LESSON 14: How can we make changes to our daily lives to reduce carbon dioxide going into the atmosphere?

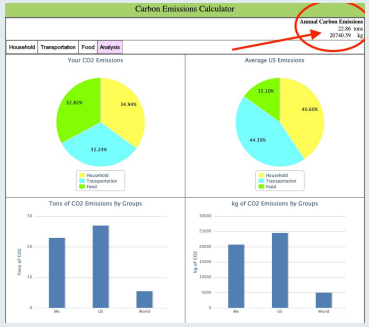
PREVIOUS LESSON

We used a Design Matrix to organize the different solutions for reducing carbon dioxide in the atmosphere that we evaluated last class. From our evaluations we determined constraints for the solutions in trying to meet the criteria of reducing the imbalance of carbon in the air. We reevaluated each solution using our constraints and decided that multiple solutions would need to be implemented to meet our criteria.

THIS LESSON

INVESTIGATION

1 day



We calculate our carbon footprint based on daily habits with home energy use, food, transportation, and waste. We share our carbon impact on the class's Carbon Scoreboard. We calculate the average carbon footprint for our class and compare to the footprint of an average American. We revisit our footprint and do a "lifestyle makeover" to select 2-4 changes we are willing to make that would reduce our footprint and would benefit our family in other ways. We compound the effects of these changes if everyone in our classroom, school, and community commits to some lifestyle changes that make sense for them.

NEXT LESSON

We will have figured out that the problem will require large-scale solutions combined with individual action. We will think about how we can target individual solutions and take them to scale. We will choose one solution matched to the stakeholders in our community or school, and then we will design a communication and/or outreach plan to inform our stakeholders of this new behavior or technology. We will present our plans to our peers and/or stakeholders and receive feedback on our approach.

BUILDING TOWARD NGSS

MS-ESS3-1, MS-ESS3-3, MS-ESS3-4, MS-ESS3-5, MS-ETS1-2

WHAT STUDENTS WILL DO

14.A Apply mathematical concepts to calculate the class's average carbon impact and possible carbon reductions and scale those reductions if more people change their behaviors.

WHAT STUDENTS WILL FIGURE OUT

- Changes to daily activities and behaviors can reduce carbon dioxide entering the atmosphere.
- If more people do these things, we can get more reduction in carbon dioxide.
- Changes to behaviors are limited by other constraints, so each person may have different options available to them.

Lesson 14 • Learning Plan Snapshot

Part	Duration	Summary	Slide	Materials
1	3 min	**NAVIGATION** Review where the students ended when they categorized solutions.		Categorizing Solutions chart (from Lesson 13)
2	12 min	**CALCULATE INDIVIDUAL FOOTPRINT AND POST RESULTS** Introduce the carbon footprint calculator and allow students to calculate and post their footprint results.	A	*Home Carbon Audit*, computer or device, Carbon Emission Calculator, sticky note, marker, computer and projector, Carbon Scoreboard (digital or chart paper)
3	8 min	**CALCULATE CLASS AVERAGE AND COMPARE TO AMERICAN AVERAGE** Calculate the class's average footprint and record on a sticky note. Compare to the American average and discuss noticings.	B-C	calculator, Carbon Scoreboard (digital or chart paper), large sticky note, markers, computer and projector, CO2 Emissions (metric tons per capita) United States data site
4	8 min	**COMPLETE A LIFESTYLE MAKEOVER AND POST RESULTS** Have students return to their footprint and choose 2-4 changes they think will reduce their footprint. Students should post their new footprint on the Carbon Scoreboard.	D	*Home Carbon Audit*, computer or device, Carbon Emission Calculator, sticky note, marker, Carbon Scoreboard (digital or chart paper), large sticky note, markers
5	12 min	**FACILITATE A DISCUSSION AND COMPOUND LIFESTYLE CHANGES** Have students make noticings of the new class scores and to share some of the changes they are willing to make. Scale the carbon savings in the class to the grade level, school, and larger community.	E-G	calculator, Carbon Scoreboard (digital or chart paper), large sticky note, markers
6	2 min	**NAVIGATION** Start brainstorming how to communicate about the problem and solutions to the larger community.	I	

End of day 1

Lesson 14 • Materials List

	per student	per group	per class
Lesson materials	• *Home Carbon Audit* • computer or device • Carbon Emission Calculator • sticky note • marker	• calculator	• Categorizing Solutions chart (from Lesson 13) • computer and projector • Carbon Emission Calculator • Carbon Scoreboard (digital or chart paper) • large sticky note • markers • CO2 Emissions (metric tons per capita) United States data site

Materials preparation (25 minutes)

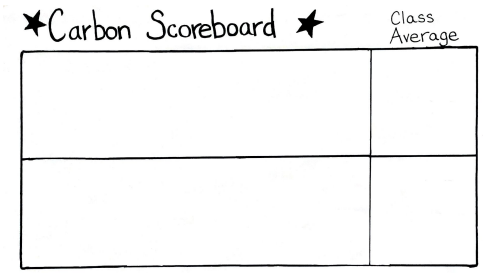
Review teacher guide, slides, and teacher references or keys (if applicable).

Make copies of handouts and ensure sufficient copies of student references, readings, and procedures are available.

Test the *Carbon Emissions Calculator* from https://ei.lehigh.edu/learners/cc/carboncalc.html . Make sure the link is approved and accessible on students' devices. It is preferred that students have their own device to calculate their footprint, so be sure to secure enough devices for 1 per every student.

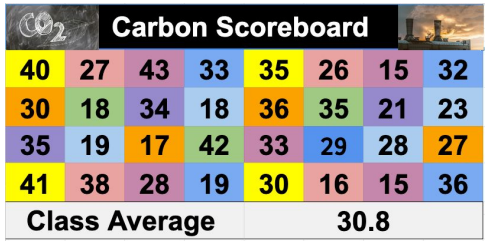
The *Carbon Emissions Calculator* is easy for middle schoolers to use, but the estimates are on the high end and may not be accurate. Therefore, you will add the real data estimate to your discussion as a comparison. Use data from *CO_2 Emissions (metric tons per capita) United States* from https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?locations=US . **Slide C** includes a screenshot of the data, but accessing the data directly allows for more functionality to scroll and see data for each year.

Make your Carbon Scoreboard on a large sheet of chart paper or the whiteboard, as shown in the image. By having students post their scores on sticky notes, you can reuse the Carbon Scoreboard with different classes of students. Retain your class's average for comparison with each other.



Alternatively, make a copy of the Digital Carbon Scoreboard to use in remote learning and/or one-to-one classroom. You can find the link to the spreadsheet file at www.teachersopensciedfieldtest.org/droughtsfloods or make a copy from the OpenSciEd public Google folder site.

Before this lesson, decide which target populations you want students to use to compound their solutions. Examples include class size, grade level, school, school district, neighborhood, zip code, town, and state. Locate the population number for the different comparisons you want to make and have these numbers ready for quick multiplication to compound reductions in CO_2. Note that the current US population is around 331 million people, and the current average zip-code population is around 8,000 people.



Carbon Scoreboard							
40	27	43	33	35	26	15	32
30	18	34	18	36	35	21	23
35	19	17	42	33	29	28	27
41	38	28	19	30	16	15	36
Class Average				30.8			

Lesson 14 • Where We Are Going and NOT Going

Where We Are Going

In the lesson, we're going to investigate some of our daily habits as they relate to the "likely" solutions we brainstormed in the previous lesson. Gathering this information for our lifestyles and our families will help identify where changes could be easier or more difficult to make, and how much those changes can impact if many people engage in them. This will be in anticipation of selecting a solution or a couple of solutions we want to communicate to our community.

Students will continue to work toward the following science ideas:

- **ESS3.D Global Climate Change.** Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding human behavior and applying that knowledge wisely in decisions and activities. (MS-ESS3-5)
- **ETS1.B Developing Possible Solutions.** There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2),(MS-ETS1-3)

Where We Are NOT Going

The carbon footprint calculator selected for this lesson is fairly basic and easy to access for middle schoolers without an intensive home audit. The tradeoff of using a simple interface is that the results are not as accurate as they may be with other calculators, and, with this calculator in particular, results tend to be high. However, the calculator provides relative numbers that students can use for comparison. This lesson will not investigate the math behind those calculations; however, many footprint calculators draw on the same kinds of data that students worked with in Lessons 12 and 13.

Another notable omission from this lesson is a comparison of the average American's footprint to the footprint of people living in other countries. The writing team considered adding this comparison but decided not to in the field-test version of the unit. When visiting the *CO_2 Emissions (metric tons per capitata) United States* from https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?locations=US , there is a possibility of comparing the US average CO_2 emissions to the average emissions of other countries. Unless you have instructional time to investigate these comparisons deeply (~2 class periods), it is recommended not to make comparisons to other countries, or to only make comparisons to other industrialized, high-income nations (For example, n Lesson 9 students saw that the United Kingdom, most of western Europe, and Japan as places that were higher carbon emitters, so these countries could be used as a comparison.). The economic, historical, and other social factors needed to explain the difference between high carbon emitters versus low carbon emitters and the current carbon trends is a rich area for student learning, but one that requires careful and thoughtful instruction. Our recommendation is to avoid these comparisons in the field-test version of the unit and our revised version will include an option for those comparisons in a more structured way.

LEARNING PLAN for LESSON 14

1 · NAVIGATION

3 min

MATERIALS: Categorizing Solutions chart (from Lesson 13)

Navigation. Make sure the Categorizing Solutions chart from Lesson 13 is visible for reference. Say, *In the last class we decided that some solutions seemed more likely than other solutions. Can someone remind us of why we decided these solutions were more likely?*

Listen for students to share the following:

- *they reduce carbon emissions*
- *are easy to do*
- *not too expensive*
- *a lot of people could do it*
- *it's something anyone can do*

Say, *Yeah, we may still not be certain about which ones make the most sense for us, but we decided these are ones that seem possible. And we wanted to see how we're doing on those solutions right now.*

2 · CALCULATE INDIVIDUAL FOOTPRINT AND POST RESULTS

12 min

MATERIALS: *Home Carbon Audit*, computer or device, Carbon Emission Calculator, sticky note, marker, computer and projector, Carbon Scoreboard (digital or chart paper)

Retrieve home learning handout. Ask students to locate their *Home Carbon Audit* that was assigned for home learning at the end of the last class period. If students do not have it, or were absent, they can still participate. Many students will be able to "guess" on the calculator to get a ballpark footprint number for their lifestyle.✱

Introduce the *Carbon Emissions Calculator*. Project the *Carbon Emissions Calculator* from https://ei.lehigh.edu/learners/cc/carboncalc.html . Say, *This is a carbon footprint calculator that we can use to get an estimate of how much our daily habits contribute to the carbon imbalance. We're going to use this tool to see how well each of us are doing on the solutions we have identified as possibly promising ones to solve this problem.*

Explain why it's called a carbon footprint (e.g., it's the amount of carbon dioxide that a person contributes) and how it's calculated (e.g., using similar math from the Solutions Cards, but now it's factored down to an individual and a home).

Preview how to calculate a footprint using your own numbers. You do not need to preview your entire footprint for students, just enough to show students how to navigate the tool.

ADDITIONAL GUIDANCE

It may help to have students round to the nearest tenths decimal place or even a whole number.

If using the chart paper scoreboard: Tell students to organize their scores from least to greatest when they post them. On the far left side should be the lowest scores and on the far right should be the highest scores. You may have a range from scores less than 10 tons to higher than 30 tons.
If using the digital scoreboard: Tell students to post their results in the appropriate tab and empty space. The spreadsheet will calculate the average for the class.

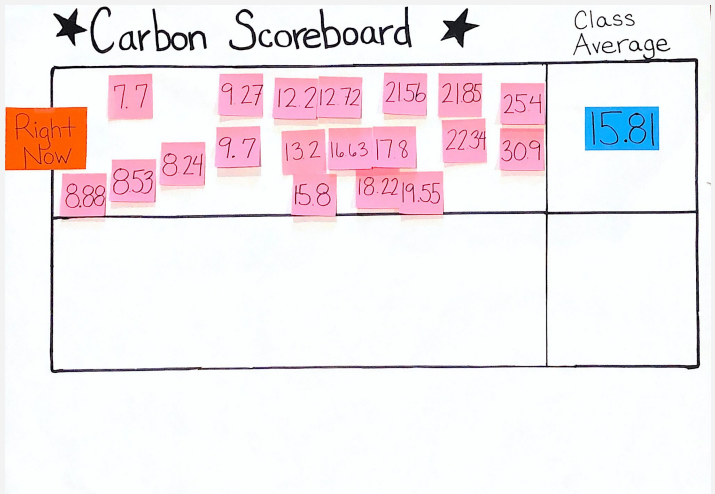
✱ ATTENDING TO EQUITY

Universal Design for Learning: An important thing you can do, particularly in this lesson, is to create a safe space for students. To do this, you need to *minimize threats* in the learning environment. Calculating a personal carbon footprint and sharing results can potentially create a situation in which students feel threatened and, therefore, may disengage. To reduce threat, have students post their carbon footprint numbers anonymously and avoid asking students to make comparisons to each other. Rather, have students make comparisons to themselves in terms of before and after their own lifestyle makeover.

Give students directions for calculating their footprint. Display **slide A**. Review the steps to calculate and post results. Show students where the Carbon Scoreboard is located. Use the guidance on the slide:

- Use your *Home Carbon Audit* to help you answer the questions.
- When you get to the final screen, locate your footprint number.
- Record your number in a large, legible font using the marker on the sticky note.
- Post to the class's Carbon Scoreboard.

Allows students 10 minutes to calculate their footprint and post their results. Give each student 1 sticky note and marker if using the chart paper scoreboard. Remind students to use their handout to enter the data. Encourage students to start noting areas where they think they have some flexibility to change habits. They may want to note these habits by jotting down a start on their handout as they enter their data.



Carbon Scoreboard scores right now

As students work, add a label to the scoreboard that says, "Right Now," or use the digital tab that says, "Before." Remind students to post their score anonymously, to post the score near similar scores, and to organize scores from lowest to highest. If necessary, have students give their scores to you and post several scores at a time to help ensure anonymity.

Be prepared to calculate the average score if using the chart paper version. Tell students to keep their device open and footprint easily accessible because they will return to it shortly.

3 · CALCULATE CLASS AVERAGE AND COMPARE TO AMERICAN AVERAGE

8 min

MATERIALS: calculator, Carbon Scoreboard (digital or chart paper), large sticky note, markers, computer and projector, CO2 Emissions (metric tons per capita) United States data site

Calculate the class average (skip if using the digital scoreboard). Arrange students in small groups or partners. Provide each group with a calculator. Display **slide B.** Ask groups to discuss what they notice about the footprint numbers across the class. Have them work together to find the class range and to calculate the average. After 3 or so minutes, bring students back together.

Have students share their observations of range and class average.✱ During the discussion, write the class average on a sticky note and post to the Carbon Scoreboard, as shown in the example above. Recording the range could be useful, too, though this is not shown in the example. Post the range near the class average.

Suggested prompts	Sample student responses
What is the range across all the scores in our classroom?	*7.7 to 30.9 tons (in example chart above)* *Accept answers that identify the lowest and highest numbers. Post to the chart.*

✱ SUPPORTING STUDENTS IN ENGAGING IN USING MATHEMATICAL AND COMPUTATIONAL THINKING

Use this opportunity to push students to use range and average to get an overall sense of how students are doing on the solutions identified as promising ones to solve the problem. Otherwise, the numbers may not have meaning to students.

✱ ATTENDING TO EQUITY

Climate change can be an upsetting topic for many students. Some students may feel that not enough is being done, and others may feel that it is a hopeless problem. The

Suggested prompts	Sample student responses
What do we notice are the lowest footprints? *What do we notice are the highest footprints?*	*The lowest are less than 10 tons, but there are only a few of them. The highest are in the twenties and thirties.*
Wow, that seems like a large difference. Where did most of the scores tend toward?	*Most were in the upper teens and twenties. We only had 1 in the 30s. There were a lot between 12-20 tons.* *Accept specific observations for each class of students.*
And how did you all calculate the average score for our class?	*We added up all the scores and divided by the number of people.*
What did we calculate was our class average?	*15.81 tons (in the example chart above)* *Accept the answer from the class. If students share different answers, have students check their calculations and share where they made an error in their original calculation.*
What do these numbers mean for the problem we are trying to solve? How well are we doing right now on the solutions we thought could be helpful and easy to do?	*We knew that a plant-rich diet was a helpful solution, but that added a lot to my footprint number.* *We thought carpooling was helpful but don't really do that right now.* *I didn't realize how much it adds up based on the size of the car.* *I was surprised how much using air conditioning could affect my score.*
What actions tend to make your scores go up quickly?	*Eating everything.* *Having larger cars.* *Using the car a lot.* *Air conditioning more rooms.* *Taking a lot of showers each day.*
What action could you take today to decrease your score? And if we all did it, how might it affect the class average?	*Eat more vegetables.* *Turn off electricity.* *Carpool to school.* *Take fewer showers or do fewer loads of laundry.*

ADDITIONAL GUIDANCE

If you teach multiple sections of science, keep each class's average score. Build a new Carbon Scoreboard that shows each class's average emissions score and their average score after reductions. Allow students to see how their class compared to other classes in terms of both impact and reductions in carbon.

Compare to real data on the American footprint.✱ Say, *When I was testing this tool, I noticed it was giving slightly high numbers. Because this tool is so simple, it's not factoring in a lot of information to get a more precise estimate. I wanted to see what the most precise estimate is for people in the United States. There is a data website that tracks this information that I want us to check out. Our numbers may be similar to the country average or may be on the high or low side of things. Let's see.*

Display **slide C** or navigate to the *CO_2 Emissions (metric tons per capita) United States* from https://data.worldbank.org/indicator/EN.ATM.CO2E.PC?locations=US if you want to project in real time. This data is current through 2016, but the average US per capita emissions is still around 15.5 tons per capita per year as of 2019.

purpose of looking at the real-time data is to emphasize to students that what the United States has been doing in recent years (shown as 2007-2016 on graph) has resulted in a downward trend in CO_2 emissions. Use this data to encourage your students that we are trending in the right direction, and there are things that everyday citizens can do to support and participate in this trend.

Have students turn and talk about observations from the graph. Use the prompts on **slide C**. If you are projecting the data in real time, use the same prompts, but give the prompts to students orally.

- What do you notice about the range—highs and lows?
- What do you notice about the overall trends?
- How does the most recent average compare to our class average?

Suggested prompts	Sample student responses
What do you notice about the range—highs and lows?	*The lowest is today! At 15.5. The highest was in the early 70s at 22.5.*
What do you notice about the overall trends?	*There was a quick trend up in the 1960s, then a lot of ups and downs. Since 2007, it's mostly been going down.*
How does the most recent average compare to our class average?	*Accept any answers, which will vary based on your class average.*

Say, *Wow, it's pretty cool that our country is making progress on this problem. I'm wondering if we can do more to help the trend keep going downward. We thought there were some solutions that were promising, but we realized we may not be doing our best on those solutions. We're going to revisit our carbon footprint to see if there are any changes we can make that may improve our footprint.*

4 · COMPLETE A LIFESTYLE MAKEOVER AND POST RESULTS

8 min

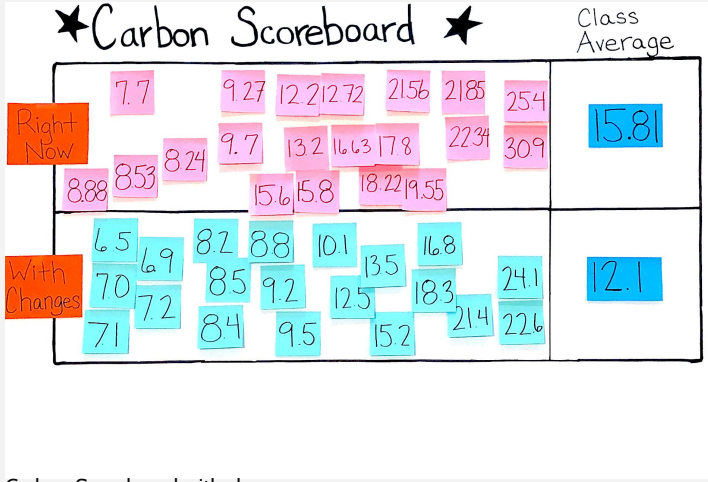
MATERIALS: *Home Carbon Audit*, computer or device, Carbon Emission Calculator, sticky note, marker, Carbon Scoreboard (digital or chart paper), large sticky note, markers

Have students return to their footprint and make changes to lower their score. Display **slide D**. Preview the instructions on the slide and provide each student with another sticky note.

Have students return to their footprint calculator to make 2-4 changes to try to lower their score. Ask students to record their changes by either (1) starring them on their *Home Carbon Audit* handout or (2) recording them in their science notebook.

While students work, post a new heading to the second row of the Carbon Scoreboard titled "With changes."

Have students post their new carbon footprint sticky note to the Carbon Scoreboard following similar strategies as before: anonymous, posted near similar numbers, and organized from least to greatest. If using the digital version, have students post the new numbers to the "after" tab.



Carbon Scoreboard with changes

Calculate the new range and class average. Ask a few students in class to calculate the new class average and post this to the Carbon Scoreboard using a large sticky note. The number is calculated automatically in the digital version.

5 · FACILITATE A DISCUSSION AND COMPOUND LIFESTYLE CHANGES

12 min

MATERIALS: calculator, Carbon Scoreboard (digital or chart paper), large sticky note, markers

Facilitate a Building Understandings Discussion about everyday changes and compounding effects. This discussion has two parts. First, to develop an understanding that even small everyday actions add up to reduce carbon dioxide emissions and that actions may be different for people in different situations. Second, to scale the average carbon reduction to larger populations of people.

KEY IDEAS

Purpose of the discussion: to identify that even a few small changes in our lifestyle and habits can add up to large impacts on carbon dioxide emissions, especially when many people do these things.

What to look/listen for:

- Our lifestyles and behaviors add carbon dioxide to the atmosphere.
  - Eating less meat or eating more veggies reduces carbon emissions.
  - Using less electricity reduces carbon dioxide emissions.
  - Recycling keeps you from adding carbon emissions.
  - Driving less or using public transportation or walking reduces carbon dioxide emissions.
- We can get our average down by making a few changes to our lifestyle. We can get it below the US average.
- If more people do these things, we can get more reduction in carbon dioxide.

Discuss everyday actions and why they vary. Display **slide E**. Use the prompts on the slide to facilitate a discussion of the different actions that students thought they could make, how those actions impact carbon, and other considerations to think about before making a change.

Suggested prompts	Sample student responses	Follow-up questions
What kinds of changes did you want to make?	*Turn off the lights and electronics.* *Recycle.* *Eat less meat or more vegetables.*	*Did they lead to big or small impacts on carbon?Are they realistic for you and your family?*
What actions were not realistic?	*Changing the type of home.* *Changing the number of family members.* *Changing appliances.*	*What are the constraints that would keep people from doing them?*
How could these changes benefit your family in other ways beyond carbon reduction?	*Saves our family money.* *Uses less water.* *Uses less stuff.*	*Are there any potential negative effects of these changes on our families that we need to think about?*
Why are each of your changes different from each other? Is this important?	*Each of us has a different living situation. Different houses, family members, and eating habits, and such. Some people can change some things that may be harder for others to change. And some people may not be able to do one thing, but they can do something else.*	

✱ ATTENDING TO EQUITY

If time permits and students can engage in these calculations in partners, use this opportunity to differentiate for math abilities. Allow more advanced math learners to engage in calculations with trickier percentages and/or calculate for different scenarios. With students who need more support, consider going through another calculation together and/or having them take example scenarios with more even numbers (e.g., 50% as opposed to 35%). Allow them to check their numbers with each other and/or you before sharing aloud.

✱ SUPPORTING STUDENTS IN THREE-DIMENSIONAL LEARNING

Students will engage in mathematical thinking in order to scale their carbon reductions to larger populations. The purpose of this work is to understand that individual actions and behaviors nested in larger populations of people engaging in actions has an impact.

Calculate the carbon savings for the class. Display **slide F**. Have students calculate how much the class saved per person by making the change (simple subtraction).

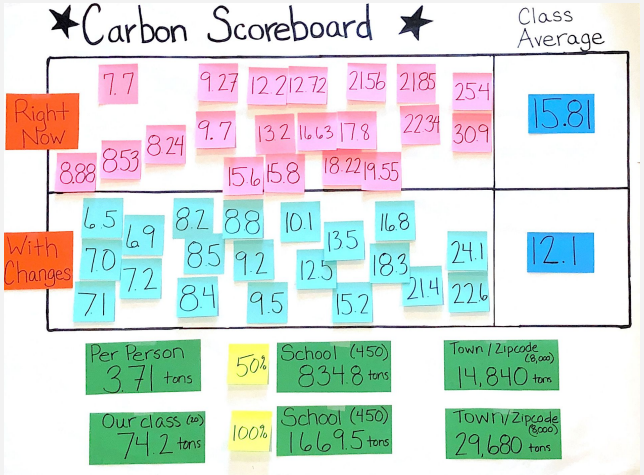
Scale the per person savings to larger populations. Engage students in calculations and a deeper discussion of scaling the changes to more people. Allow students to choose different populations that they could scale their changes to, such as the school, community, family, church community, everyone in the city, their zip code, their sports team, etc. Be prepared with some of these populations numbers on hand or have students estimate the population number. Students should multiply the per person savings by the new larger population.

Record some of these on the Carbon Scoreboard. The example to the right shows the sample Carbon Scoreboard scaled to a school of 450 teachers and students and to a town with a zip-code population of 8,000. There are two calculations—one for 100% participation in changed actions and another for 50% participation.

Have students first do calculations based on 100%. Then, at some moment, problematize to say, *How realistic would it be that everyone would do these things? What is a more realistic percentage?*

Display **slide G** and have students think through realistic percentages of people who may change their habits. To support students in understanding percentages, have all of your students stand up. Ask half to sit down and the other half to stay standing. Then ask a quarter to sit down, while three-quarter remain standing. As students move between sitting and standing, calculate the percent together.

Help students identify a "realistic" percent they'd want to use (e.g., 40%, 50%, 75%).



Carbon Savings scaled up to more people

Recalculate based on the new percentage. Help students multiply their carbon savings that were calculated at 100% by the new percent (e.g., 3.7 x 150 students and teachers = 555 tons; but if only 50% changed their habits, it would be half of that, which is 555/2 = 278 when rounded).

If time permits, arrange students in pairs and allow them to calculate a new carbon savings number for a group size of their choosing and the percent they could convince to engage in an action. Let them share their calculations with the class.✱

Example calculations are shown below for a per person savings of 3.7 tons.

3.7 per person	Class	Grade	School	Neighborhood/ small town	Zip code	Community group (e.g., sports team)	United States
# of people	20	150	450	4,000	8,000	80	331,000,000
Carbon savings 100%	74	555	1,665	14,800	29,600	296	**1,224,700,000 (> 1 Gigaton)**
Carbon savings 50%	37	278	833	7,400	14,800	148	612,350,000

Post any new carbon savings calculations to the Carbon Scoreboard.

Facilitate a concluding discussion of the scaled numbers. Say, *When we did our own calculations, we were only saving 3.7 tons per person, which didn't seem very big. But look how quickly it grows when more people are willing to make changes. Remember we were trying to save about 9 gigatons of carbon per year (which is 1 billion tons). We don't get very close with a few people, but we do start to get larger numbers when more people are willing to make changes.*✱ Display **slide H**.

Suggested prompts	Sample student responses
What other important things can you summarize from these numbers with respect to the problem we are trying to solve?	*Every little bit adds up to lower carbon dioxide.* *Even small changes can add up to big impacts on the carbon imbalance.* *It may feel like the things you are doing don't matter, but if you are doing them with other people, they can make real changes.* *If you don't make changes, it is hard to expect others to change.*
What assumptions did we make about our numbers?	*The numbers are based on our average reduction, and we know a lot about the problem.* *Different people need to be able to make different changes based on their situation, so it may not be easy for everyone to change things in their life.*

ASSESSMENT OPPORTUNITY

Building towards: 14.A Apply mathematical concepts to calculate the class's average carbon impact and possible carbon reductions and scale those reductions if more people change their behaviors.

What to look/listen for:

- students calculating the carbon savings from their lifestyle changes,
- students multiplying the savings by different population sizes, and understand why they are multiplying,
- students recognizing that their calculations are based on getting 100% of people to make changes, and to recalculate a more realistic percentage, and
- students understanding that the numbers reflect an average carbon savings based on different actions people may be willing to take.

What to do: To support the math, particularly for students who struggle with math, talk about the numbers in a concrete example together. Start with class level, talk and show the calculation on the front whiteboard, and what each number and each operation means. It's important for students to recognize that changing the percent is a reflection of how many people can be convinced to change their behaviors. Having students model the percentages visually (see slide G) and kinesthetically can support students too.

6 · NAVIGATION

2 min

MATERIALS: None

Have students turn and talk about changes that make sense for their community. Arrange students in partners and display **slide I**. Give students a couple minutes to turn and talk about what solutions from Lessons 12, 13, and today's lesson make sense for their community using the prompts on the slide.

- What changes do we think would be easiest and most effective in our community?
- What would make it convincing for our community to do those things?

Say, *In the next class, we'll start thinking about a solution, or solutions, we think make sense for our community (or school), and how best to communicate those solutions to people in the community.*

Additional Lesson 14 Teacher Guidance

SUPPORTING STUDENTS IN MAKING CONNECTIONS IN MATH

CCSS.Math.Content.6.RP.A.3.c: Find a percent of a quantity as a rate per 100 (e.g., 30% of a quantity means 30/100 times the quantity); solve problems involving finding the whole, given a part and the percent.

Students will draw upon 6th grade math to complete this lesson. First, students know how to compute unit rate and will apply this concept to calculate a per person carbon savings number. Students then apply the percent of a quantity (such as the number of people in the school) and the rate per person to solve a problem around carbon reductions based on lifestyle changes. The purpose of engaging in these mathematical calculations is twofold: (1) to understand that individual actions add up and (2) that the percent of the population engaging in those actions matter in terms of the carbon savings that is possible.