

Carbon and Water Footprint Classroom Activity: Teacher's Guide

- Overview:
 - An interactive classroom activity of around 1 hour, designed to introduce and convey the concepts of water and carbon footprints and environmental consequences to everyday actions.
- Goal:
 - To help students aged 7-12 conceptualize resource use and encourage them to take steps to reduce their carbon and water footprints.
- Objectives:
 - Introduce the concepts of water and carbon footprints.
 - Allow students to consider their habits and see for themselves the varying impact their choices have on the environment.
 - Give students the chance to make pledges to change their habits.
 - Engage the students and start a conversation about resource use and conservation.
- Materials:
 - Printouts of the worksheets (Questionnaire, Graph Paper, Block Values, and Reductions)
 - Colored pencils (blue, graphite)
 - Markers (green)
- Instructions:
 - Teacher explains instructions and introduces concepts to the class.
 - Students break into groups of 2.
 - Students take turns reading each other the questions and recording the answers.
 - Teacher hands out the page with corresponding blocks for each question (Block Values). Students fill out their paper accordingly and compare results with their partners. Carbon blocks are represented by regular graphite pencil, and water blocks are represented by blue colored pencil.
 - Teacher explains the value represented by each block.
 - Next, teacher hands out Reductions page, and partners take turns committing to different reductions and adjusting their paper accordingly (reductions are indicated by green marker drawn over the colored pencil).
 - Students compare and reflect.

Explaining the Concept

Consider all of the different “things” you use in your daily life. What you eat for breakfast, the clothes you wear, the desks in the classroom, the car you drive to school—they all come from earth’s resources. They’re powered and transported by earth’s resources, too. An environmental footprint is an annual measure of how much land and water it takes to provide the things we use and consume.

In this activity, we will be focusing on the water and carbon components of your environmental footprint. It does not attempt to estimate a student’s total carbon or water footprint. Rather, it highlights the impact of certain key lifestyle choices, most of which students can take an active role in changing.

Carbon footprint: In this activity, “carbon footprint” refers to the amount of CO₂ emitted annually from the lifestyle choices included in the questionnaire. Each carbon block represents 90 kg of atmospheric CO₂. 10 of these blocks equals nearly one metric ton of atmospheric CO₂. This measurement can be portrayed to students as a large sphere 10 meters in diameter, full of CO₂. This representation comes from this video (<https://www.youtube.com/watch?v=v9cT-tHoXdI>), which might help to visualize CO₂ emissions. CO₂ emissions are the most plentiful greenhouse gas emissions caused by human activities.

The instructor may find it necessary to explain the importance of CO₂ emissions as it relates to climate change. Basically, greenhouse gases such as carbon dioxide, methane, and others, are released into the atmosphere at rates far exceeding those of the pre-Industrial era. This influx increases the concentration of greenhouse gases, bulking up the greenhouse effect, which prevents the earth from turning into a ball of ice by trapping in some of the heat from the sun. With too many greenhouse gases, however, more and more heat is trapped, warming the planet and disrupting delicate climatic balances. Scientists believe that once certain temperature thresholds are exceeded, chain reactions (known as “feedback loops”) will be set in motion that have far-reaching and sometimes irreversible consequences. The moral of the story is that human-caused greenhouse gas emissions contribute to climate change, which can effect everything from habitat loss and species extinction to rising sea levels, increased intensity of catastrophic weather events, collapse of food systems, and more.

Water footprint: In this activity, “water footprint” refers to the amount of fresh water used by the lifestyle choices included in the questionnaire. We use freshwater in just about every process—each gallon of oil, pair of jeans, or chocolate bar uses significant amounts of freshwater along the supply chain. For this activity, we choose to highlight numerous activities that not only account for water coming out of the spout, but water used in production processes as well (since these “hidden” liters tend to represent the bulk of our usage). [This graphic](#) can help students visualize the extent of “hidden” water usage. There are many different estimates for hidden water and water use in general, but our calculations are largely based off of National Geographic water footprint data.

It may be helpful to explain to students the scarcity of freshwater in the U.S. and around the world. From California’s worst drought in 1,200 years to the [projection](#) of half the world’s population living in a water-stressed area in 2025, freshwater scarcity is a significant problem. Today, [1 in 5 people](#) do not have access to safe drinking water. For older students, it might be helpful to lay out the geopolitical consequences of water scarcity. Civil war in Syria, the Arab Spring, revolution in Yemen, the Israel-Palestine conflict, Rwandan genocide, war in Darfur, have all had water scarcity as a stressor. As people are increasingly prone to saying, “wars will be fought over water.” And, to a certain extent, they already have been.

Throughout this activity, there are opportunities for partners to discuss with each other their habits, their impressions of block values and fun facts, and their goals for reductions. Reflection time after the activity can be constructive as well.

Print double-sided if possible!

Questionnaire

Mark whichever answer best fits your habits

- Does the person who picks you up from school leave the car engine running while they wait?
 - Yes
 - No
- How often do you eat red meat (beef, lamb, pork) as the main course?
 - More than once a day
 - Once a day
 - A few times a week
 - Once or twice a week
 - Never
- Does your family purchase bottled water?
 - Yes
 - No, I use a reusable water bottle
- Do you leave the tap running when you brush your teeth?
 - Yes
 - No
- What kind of bags do you use when you go shopping?
 - Plastic bags from the store
 - We bring our own
- Which do your family recycle?
 - Plastic
 - Glass
 - Paper
 - Metal
 - None

Block Values

Follow the instructions given for each choice that you selected.

- Does the person who picks you up from school leave the car engine running while they wait?
 - Yes (+4 carbon blocks)
 - No (0 carbon blocks)
 - *Leaving your car engine on without driving (this is called “idling”) gives off as much CO₂ as when you are driving.*
- How often do you eat red meat as the main course?
 - More than once a day (+8 carbon blocks) (+40 water blocks)
 - Once a day (+7 carbon blocks) (+25 water blocks)
 - A few times per week (+5 carbon blocks) (+15 water blocks)
 - Once or twice a week (+4 carbon blocks) (+10 water blocks)
 - Never (0 carbon blocks) (0 water blocks)
 - *Meat, especially red meat, uses a lot of water! Eating 6 fewer hamburgers has the same water footprint impact as choosing not to shower for the whole year. Also, burps and farts from cows and pigs make up 18% of the world’s greenhouse gas emissions, more than all car and plane emissions combined!*
- Does your family purchase bottled water?
 - Yes (+1 carbon block) (+½ water block)
 - No, I use a reusable water bottle (0 carbon blocks) (0 water blocks)
 - *Plastic water bottles don’t have the biggest effect on carbon or water footprints, but they impact the environment in other ways. 35 billion water bottles are thrown out each year, which would stretch from the East Coast to the West Coast and back 800 times. These bottles often end up in the ocean, where they are toxic to turtles, fish, and other sea creatures.*
- Do you leave the tap running while you brush your teeth?
 - Yes (+½ water block)
 - No (0 water blocks)
 - *Leaving the tap running while you brush uses a lot of water. By turning off the tap when you brush, you can save 4 bathtubs of water each month!*
- What kind of bags do you use when you go shopping?
 - Plastic bags from the store (+3 carbon blocks)
 - We bring our own (+½ carbon block)
 - *Yep, plastic bags are made of oil. Even some reusable bags have oil as an ingredient, too. But bringing your own is always better than using plastic ones!*
- Which ones do your family recycle? (start with +3 ½ blocks and subtract from there)
 - Plastic (-1/2 carbon block)
 - Glass (-1/2 carbon block)
 - Paper (-1 ½ carbon blocks)
 - Metal (-1 carbon block)
 - None (-0 carbon blocks)

Reductions

Check off whichever pledges you want to commit to and use a green marker to color in the carbon and water blocks that match your reductions. Remember not to pledge to do something that you already do.

- I pledge to:
 - Ask the person who picks me up if they can turn off the car engine while they wait for me (reduce 4 carbon blocks)
- I pledge to (*pick one*):
 - Go one more day a week without red meat (reduce 1 carbon block and 5 water blocks)
 - Go two more days a week without red meat (reduce 2 carbon blocks and 10 water blocks)
 - Go three more days a week without red meat (reduce 3 carbon blocks and 15 water blocks)
 - Go four more days a week without red meat (reduce 4 carbon blocks and 20 water blocks)
- I pledge to:
 - Use a reusable water bottle instead of disposable plastic ones (reduce ½ water block)
 - Turn off the tap while I brush my teeth) (reduce ½ water block)
 - Bring my own reusable bags to the store (reduce 2 ½ carbon blocks)
- I pledge to:
 - Recycle plastic (reduce ½ carbon block)
 - Recycle glass (reduce ½ carbon block)
 - Recycle paper (reduce 1 ½ carbon blocks)
 - Recycle metal (reduce 1 carbon block)

Carbon and Water Footprint Activity

1 carbon block = 90 kg of atmospheric CO₂. 10 carbon blocks is equal to a **sphere 10 meters high and as heavy as a car.** That's big enough to burst through your classroom and the one above it.

1 water block = 10,000 liters of fresh water. 4 water blocks is equal to a **large backyard swimming pool.**

Water Blocks 

Carbon Blocks 

How big are your carbon and water footprints? Think about how much CO₂ and how much fresh water you use each year, only from the activities in these questions. And still, this isn't even close to the size of your actual footprint!

Now, think about the difference your reductions made. You can save huge amounts of CO₂ and fresh water each year by making some of these changes. The world needs people to step up and fight against climate change, habitat destruction, pollution, and wasteful water use. You always have a choice—**what do you want your world to look like?**

Sources and Extra Information

- Does the person who picks you up from school leave the car engine running while they wait?
 - Yes (363 kg) 4 blocks
 - No (0) 0 blocks
- How often do you eat red meat as the main course?
 - More than once a day (726 kg) 8 blocks (400,000 liters) **40 blocks**
 - Once a day (680 kg) 7 blocks (250,000 liters) **25 blocks**
 - A few times per week (635 kg) 5 blocks (150,000 liters) **15 blocks**
 - Once or twice a week (454 kg) 4 blocks (100,000 liters) **10 blocks**
 - Never (0) 0 blocks (0 liters) **0 blocks**
- Does your family purchase bottled water?
 - Yes (45 kg) 1 block (300 liters water) **½ block**
 - Rarely (4.5 kg) 0 blocks (30 liters water) **0 blocks**
 - Only use a reusable water bottle (0 blocks) **0 blocks**
- Do you leave the tap running when you brush?
 - Yes (3,000 liters) **½ block**
 - No (0 liters)
- What kind of bags do you use at the store?
 - Plastic bags at the store (272 kg) 3 blocks
 - We bring our own (45 kg) **½ block**
- Which ones do your family recycle? (start with 136 kg, subtract accordingly) **3 ½ blocks**
 - Plastic (-18 kg) -1/2 block
 - Glass (-9 kg) -1/2 block
 - Paper (-68 kg) -1 ½ blocks
 - Metal (-41 kg) -1 block
 - None (-0 kg) -0 blocks

Water: <http://environment.nationalgeographic.com/environment/freshwater/water-calculator-methodology/>

Blue jeans: 11,000 liters

http://www.wwf.org.uk/what_we_do/rivers_and_lakes/the_hidden_cost_of_water.cfm)

Hose: 23 liters per minute (<http://www.epa.gov/WaterSense/kids/hose.html>)

Carbon: <https://www.americanforests.org/assumptions-and-sources/>,
<http://www.homepower.com/articles/home-efficiency/electricity/half-plan-reducing-your-carbon-footprint-part-two>, <http://www.stopglobalwarming.org/take-action/action-items/>,

<http://www.countdownyourcarbon.org/our-assumptions.html>

4 water blocks equals a large backyard swimming pool (15' x 30' x 4' x 5.9 = 10,620 Gallons, 40,200 liters)

10 carbon blocks equals a balloon of CO₂ 10 meters across.