



## TEACHER GUIDE

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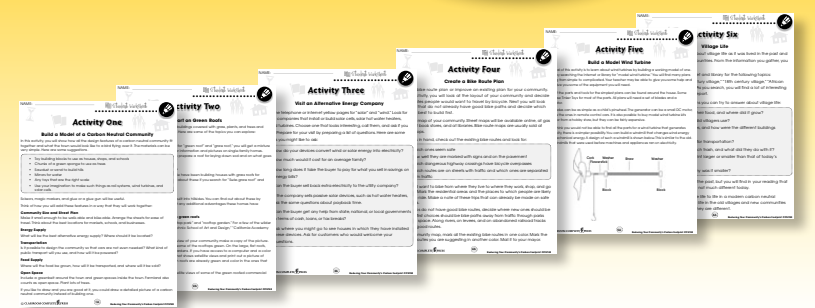
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# The Transportation Footprint of a Community

1. Circle the word **TRUE** if the statement is TRUE or Circle the word **FALSE** if it is FALSE.
- a) Sharing rides to work is called carpooling.  
TRUE      FALSE
  - b) Buses are a type of public transport.  
TRUE      FALSE
  - c) Telecommuters are old-fashioned telephones.  
TRUE      FALSE
  - d) Transportation adds very little to the carbon footprint of a community.  
TRUE      FALSE
  - e) Biking has the same carbon footprint as riding a bus.  
TRUE      FALSE
  - f) Electric cars usually have a carbon footprint.  
TRUE      FALSE

2. Put a check mark (✓) next to the answer that is most correct.
- a) Which invention was the main cause of people moving from cities to the suburbs?
- A car
  - B radio
  - C telephone
  - D electric lights
- b) Which means of transportation has the smallest carbon footprint?
- A bike
  - B bus
  - C carpool
  - D train
- c) How do most people in the United States travel to work?
- A bus
  - B car
  - C train
  - D walk



# Greener Vegetables

**M**ost of the food in American cities are grown hundreds of miles away using large tractors, chemical **fertilizer**, and **pesticides**. In the old-time villages described in the transportation section, food was grown just outside the city and brought in to markets on market days. Many people also had their own vegetable gardens inside the city.

Some of the new green cities being built are designed the same way. Food is grown nearby or inside the city, which cuts down on carbon dioxide emissions by trucks bringing food into the town. The crops also absorb some of the CO<sub>2</sub> the city produces and lowers the temperature in the summer. When crops for a green city are grown without the use of chemical fertilizer and pesticides, the produce is said to be **organic**. Organic produce has a lower carbon footprint because the manufacture of fertilizer and pesticides releases CO<sub>2</sub>.



Local farm vegetables

**STOP** How is organically grown food different from other food?

---



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It is easier to design a new carbon neutral city than to make a big reduction in the carbon footprint of an existing city. But can it be done? Recent history of the island nation of Cuba shows that it is possible.

In 1991, Cuba lost its main supply of oil, and suddenly they had to get along with only 10% as much fuel. At that time, their farms were much like those in the United States. Cubans used tractors, fertilizer, and pesticides that all depended on oil. The next ten years were hard for many Cubans, but they successfully changed the farming system to one that did not depend on fossil fuels. The farms were moved closer to and even inside of the cities. Tractors were replaced by human and animal power. Organic methods of farming were required by law. It would be good if other countries made the same kinds of changes. If we get started now, maybe the change won't be as painful as it was for the Cubans.



# Reduce, Reuse, Recycle, and Plant

1. Put a check mark (✓) next to the answer that is most correct.
- a) What is the chemical formula of the gas produced by decomposing organic matter?
- A CH<sub>4</sub>
  - B CO<sub>2</sub>
  - C NaCl
  - D SO<sub>2</sub>
- b) Why did Los Angeles plan to plant one million trees?
- A To grow fruit.
  - B To shade sidewalks.
  - C To produce lumber for new homes.
  - D To remove carbon dioxide from the air.
- c) Which of these can be used as a fuel?
- A oxygen
  - B nitrogen
  - C methane
  - D carbon dioxide
2. There are several steps in the process of converting food scraps to electrical energy. Number the steps from 1 to 7 in the order they occur.
- \_\_\_ a) Collect the methane produced by the microbes.
  - \_\_\_ b) Cover the food scraps with soil.
  - \_\_\_ c) Send food scraps to a landfill.
  - \_\_\_ d) Wait for microbes to decompose the scraps.
  - \_\_\_ e) Boil water to make steam.
  - \_\_\_ f) Use the steam to power an electrical generator.
  - \_\_\_ g) Burn the methane.



# Some Green Towns and Cities

3. Answer the questions in complete sentences.
- a) Describe one energy source used by many carbon neutral communities.
- 
- 
- b) Describe one way in which carbon neutral communities offset the small amount of CO<sub>2</sub> they do emit.
- 
- 
- c) Explain how carbon neutral communities reduce their transportation footprint.
- 
- 
- Extensions & Applications**
- Think about the community where you live.
- a) Consider the climate and geography where you live. What would be the best alternative energy sources that could replace fossil fuels in your community?
- 
- 
- b) How could the transportation system in your community be changed to lower its carbon footprint?
- 
-



# Carbon Footprint Calculator

On this page and the following page, you can calculate the carbon footprint of your community. You can think of your community as your city, town, neighborhood, or suburb. If you live in the country, you can calculate the footprint for your county. Whatever area you take to be your community, you will need to be able to find its population.

Because communities are so different and because there are so many factors that make up the footprint, you cannot expect the result to be perfectly accurate. It will be a fairly good estimate though, and it will probably be many thousands of tons of carbon dioxide. A ton equals 2,000 pounds, which is about the weight of a small car.

First you will need to find the **per capita** carbon footprint of your state. Per capita means per person. The per capita footprint is the share of the total footprint caused by the activities of the average person and is given in tons per year. Per capita footprints vary widely from state to state. We have divided the states into groups with high, medium, and low footprints. Look at the table below and find which group your state is in.

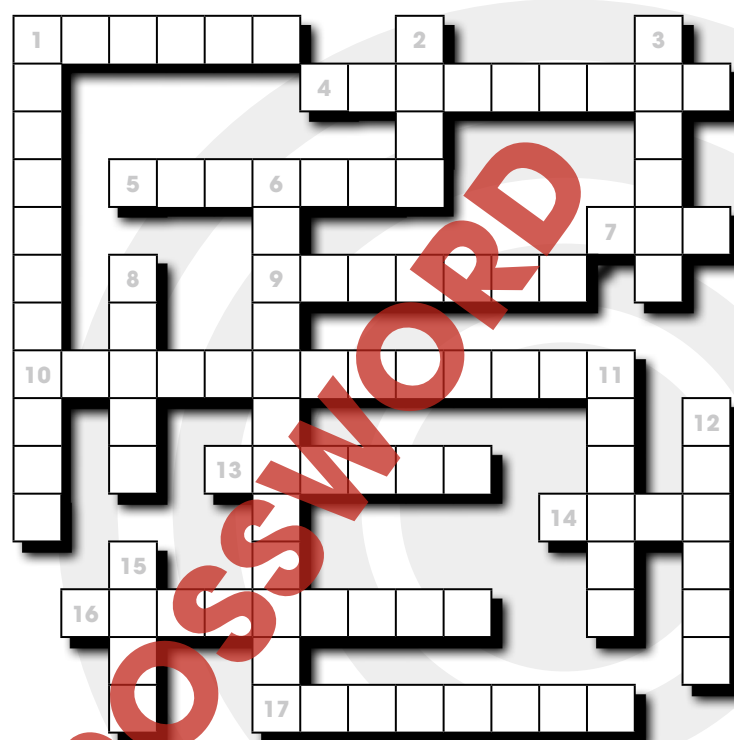
| Per Capita Carbon Footprints of States in Tons per Year |   |   |
|---|---|---|
| Low Footprint States<br>Use 13 Tons per Year            | Medium Footprint States<br>Use 20 Tons per Year | High Footprint States<br>Use 31 Tons per Year |
| Arizona   | Arizona   | Alabama                                       |
| California  | Colorado  | Alaska  |
| Connecticut   | Delaware  | Indiana                                       |
| District of Columbia                                    | Georgia   | Iowa  |
| Florida   | Hawaii  | Kansas  |
| Idaho   | Maine   | Kentucky                                      |
| Illinois  | Michigan  | Louisiana                                     |
| Maryland  | Minnesota                                       | Missouri                                      |
| Massachusetts   | Mississippi                                     | Montana                                       |
| New Hampshire   | Nevada  | Nebraska                                      |
| New Jersey  | Pennsylvania                                    | New Mexico                                    |
| New York  | South Carolina                                  | North Dakota                                  |
| North Carolina  | South Dakota                                    | Ohio  |
| Oregon  | Tennessee                                       | Oklahoma                                      |
| Rhode Island  | Utah  | Texas   |
| Vermont   | Virginia  | West Virginia                                 |
| Washington  | Wisconsin                                       | Wyoming                                       |



# Crossword Puzzle!

### Across

- Solar power is either passive or \_\_\_\_\_.
- Martial arts masters get a black belt, and some cities get a \_\_\_\_\_.
- People sharing rides to work.
- Carbon dioxide is a greenhouse \_\_\_\_\_.
- The kind of vegetables that are grown without pesticides.
- People who work at home using a computer and telephone.
- This type of fuel releases carbon dioxide when it burns.
- Coal is a fossil \_\_\_\_\_.
- Per person.
- Someone on his or her way to work.



### Down

- The type of fuels that are used to replace fossil fuels.
- Photovoltaic \_\_\_\_\_.
- \_\_\_\_\_ climate change.
- The type of device that changes the sun's energy directly into electricity.
- Having to do with the sun.
- A neighborhood outside a city.
- When a city absorbs the sun's energy, it creates a heat \_\_\_\_\_.
- What greenhouse gases trap.

### Word List

- |             |           |               |
|-------------|-----------|---------------|
| active      | fuel      | organic       |
| alternative | gas       | per capita    |
| carpool     | global    | photovoltaic  |
| cell        | greenbelt | solar         |
| commuter    | heat      | suburb        |
| fossil      | island    | telecommuters |



# Comprehension Quiz

### Part A

Circle the word **TRUE** if the statement is TRUE or **FALSE** if it is FALSE.

- Global climate change is caused by a change in the amount of greenhouse gases in the atmosphere.  
**TRUE**    **FALSE**
- Carbon dioxide is a greenhouse gas.  
**TRUE**    **FALSE**
- Your community carbon footprint is the same as your personal carbon footprint.  
**TRUE**    **FALSE**
- Adding parkland to your community increases its carbon footprint.  
**TRUE**    **FALSE**
- Some communities generate all their own electricity from renewable sources.  
**TRUE**    **FALSE**
- Carbon neutral communities are being built in countries around the world.  
**TRUE**    **FALSE**
- People living on low-lying islands are looking forward to a rise in global temperature.  
**TRUE**    **FALSE**

### Part B

Put a check mark (✓) next to the answer that is most correct.

- Which invention was the main cause of cities and communities spreading out to cover more land?  
 A television  
 B cell phone  
 C automobile  
 D electric light
- Which change in a community's food supply would reduce its carbon footprint?  
 A Buying food from farmers closer to home.  
 B Improving packaging to keep food fresh longer.  
 C Using more chemical fertilizer to increase crop yield.  
 D Buying more food than you need to be ready for natural disasters.
- Cities absorb more solar energy than the surrounding countryside, creating a  
 A heat island.  
 B carbon offset.  
 C sea level rise.  
 D greenhouse effect.

SUBTOTAL: /10

# Carbon Neutral Community



At least nine ways to lower the carbon footprint of a community are shown or hinted at in the picture below. See if you can find them all.



# Reduce, Reuse, Recycle, and Plant

1. Put a check mark (✓) next to the answer that is most correct.

a) Which of these is a greenhouse gas?

- A hydrogen
- B methane
- C nitrogen
- D oxygen

b) Which of these items contains a metal that can be recycled?

- A soda cans
- B food scraps
- C newspapers
- D water bottles

c) Why is reducing the amount of a product you use better than recycling the product?

- A Recycling takes too much time.
- B Recycling materials uses energy.
- C Recycled products are not as strong as new ones.
- D Products made from recycled materials do not last very long.

2. Circle the word TRUE if the statement is TRUE or Circle the word FALSE if it is FALSE.

a) Old telephone books can be recycled.

TRUE FALSE

b) Food scraps can be composted.

TRUE FALSE

c) All waste materials should be buried in a land fill.

TRUE FALSE

d) Buying new things adds less to the carbon footprint than buying used things.

TRUE FALSE

e) A community can reduce its carbon footprint by planting trees.

TRUE FALSE

f) Plastic drinking water bottles can be recycled.

TRUE FALSE

1.

a)  B

b)  A

c)  B

2.

a) TRUE

b) TRUE

c) FALSE

d) FALSE

e) TRUE

f) TRUE

26

(Answers will vary.)  
When buried food scraps decompose, they release methane gas. This gas can be used as a fuel to generate electricity.

27

1.

a)  A

b)  D

c)  C

2.

a) 4

b) 2

c) 1

d) 3

e) 6

f) 7

g) 5

28

3.

a) Recycling processes usually release some greenhouse gases.

b) The most efficient way to remove CO<sub>2</sub> from the atmosphere is to plant trees and other green plants.



1.

A small cluster of homes, surrounded by a greenbelt, green roofs, solar hot water, photovoltaic cells, energy from organic waste, crops grown nearby, and wind turbines should be circled.

2.

a)  A

b)  C

c)  C

d)  A

30

### Extensions & Applications

Answers will vary but may include: glass bottles can be recycled into new glass bottles; newspapers can be recycled into other paper products; aluminum cans can be recycled into new aluminum cans; plastic bottles can be recycled into many plastic products; food scraps can be composted to make organic fertilizer.

# EASY MARKING ANSWER KEY

