Contents

TEACHER GUIDE

STUDENT HANDOUTS

READING COMPREHENSION

NAME: _____

Before You Read

Very Green Houses

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

a) Cities are usually hotter than the surrounding countryside.
TRUE **FALSE**

b) Some cities encourage builders to cover roofs with plants.
TRUE **FALSE**

c) Plants add carbon dioxide to the atmosphere.
TRUE **FALSE**

d) Trees planted around a house usually increase the cost of air conditioning.
TRUE **FALSE**

e) It is possible for a household to produce all of its own electricity.
TRUE **FALSE**

f) The cost of energy-efficient appliances is usually balanced by lower energy bills.
TRUE **FALSE**

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

a) **Photovoltaic cells change energy from the sun directly into**

- ◯ **A** heat energy.
- ◯ **B** nuclear energy.
- ◯ **C** electrical energy.
- ◯ **D** chemical energy.

b) **If a city has a green belt, what does it have?**

- ◯ **A** A river or canal covered with algae.
- ◯ **B** A large park in the center of the city.
- ◯ **C** A band of open forests and fields surrounding it.
- ◯ **D** A strip of grass separating the lanes of a freeway.

c) **All of these are reasons to plant trees and grass inside a city, *except***

- ◯ **A** provides habitat for wildlife.
- ◯ **B** lowers temperature on hot days.
- ◯ **C** provides lumber for construction.
- ◯ **D** removes carbon dioxide from the air.

Reading Passage

NAME: _____

Very Green Houses

City buildings and streets are made of a lot of concrete, stone, brick, and asphalt. All of these materials absorb heat and hold it. This makes cities warmer than the surrounding countryside, creating what is called a **heat island**. Heat islands change the local climate and add to the part of the carbon footprint caused by running air conditioners.

A roof park in Tokyo, Japan

Some cities have reduced the heat island effect by covering roofs with living plants. People's homes can be covered with grass, and large office buildings are strong enough to support trees and other large plants. Green roofs provide **insulation** and create habitat for wildlife. If a roof is flat, it can be used to grow crops, and this helps reduce the CO_2 emitted when food is shipped to the city from distant farms.

STOP

What is the cause of the "heat island" effect caused by cities?

_____

_____

Buildings can have other design features that reduce their carbon footprint by collecting solar energy. These designs can be classified as either **passive solar** or **active solar**. Passive solar design uses the sun to heat the house or to heat water. This reduces the footprint by reducing the use of fossil fuel. It can be as simple as building the house at the best angle

After You Read

NAME: _____

Very Green Houses

1. **Write each word or group of words beside its meaning.**

heat island effect	**insulation**	**passive solar**
active solar	**photovoltaic cell**	**greenbelt**

_____ **a)** a material that helps keep temperature from changing by preventing heat flow

_____ **b)** a device that converts energy from the sun directly into electricity

_____ **c)** design that captures the sun's energy as heat

_____ **d)** design that changes the sun's energy into a form other than heat

_____ **e)** a band of trees and other plants surrounding a city

_____ **f)** local climate change caused by heat absorption by building materials in a city

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

a) The heat island effect is caused by volcanoes.
TRUE **FALSE**

b) Grass covered roofs provide insulation.
TRUE **FALSE**

c) Building a greenhouse as part of a home can help cool the home in the summer.
TRUE **FALSE**

d) A solar hot water heater is a passive solar device.
TRUE **FALSE**

e) City rooftops can become small parks and farms.
TRUE **FALSE**

f) Surrounding a city with a greenbelt helps hold in heat.
TRUE **FALSE**

After You Read

NAME: _____

Very Green Houses

3. **Answer the questions in complete sentences.**

a) Describe an active solar device and explain how it changes energy from one form to another.

_____

_____

_____

b) Describe a passive solar device or design feature and explain how it changes energy from one form to another.

_____

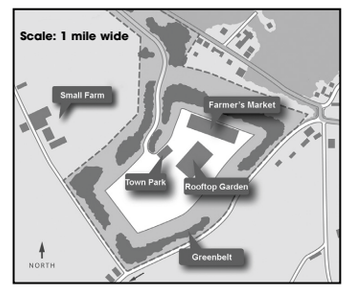
_____

_____

_____

Extensions & Applications

The plan for a town that will be carbon neutral is shown here. In the left-hand column of the table below list four features of the community that will help lower its carbon footprint. In the right-hand column explain how each feature will reduce the footprint. You may list features that are not named. Some explanations can be the same, but give as many different explanations as you can.



Feature	How the Feature Reduces the Carbon Footprint

See page 13 for Final Version Worksheet.

Hands-On Activity # 4

CALCULATING YOUR COMMUNITY'S NEW, IMPROVED CARBON FOOTPRINT

(continued)

TRANSPORTATION

Changing from car to telecommuting:

How many people are likely to change from commuting by car to telecommuting in the next 10 years? Multiply the likely number by 4. This is based on an average round-trip commute of 32 miles.

(people likely to begin telecommuting) × (4 tons) = _____ Tons

Changing to biking or walking to work:

How many people are likely to change from commuting by car to walking or biking to work in the next 10 years? Each person will reduce the footprint by 1 ton. This is based on an average round-trip commute of 8 miles.

(people likely to begin biking or walking) × (1 ton) = _____ Tons

Carpooling:

How many people are likely to begin carpooling to work in the next 10 years? Each person will reduce the footprint by 2.4 tons. This is based on averages of 2.5 people in each carpool and 32 miles round trip.

(people likely to begin carpooling) × (2.4 tons) = _____ Tons

Changing from car to public transport:

How many people are likely to change from commuting by car to taking public transport in the next 10 years? Each person will reduce the footprint by 3 tons. This is based on a round trip of 32 miles.

(people likely to change to public transport) × (3 tons) = _____ Tons

Total transportation footprint reduction = _____ **Tons**

CARBON NEUTRAL BUILDING

If all new buildings built in the next 10 years were carbon neutral it would reduce the carbon footprint by 7%. Multiply the footprint you calculated on page 15 by 0.07.

(present carbon footprint) × (0.07) = carbon neutral building reduction = _____ Tons

PLANTING TREES

Divide the number of trees you think your community will plant in the next 10 years by 100.

$\frac{\text{(number of trees planted)}}{(100)}$ = tree planting reduction = _____ Tons

Add all the footprint reductions and subtract the result from your current community footprint. This is your new, improved community carbon footprint.

NAME: _____

After You Read

Word Search

Find all of the words in the Word Search. Words are written horizontally, vertically, diagonally, and some are even written backwards.

active	decompose	greenhouse	organic	turbine
atmosphere	fertilizer	habitat	per capita	wind
carbon footprint	fossil fuel	heat island	pesticide	
carbon neutral	gas	methane	photovoltaic cell	
carpool	geothermal	microbe	solar	
commuter	greenbelt	natural	suburb	

P	T	A	B	C	C	H	R	E	T	U	M	M	O	C	R
O	H	U	D	A	E	F	A	G	H	I	J	K	L	A	A
M	R	O	R	R	T	L	E	B	N	E	E	R	G	R	L
N	O	G	T	B	O	P	D	Q	I	R	S	A	E	B	O
T	U	V	A	O	I	W	X	N	Y	T	T	Z	O	O	S
P	D	G	P	N	V	N	A	B	I	M	A	C	T	N	D
E	N	R	M	F	I	O	E	R	O	W	P	T	H	N	F
R	A	E	I	O	E	C	L	S	F	L	E	E	E	E	O
C	L	E	C	O	G	H	P	T	A	N	S	I	R	U	S
A	S	N	R	T	J	H	A	R	A	O	T	T	M	T	S
P	I	H	O	P	E	C	U	H	P	I	I	K	A	R	I
I	T	O	B	R	T	T	T	M	L	L	C	M	L	A	L
T	A	U	E	I	A	E	O	N	I	O	I	C	P	L	F
A	E	S	V	N	M	C	Q	Z	R	S	D	G	E	T	U
U	H	E	V	T	E	W	E	X	Y	Z	E	A	A	L	E
B	C	D	E	D	B	R	U	B	U	S	F	G	H	S	L

NAME: _____

After You Read

Comprehension Quiz

Part C

Answer each question in complete sentences.

1. What does telecommuting mean? (2)

2. How can food waste be used to generate electricity? (2)

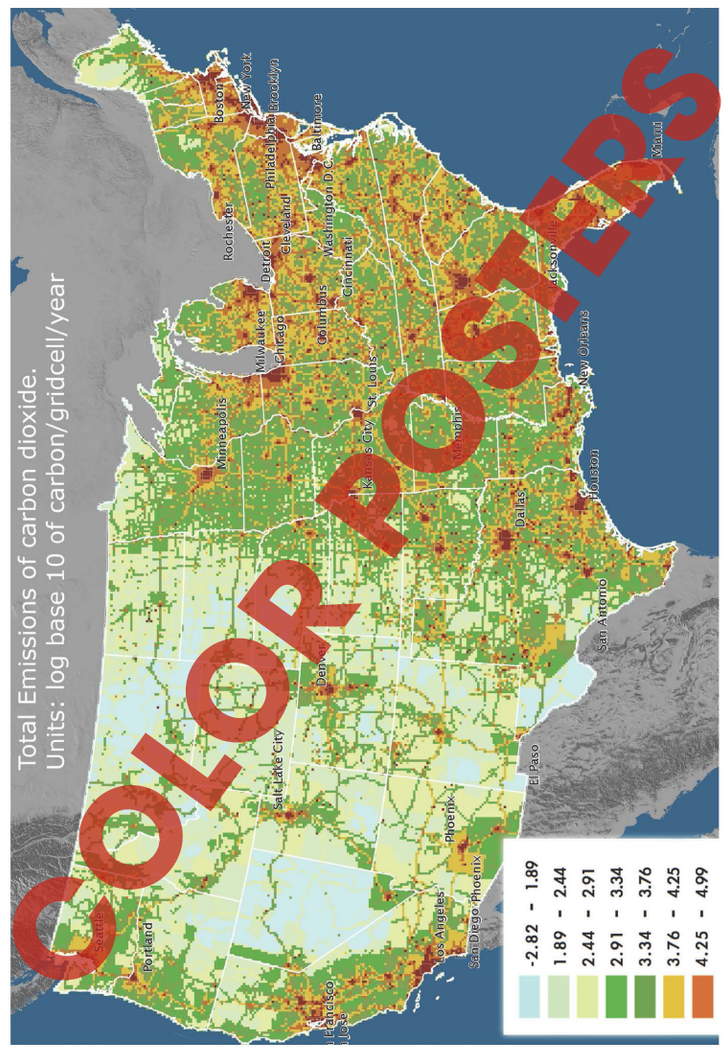
3. What makes a community carbon neutral? (2)

4. Explain how planting trees lowers the carbon footprint of a community. (3)

5. Identify three alternative energy sources with little or no carbon footprint. (3)

SUBTOTAL: /12

Total Emissions of Carbon Dioxide



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After You Read

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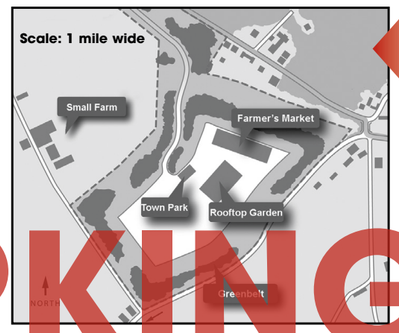

Feature	How the Feature Reduces the Carbon Footprint

See page 13 for Final Version Worksheet.

EZ

3.

a) (Answers will vary.) Photovoltaic cells are flat panels that collect solar energy and change it into electrical energy.

b) (Answers will vary.) A solar hot water heater absorbs sunlight and changes it into heat energy which then heats water.

Extensions & Applications

Feature	How the Feature Reduces the Carbon Footprint
Greenbelt	Reduces heat island effect, saving on summer air conditioning that uses electricity generated with fossil fuels.
Small size (1 mile)	Eliminates the need for fossil fuel burning cars and buses because you can walk or bike.
Farmers Market	Reduces the amount of CO_2 emitted shipping vegetables.
Rooftop Garden	Absorbs CO_2 from the atmosphere.