnguq cat**
 renewable resource - **atunqiggluki cat**



Jolene Nanouk - Iñupiaq
 Qawiaraq dialect
 Unalakleet, AK

airplane - **tiñisuun**
 barge - **umiam kalia**
 clothing - **atnuḡaaq**
 fuel - **uqsruq**
 nonrenewable resource - **atunñaittuat**
 renewable resource - **atunñaqtuat**



Renewable and Nonrenewable Fashion Show

What materials are your clothes made of?

Clothing can be made from renewable or nonrenewable sources. All of the renewable materials listed below come from plant and animal resources. Nature will be able to replace these resources as long as they are not overharvested. All of the nonrenewable materials listed are manmade from petroleum products. Petroleum is refined from crude oil, which is a fossil fuel.

Example Materials	
Renewable	Nonrenewable
Cotton	Polyester
Fur	Spandex
Leather / Hide / Skin	Nylon
Silk	Arcrylic
Wool	Rayon
Natural rubber	Synthetic rubber

Homework

1. Your teacher will announce the dates of the Research Day and Fashion Show. For homework, choose the clothes you will wear for the Fashion Show. You will need to bring them to school on the Research Day, and either wear or bring them to school again on the day of the Fashion Show.

Research Day

2. Work with a partner. Interview your partner about their clothing items and what they are made of. For store-bought items, read the tags. Decide if each fabric or material is from a renewable or nonrenewable resource. If you are unsure, ask your teacher if you may use the internet to learn the source of the material.



3. Prepare a short speech for introducing your partner. Write down what you plan to say. For example, "This is _____. He/she is wearing a shirt that is made of 50% cotton and 50% polyester. Cotton is a plant, which is a renewable resource. Polyester comes from petroleum, which is a nonrenewable resource."





Fashion Show

4. Your class will make up the audience at the Renewable and Nonrenewable Fashion Show. When it is your turn to introduce your partner, speak clearly and loud enough for the audience to hear. When it is your turn to model your clothing examples, have fun with it!



Carbon Footprint

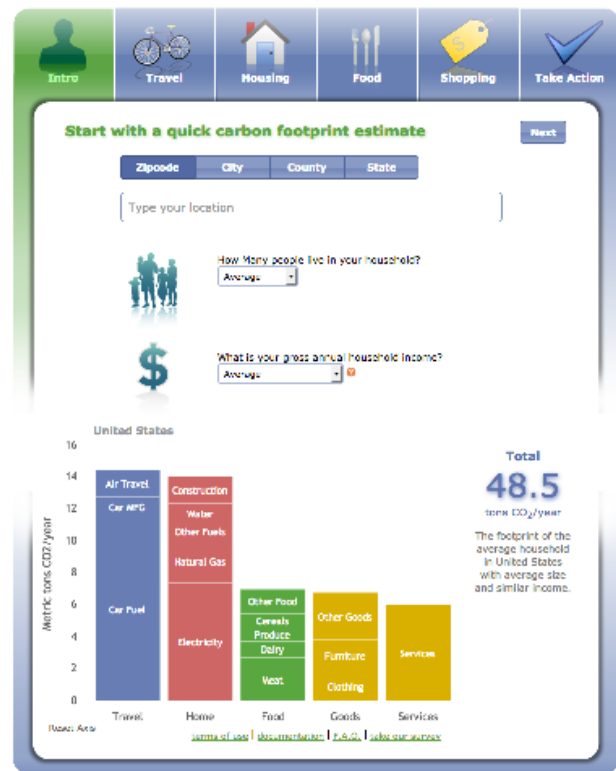
Thinking about your Carbon Footprint

Carbon Footprint refers to the impact a person's lifestyle has on the environment, based on how much carbon dioxide you produce in order to meet your needs and wants. There are numerous carbon footprint calculators available on the Internet. The website activity will ask you questions on topics such as the size of your home, the type of vehicle your family drives, how often you travel by airplane, the number of electronic devices you own, the food you eat, and how much new clothing you purchase in a typical year.

Below are sites that offer free carbon-footprint calculators.

The screenshot shows a web interface for a carbon footprint calculator. At the top, there are navigation icons for 'Get Started', 'Travel', 'Home', 'Food', 'Shopping', 'Your Footprint', and 'Take Action'. Below this is a 'Get Started' section with a 'START WITH A QUICK CARBON FOOTPRINT ESTIMATE' button. The form includes fields for 'Zipcode', 'State', 'City', 'County', and 'Country'. A text input field is labeled 'Enter your location'. Two sliders are used for input: 'How many people live in your household?' (ranging from 1 to 5+, with an average of 2.5) and 'What is your approximate gross annual household income?' (ranging from <10k to 120k+, with an average of 40k). A green 'NEXT' button is positioned below the income slider. At the bottom, three data points are displayed: '44 tons CO₂/year' for 'Your Total Footprint', '44 tons CO₂/year' for 'Similar Households', and '0%' for 'Better than Average'.

Above is a free carbon-footprint calculator provided by The Nature Conservancy. Source: <https://www.nature.org/greenliving/carboncalculator/index.htm>



This calculator is provided by CoolClimate Network, University of California, Berkeley. Source: <http://coolclimate.berkeley.edu/calculator>



Heating our Homes

In Alaska's cold climate, people use a lot of fuel to heat homes. Alaska's energy demand per person is the third highest in the nation. Most homes are heated with fuel oil or wood. Fuel oil is a nonrenewable resource and wood is a renewable resource. Sometimes homes are heated using electricity. Electricity is produced in a power plant and most power plants burn coal to make electricity. Coal is another nonrenewable resource.

Fuel oil, coal, and wood all produce carbon dioxide when they are burned and contribute to air pollution. You can reduce the carbon footprint of heating your home by setting the thermostat at a cooler temperature. If you feel chilly, you can wear an extra layer of clothing or use an extra blanket, rather than turning the thermostat up.



Cold winters make home heating a significant part of Alaska's energy demand.



Burning dry wood in a wood stove is more efficient and produces less pollution than wet wood.

A valuable tip for woodstoves is to plan ahead and make sure you are burning dry wood. Dry or "seasoned" wood burns more efficiently than "green" wood. With lower moisture content in your firewood, you will use less wood and create less air pollution.

Alaska ranks first in the nation in terms of per capita spending on renewable energy! Renewable energy resources in Alaska include solar, wind, hydropower, geothermal, and biomass. These renewable resources are abundant and will be available to us indefinitely. With the exception of biomass, they generate less air pollution than nonrenewable energy resources such as fuel oil and coal.



Alaskan Challenges

Importing the Products We Use

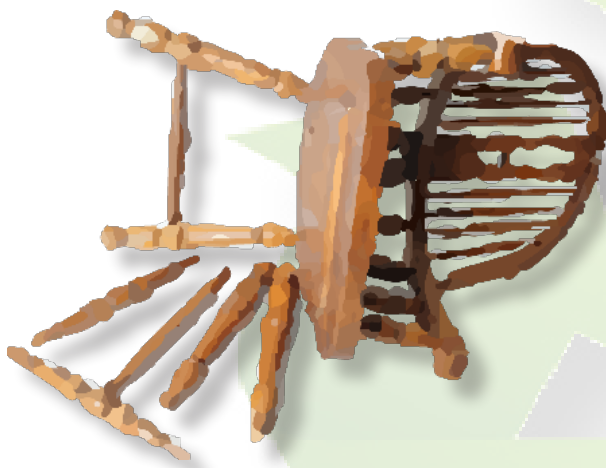
Alaska's location means that a lot of the food we eat and the products we use are shipped from far away. The advice of the "3 R's" tells us to reduce, reuse, and recycle.



Soda cans can be recycled, but are often thrown away, because shipping them to a recycling plant is costly.



Eating locally sourced food such as this salmon and using locally made tools such as this ulu reduce your environmental impact.



A little time and wood glue could make this chair useable for many more years.

Recycling involves processing waste materials into something new. Shipping recyclable materials long distances to a recycling plant can be expensive. However, everyone can reduce and reuse more. For example, you can reduce your environmental impact by eating more local foods instead of food that is shipped in. You can repair and reuse a broken piece of furniture instead of throwing it away and buying a new one. What other ways can you think of to minimize your carbon footprint?



The Carbon Footprint of Shipping

What is the carbon footprint of the clothing you purchase?

In this activity, you will look at store-bought clothing to determine how far it traveled and how much carbon was produced on its journey.

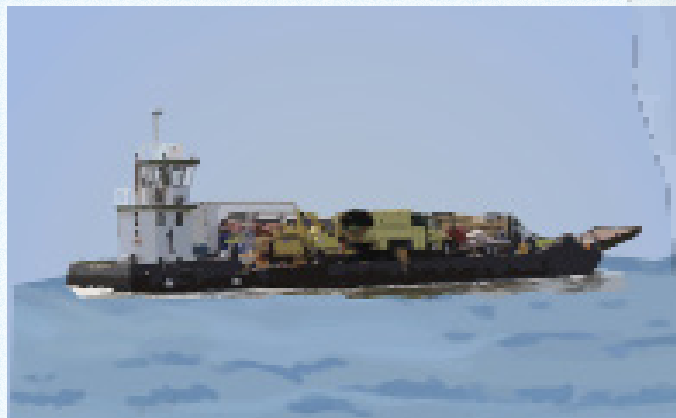
Materials

- Clothing items with tags
- Student Worksheet: *The Carbon Footprint of Shipping* (or student notebook)
- Computer or tablet with internet access
- Scale that measures in grams (optional)

Procedure

1. Choose 3 garments. Look at the tag on each article of clothing to determine where it was made.
2. Estimate how much each item weighs. The following chart of average garment weights may help you make your estimates. The actual weight of garments can vary greatly due to thickness of fabric and size of the garment. (Optional: Measure the mass of each item on a scale).

Item	Weight in grams	Item	Weight in grams
T-shirt	200	Leggings	300
Jeans	700	Track pants	600
Hoodie	400	Shorts	300
Pair of shoes	1,125	Sweater	400
Pair of boots	2,250	Button-down shirt	250



Activity

- Determine the shipping methods and mileage for each item. Shipping methods can include ocean freighter, barge, airplane, railroad, or truck. Most items traveling long distances across the ocean will be on ocean freighters, with barges being used for river travel or shorter distance ocean travel. For villages off the road system, all shipped items arrive by airplane or barge. If your item was made in the USA, it may have travelled by truck or railroad across the Lower 48 before being shipped by airplane or barge to Alaska.



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To determine distances, you can use an Internet application such as Google Maps. For international shipping routes, try the website www.ports.com.

Example: T-shirt made in Bangladesh			
From	To	Method	Miles
Bangladesh (Port of Chalna, Bangladesh)	Anchorage (Port of Anchorage, USA)	Ocean Freighter	18,980
Anchorage	Unalakleet	Airplane	400

- Calculate the carbon contribution of each item. Each vehicle produces carbon dioxide, but of course your garment is not the only cargo the vehicle is carrying!

Mode	Functional Unit	Emission Factor (grams CO ₂)
Airplane	grams per ton-mile	2,050.0
Barge	grams per ton-mile	17.5
Railroad	grams per ton-mile	22.9
Truck	grams per ton-mile	161.8
Ocean Freighter	grams per container-mile	42.6



4a. For items that were shipped by airplane, barge, railroad, or truck, the carbon dioxide emissions are calculated based on weight. There are 1,000,000 grams in a metric ton. Use the weights you estimated in Step 2 and the miles you calculated in Step 3 in the following equation:

$$\begin{array}{|c|} \hline \text{Distance} \\ \text{(miles)} \\ \hline \end{array} \times \begin{array}{|c|} \hline \text{Emission Factor} \\ \text{for that mode} \\ \text{of travel} \\ \hline \end{array} \div \begin{array}{|c|} \hline 1,000,000 \\ \hline \end{array} \times \begin{array}{|c|} \hline \text{Weight of} \\ \text{Garment} \\ \text{(grams)} \\ \hline \end{array} = \begin{array}{|c|} \hline \text{Grams of} \\ \text{Carbon Dioxide} \\ \hline \end{array}$$

4b. For items that were shipped by ocean freighter, the carbon dioxide emissions are calculated based on volume. Use the chart below to help you estimate how many garments fit in one shipping container.



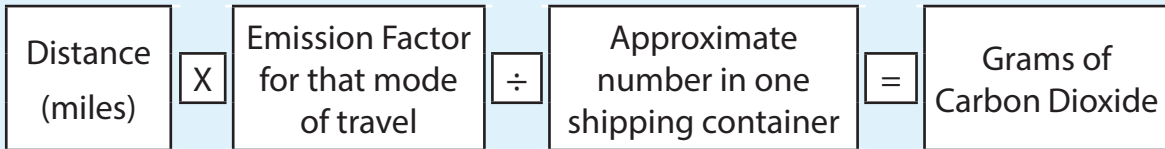
On an ocean freighter, the items are packed into metal shipping containers (often referred to as Conex units).

Item	Approximate Number in one 20ft Shipping Container	Item	Approximate Number in one 20ft Shipping Container
T-shirt	36,000	Leggings	30,000
Jeans	10,000	Track pants	12,000
Hoodie	8,000	Shorts	30,000
Pair of shoes	5,000	Sweater	9,000
Pair of boots	2,400	Button-down shirt	30,000



Activity

Then, use the miles you calculated in Step 3 in the following equation:



Example: T-shirt from Bangladesh					
Mode	Distance	x Emission Factor	÷ 1,000,000 (omit this step for ocean freighters)	x Weight of garment OR ÷ number of garments per container	= Grams of carbon dioxide (round to nearest 10 th)
Ocean Freighter	18,980	42.6	N/A	36,000	22.5
Airplane	400	2,050	1,000,000	200	164
Total:					186.5

Conclusions

5. Which method of transportation contributes the most pollution (CO₂)?
6. Which method of transportation contributes the least pollution (CO₂)?
7. What are some ways you can reduce the carbon footprint of your clothing?







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