

# Carbon In My Life Student Guide

Carbon is one of the most common elements in the world and is in nearly everything. Carbon dioxide is also often released as a byproduct in the manufacturing, transportation, and use of products, food, individual transportation, and daily energy **consumption**. Remember that our “carbon footprint” is the total amount of carbon dioxide contributed by all of the things we do and all of the things we use, at home or at school.

You can probably think of a few ways to reduce your carbon footprint, including walking instead of driving, switching to compact fluorescent light bulbs or LED bulbs, and recycling. Today people are looking closely at new ways to reduce their carbon footprint, or the carbon in their lives.

In this activity, you’ll learn how to investigate the carbon impacts of the products you use, the foods you eat, the energy and water you use, and of the different forms of transportation you use. You will select items to study and develop strategies to reduce your carbon footprint at school. Later, you can apply some of the same strategies at home.

## Products

To determine the carbon impact for any product we buy or use, we have to look at the “life cycle” for that product. The product life cycle includes everything that had to happen to make that item, deliver it to you, and what happens to it when you’re done. Thinking about a product’s life cycle can tell us a lot about its carbon impact.

It is also important to think about whether a product is disposable or not. Disposable products can include everyday items like bottles, plates, and silverware. Diapers, writing utensils, contact lenses, and even items like gift cards are considered disposable. If you receive a gift card or give a gift card as a present, what do you do with it? Many people use a gift card and when the value has been used completely, they throw it away. These gift cards often come with different types of packaging around them, and we often go even further and wrap them more decoratively. Some gift cards can be reloaded with value added to them. Many disposable products can even be used twice or several times. There are also many reusable alternatives to disposable products. Whether you use disposable or reusable products, either option involves the mining, extraction, refining, manufacture, and shipping of parts and packaging, often including plastics. Each of these individual steps involves energy use and carbon impacts. Many disposable products can be made from recycled materials, which means less energy and carbon were involved in their manufacture. Try to use products made from recycled content as much as possible. When recyclable and reusable alternatives to disposable products are used, they can reduce your carbon impact by a significant amount. If you purchase a reusable cup to fill each time you stop for a beverage, you will have created far less waste and reduced your carbon footprint. Purchasing online “e”-gift cards, or reloading a used card can save on waste and impacts as well. Some businesses even reward customers for using reusable products or for environmentally-friendly purchases. If stores can cut costs on supplies like cups, because their customers use refillable ones, it often leads to discounts for those customers.

## Foods

The foods you eat also have an impact on the amount of carbon in your life. Where does most of your food come from? There are many places our food and food products can come from. Some people eat foods that they have grown and produced themselves. Many people buy all of their foods at the grocery store or local market. Does all of the food we eat get produced locally? In many cases, the items we eat are shipped in from all over the country, and sometimes the world! Not all foods can be grown year-round, or in all climates, but we eat them anyway to supplement our diets. If it is cold and wintry where you live, the produce you buy at the store is probably not produced locally, it is shipped in from other areas. Some foods like animal products, or foods with multiple ingredients, require more energy to produce and keep them healthy for those who eat them. Items that must be transported long distances or require more energy to produce will have a much greater carbon impact.

Some foods use a lot of packaging. This packaging has a carbon footprint all its own and is different for plastic wrapping, paper boxes, or foam containers. Usually, the less packaging any product has, the lower its carbon footprint. What do we do with the packaging? Is it recycled?

Like products, leftover food has a life after we’re done with it. Are we sending leftover food items down the drain, into a landfill, or are we sending them to a compost pile to be turned into rich soil for a garden?

Think about the life cycle for every plastic fork or disposable plate you might use in one year. Would it be better to use plates and utensils that are used over and over again, or would it require too much water and energy to clean and dry them? Compostable utensils and containers are now available. Would these be better for the environment than disposable utensils?

How many different ways is carbon involved in the refrigeration, preparation, handling, and transportation of food at your school or home?

## GIFT CARD



## Energy

We all use many forms of energy at school and at home, including our lights and computers, heating and cooling rooms, running our refrigerators and phones, and more.

There are two main ways to reduce the carbon footprint of the energy we use. The easiest way to reduce our energy use is by conservation. Conservation is simply saving by changing our behaviors—to remember to turn off lights and other electrical devices when not in use and to set thermostats to use less energy to heat and cool rooms. Look around your classroom to see how many different items are plugged in and using electricity.

Another way to use less energy is by energy efficiency or using better equipment. Switching light bulbs to compact fluorescents (CFLs) or light emitting diode (LED) bulbs and buying ENERGY STAR® appliances, as well as insulating and weather-stripping our homes are examples of energy efficiency at work.

The second way to reduce the carbon footprint of the energy we use is in using renewable resources or less carbon-rich forms of energy. Coal is a nonrenewable resource that makes most of our electricity, but has a significant carbon footprint. Electricity can come from using renewable resources—wind, solar, geothermal, and hydroelectric power. These sources create no CO<sub>2</sub> during energy production and are called “carbon neutral.” While nuclear energy is nonrenewable, there are no emissions associated with electricity generation, so electricity generated from nuclear power is also carbon neutral.

Some utility companies give customers the opportunity to request that most or all of their electricity comes from carbon neutral sources or purchase these credits on their bill. Some schools and homes are equipped with solar photovoltaic systems or wind turbines that generate as much electricity throughout the year as the buildings use. There are many ways to decrease your energy carbon footprint.

## Water

You might not think that the water we use can add to our carbon footprint, but it does. The processes of finding, purifying, treating, and transporting water involve energy and have a carbon footprint.

When we are done with the water it goes to a sewage or water treatment plant and these steps add to water’s carbon footprint. So, using less water reduces your carbon footprint on the input side and on the output side of your use.

It takes energy to heat our water, and this process creates carbon dioxide. If the water heater settings are too high, lowering the setting can lower your carbon footprint.

The two greatest ways we can reduce the carbon footprint of the water we use are to use less and to manage the water we’re using differently. There are many ideas for using less water: take short showers instead of baths, don’t let the water run while you brush your teeth or wash dishes, and be sure that your sprinkler systems are not wasting water. Installing low-flow toilets and showerheads will save a lot of water and lower your carbon footprint.

When our wastewater leaves our house or school, it goes to a treatment plant that uses energy and where more carbon dioxide is created. Whenever you can, don’t send water down the drain; use it to water plants or trees instead.

Think of all the places water is used at your school and try to think of ways to take action to reduce your carbon footprint.

CFL LIGHT BULB



LED BULB



WIND TURBINES



WATER FAUCET



## Transportation

For Americans, transportation choices make up a large part of our carbon footprint. Over long distances we can travel by car, by bus, by train, or by plane. Train travel tends to have the lowest carbon impact and air travel has the highest.

Most of us need to use some form of transportation every day. The choices for most people are to use a car, a bus, a local rapid transit, a bicycle, or to walk. Some ways to reduce our carbon footprint include driving less by combining errands into fewer trips, driving slower on the highway, and carpooling.

Four people carpooling to school or work in one car use a fraction of the energy of four people in separate cars. Whenever possible, walk, bike, or use public transportation. When we have to use a car, we should remember that some cars, like hybrids, are much more efficient than others, and maintaining proper tire pressure and keeping the car tuned-up leads to better fuel economy and reduced carbon emissions.

At school, we can encourage students to walk or bike, or find ways for students to carpool. Some schools have a “no-idling” rule when students are being picked up after school, which cuts down on the amount of fuel burned and the amount of emissions released.

What are the different ways students and teachers use transportation at your school? What are some ways you can reduce your carbon footprint in the ways you use transportation? How far must items be transported before you use them?

## Comparing Carbon Footprints

### ■ Paper or Plastic Shopping Bags?

Which product do you think uses less energy and has a lower carbon footprint? Both have impacts in their manufacture, transportation, and disposal, but a life cycle analysis shows that neither is perfect. Paper bags are made of a renewable resource, wood, and they are recyclable. Plastic bags are made of nonrenewable petroleum, but use less energy in their manufacture and transportation. They don't decompose well in a landfill, but they are recyclable too. It actually takes more than four times the energy to make a paper bag and, because they take up more space, it takes more energy to transport them in bulk.

Recycling paper and plastic bags will help decrease your carbon footprint, but the very best choice is to use a reusable shopping bag made of canvas or recycled plastic. These are becoming widely available at stores and are, by far, more environmentally friendly than any disposable bag.

### ■ Foam or Paper Drinking Cups?

Foam, or Styrofoam™, has many uses including drinking cups. Foam cups are recyclable, but they are not biodegradable. If foam is not properly disposed of and ends up in the environment, it can remain there for hundreds of years. Paper cups are often recyclable and will break down in the environment more quickly than foam, but in landfills both take up space and will not readily decompose. Studies show that it actually takes more energy to produce paper cups, so the carbon footprint for these is greater than for foam cups.

A third type of cup becoming available is compostable drinking cups. These can be made of organic materials like cornstarch, and they

## NATURAL GAS BUS



Image courtesy of United States Environmental Protection Agency

## PAPER BAG



## PLASTIC BAG



## REUSABLE GROCERY BAG



break down harmlessly when composted with plant and vegetable materials. Other compostable eating utensils are available, like forks and knives, but they are more expensive to purchase.

As we found with shopping bags, an alternative to disposable cups is to use washable glass, plastic, ceramic, or metal drinking containers. When we wash them we use some energy and water, but we do not have to make them over and over and we create less of a problem with waste.

As you study the carbon footprint for any of the items in your everyday life, remember that there are misconceptions about what choices are better for the environment. New products and ideas are being created every day, and it's important to do a little research to be sure that you make the best choices.

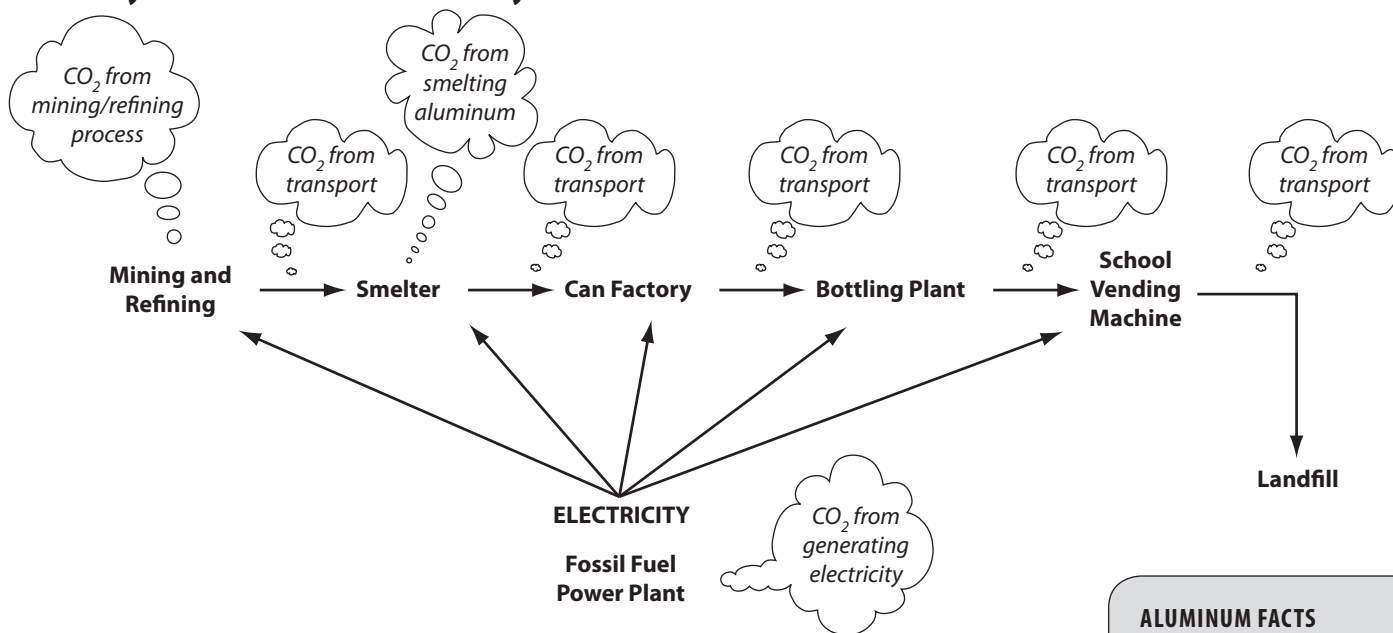


# Aluminum Can Life Cycle Comparison

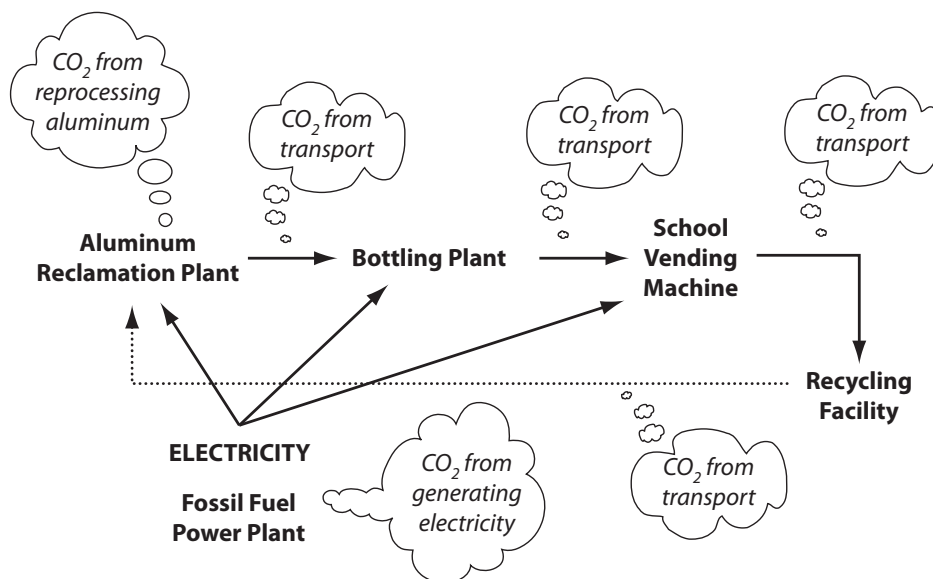


Several steps are needed to create a new product. When we use recycled materials we eliminate several steps, and the reduction of processes and transportation means less energy is used during the life cycle. This also results in fewer emissions of carbon dioxide due to electricity use and transportation.

## Non-Recycled Aluminum Can Life Cycle



## Recycled Aluminum Can Life Cycle



### ALUMINUM FACTS

- In the U.S., 100 billion aluminum beverage cans are produced annually; a little more than half of those are returned for recycling.
- The energy used to make one aluminum beverage can is about 7,000 Btu. Recycling saves 95 percent of the energy it would take to make new metal from ore.
- It takes about 60 days for aluminum beverage containers to be recycled and reappear on store shelves.

Data: Alcoa

Every product you use has a life cycle and associated carbon dioxide impacts before and after its use. With a little research you can find out where the energy use and CO<sub>2</sub> emissions occur.

Try to draw a life cycle chart like the one above for some other items you use at home or at school. Ask yourself where the product, or water, or energy comes from. Then think about where the product, or water, or energy goes when you are done using it.



# Carbon In My Life Survey

Discuss the items below. Are these occurrences happening at your school?

Do you think that CO<sub>2</sub> emissions are involved (yes or no)?

Brainstorm additional items observed at your school that you think can be improved upon.

OBSERVED ITEM TO STUDY	NEVER	SOMETIMES	OFTEN	CO <sub>2</sub> EMISSIONS
Cans and bottles are being used, then thrown in the trash.				
Paper and cardboard recycling occurs at school.				
Parents' cars are seen idling in morning and afternoon.				
Buses are often idling for a long time.				
Sprinklers are watering areas without grass and running too long.				
Lights in the gym are left on all day.				
Computers are left on when not being used.				
Students are encouraged to bike and walk to school.				
The cafeteria uses disposable plates, cups, and utensils.				
Classrooms are too cold on hot days, too warm in the winter.				
Schools distribute lots of paper handouts.				
Classrooms and offices are equipped with occupancy sensors.				
Vending machines are using energy, creating trash.				
Science class goes through a lot of disposable batteries.				
Students bring their lunch in disposable bags and containers.				
Waste material that could be composted is sent to a landfill.				
Other:				
Other:				
Other:				
Other:				



# Carbon In My Life Study Items

Think about all of the ways carbon cycles in and out of your life. What products do you use on a daily basis? What do you eat? What types of energy (electrical or natural gas) and water uses do you have? How do you travel?

List a few items in each column.

CONSUMABLE PRODUCTS I USE	FOODS I EAT	ENERGY AND WATER I USE	TRANSPORTATION I USE	OTHER

Your team should discuss each of these items and try to identify opportunities to implement changes in their use that might lower the carbon footprint.

## Critical Questions

1. Does this item apply at school, at home, or at both?
2. Does taking action require individual action or group cooperation?
3. What obstacles might be encountered in taking action to lower the carbon footprint of this item?
4. Select four or five items, one from each category above, to study using the *Item Analysis Organizer*.
5. Develop an action plan for one or more items studied using the *Questionnaire*, and *Action Planner*.



# Carbon In My Life Item Analysis Organizer

Answer the questions in this organizer to find opportunities to reduce your carbon footprint.

Item: _____ What purpose does this item serve? _____	
Can you do without this item?	YES → Item is not essential: Explain how not using it will save energy or lower your energy carbon footprint.
NO ↓	
If item is essential, is there a better, less carbon intensive way to meet the same need?	YES → Describe an alternative way to meet this need and how it will lower your carbon footprint.
NO ↓	
Is there a better source for this item, a renewable, more local, or more efficient source?	YES → Describe the alternative source and how it will lower your carbon footprint.
NO ↓	
Can you use less of this item?	YES → Explain your plan to use less of this item and how it will lower your carbon footprint.
NO ↓	
Is this item being wasted or disposed of carelessly?	YES → Describe your suggestion for proper disposal and how it will lower your carbon footprint.
NO ↓	
If you answered "NO" to every question, select a different item to study until you can answer "YES" to one of the questions. Once you've identified items that offer an opportunity to conserve energy or reduce your carbon footprint, complete the Questionnaire and Action Planner.	



# Carbon In My Life Questionnaire

You can lower your carbon footprint if you learn to ask these questions of every thing you use:

- Is it essential, do I have to use it or can I live without it?
- What purpose does it serve, what need does it fill? Can I fill that need in a different way?
- If I have to use it, can I use less of it or use it more wisely?
- Where does it come from, and is there a better or more local source for it?
- When I'm done with this item, where does it go, is it recycled or reused?

Choose one item from each category on page 68. Use this questionnaire to analyze your use of the product and think about what steps you might take in order to lessen your own carbon footprint. Compose detailed answers on a separate piece of paper.

**Item description:** \_\_\_\_\_

**Need met:** \_\_\_\_\_

**Item's current energy use impact:** \_\_\_\_\_

**Item's current CO<sub>2</sub> impact:** \_\_\_\_\_

Complete as many of the questions below as apply to the item being studied:

**This item comes from (what materials, where):** \_\_\_\_\_

**An alternate source is:** \_\_\_\_\_

**The energy needed would be lower because:** \_\_\_\_\_

**The CO<sub>2</sub> impact would be lower because:** \_\_\_\_\_

**Other ways I could meet the same need include:** \_\_\_\_\_

**The energy needed would be lower because:** \_\_\_\_\_

**The CO<sub>2</sub> impact would be lower because:** \_\_\_\_\_

**Ways to use less of this item include:** \_\_\_\_\_

**The energy needed would be lower because:** \_\_\_\_\_

**The CO<sub>2</sub> impact would be lower because:** \_\_\_\_\_

**Where this item goes after it's used is:** \_\_\_\_\_

**An alternative for this item after it is used:** \_\_\_\_\_

**Energy is saved because:** \_\_\_\_\_

**The CO<sub>2</sub> impact might be lower because:** \_\_\_\_\_

**Actions I can take include:** \_\_\_\_\_

**Actions others can take include:** \_\_\_\_\_

*If you are unable to find ways to lower energy use or the CO<sub>2</sub> impact, select another item to analyze. When you've found ways to lower energy use or CO<sub>2</sub> impact, complete the Action Planner on the next page.*





# Carbon In My Life Action Planner

Select one of the items analyzed that offers an opportunity for you to reduce your personal carbon footprint or the carbon footprint of your school.

Use this planner to plan and execute your carbon reduction strategy.

Compose detailed answers on a separate piece of paper.

**Item Description:** \_\_\_\_\_

**Problem Description:** \_\_\_\_\_

How is energy related to this item?

How is CO<sub>2</sub> related to this item?

How are behaviors and choices related to this item?

The action you plan to take:

What you need to learn before you can take action?

Who might need to give permission for you to take this action?

Who can help you make this action successful?

List any difficulties you might encounter:

What will determine "success" for your action and when will success be met?

Explain how this action might save money, cost money, or have no financial impact.

Does action on this item give you ideas for other items to study? List these below.

Describe how you could encourage others to take similar actions.

Develop a timeline for each step you plan to take.

Take notes and document your progress in your science notebook.

