

# RENEWABLE OR NOT?

## AT A GLANCE

Students learn the difference between renewable and non-renewable resources and discover why sustainable use of natural resources is important.

### OBJECTIVES

Students will:

- Identify renewable and non-renewable resources and explain the differences between them.
- Understand the importance of conserving non-renewable resources.

### KEY VOCABULARY

Fossil fuels, natural resources, non-renewable resources, renewable resources, sustainable yield.

### SUGGESTED GRADE

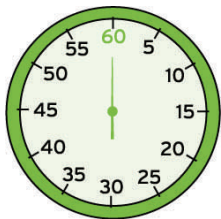
LEVELS: 4—8

### ILLINOIS STATE LEARNING GOALS

1: A, C; 4: A, B; 12: B; 13: B;  
15: A, B, E

### PACE YOURSELF

60 MINUTES



### ADVANCE PREPARATION

1. Make one copy of the student worksheet for each team.
2. Prepare materials for demonstrations.
3. Make 14 slips of paper as follows: two First Generation, four Second Generation, and eight Third Generation. Put slips in a paper bag.
4. Make popcorn (other snacks such as pretzels may be used).



### MATERIALS

#### Per Class:

14 slips of paper (2" x 3" or larger)  
Large jar or container  
15 paper bags, like lunch bags  
Popcorn

#### Per Group:

Scissors  
One student worksheet



### WHAT YOU NEED TO KNOW

**Natural resources** are all of the things we use in our physical environment to meet our needs and wants, such as water, land, materials for clothing, etc. We can put all of the things that we use into two categories **non-renewable** and **renewable** resources.

Non-renewable resources exist in finite or limited amounts. Once they are used up, they are gone forever. For example, **fossil fuels** are formed through natural processes that take millions of years. If we use all of the available fossil fuels, no additional amounts of them will ever be available to us—at least not for millions of years.

Renewable resources are materials that can be replenished through natural and/or human processes. For example, even though trees die or are cut down, new trees are naturally reseeded or can be replanted by humans. Solar energy, wind, and tides are renewable resources that are constantly or perpetually being renewed or restored.

The maximum rate at which people can use a renewable resource without reducing the ability of the resource to renew itself is called **sustainable yield**. For example, a sustainable yield of timber would mean harvesting only the volume of trees that they forest could

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grow. This term also applies to water and wildlife. The sustainable yield of any resource varies from region to region and is different depending on the resource.



## WARM UP

1. Divide the class into groups of four.
2. Write the terms “renewable resource” and “non-renewable resource” on the board. Have students work together to write a definition and/or think of examples for each.
3. Give each team a copy of the student page.



## ACTIVITY

### Part A: Sorting What's What

1. Students will get clues from the student worksheet and give each group member one.
2. Students should read their clue card and share the information with the rest of their team. Then each team should use these bits of information to determine a definition for renewable and non-renewable resources.
3. Teams will discuss the questions on the student worksheet, with one member designated to record their responses and one designated to report them.
4. Have each group share their responses with the class. Write key words or responses on the board.

### Part B: Popcorn Generation

1. Fill a large jar or container with popcorn and have your paper bag with the 14 slips of paper ready.
2. Have 14 students draw a slip of paper from the bag and also give each of them an empty paper bag. *They should not tell anyone what the paper says.*
3. Ask the two First Generation students to come up to the big jar of popcorn. Explain that the food in the jar represents the world's supply of a non-renewable resource. Tell them they can take as much of the non-renewable resource as they want. Let them fill up their bags while the rest of the students watch.
4. When the First Generation students are done, invite the four Second Generation students to go up and take as much of the remaining “non-renewable resource” as they want. After they've finished, have the Third Generation students come up and take what they want.
5. Discuss with students what is happening to the world's “non-renewable resource” (popcorn) supply. What happened to the total amount of the resource? How much was left for each successive generation? Was anything left for a Fourth Generation? Did any of the students who were part of the demonstration think about those who might be eating after them, or were they only trying to get as much popcorn as they could?
6. What connections do the students see between what happened in the demonstration and what happens in the real world?

### Part C: Greed vs. Need

1. Divide the group into teams of four. Give each team 16 pieces of popcorn. Explain that students will play a game in which the popcorn represents the team's supply of a renewable resource that is replenished after each round of play. Each student can take freely from the team supply; however, the team should keep the following in mind:

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During the discussion, be sure to introduce the concept of sustainable yield.

Some of the groups may run out of resources right away, but one or more of the groups should figure out a way to collect at least one piece of popcorn each round and still have leftovers in their collective pile to be “renewed.”

## RULES

- At the end of the game, each team member will get to eat all of the popcorn that he or she collected.
  - Each team member needs to take at least one piece of popcorn per round to live.
  - At the end of each round, the popcorn will be replenished by one-half of its existing amount.
2. Begin round one. Allow students on each team to take freely from their team’s popcorn pile. Students should record how many pieces they have taken and how many are left in the team pile.
  3. Find out how many pieces each group has in its team pile, and give the group half that amount in new pieces.
  4. Play three or four more rounds, stopping after each to find out if any of the students didn’t survive (remember, this happens if there is not enough popcorn for them to get a piece).
  5. After four or five rounds, have the students share what happened in their teams. In which teams did all the students survive? Which students had the most popcorn in their personal supplies? Which team had the most popcorn in its collective pile? Which teams think they would be able to keep a resource forever as long as the resource kept renewing itself? On these teams, how many pieces were these students taking each round?



## CHECK IN

Discuss these questions with the entire group.

- What are the advantages and disadvantages of using a resource in a sustainable way? (Advantage: It can last forever. Disadvantage: You need to control your use of it.)
- What advantages and disadvantages are there to using a resource in a non-sustainable way? (Advantages: People can use as much as they want of an available resource; they can make a lot of money in the short term. Disadvantage: They can destroy the resource base for themselves and future generations.)
- In this activity, the population of each group stayed the same. In reality, however, the human population is increasing rapidly. What would have happened if on or more additional people had been added to your group?
- How would the following potentially impact the quantity and quality of resources: natural disasters? Improved education systems for all? Disease?



## WHAT’S HAPPENING?

Renewable resources have the ability to replenish themselves, however the sustainable yield of that resource must be considered. If resources are consumed at a greater rate or capacity than they can be replenished, they will become nonexis-

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It's a good idea to remind students of some examples of renewable resources, such as trees. Ask students, would a new tree be ready immediately? No, which is similar to what they are demonstrating in this activity.

tent. A non-renewable resource is a natural resource that cannot be remade, regrown or regenerated on a scale comparative to its consumption. It exists in a fixed amount that is being consumed or used up faster than it can be made by nature. Fossil fuels (such as coal, oil, and natural gas) and nuclear power are non-renewable resources as they do not naturally reform at a rate that makes the way we use them sustainable.

Answers to questions on the Student Worksheet:

1. Renewable: Corn, sunshine, tides, trees, tuna, geothermal or hot springs, wind, salmon, water. Although these resources are considered renewable, some can be regionally depleted by non-sustainable management practices.
2. Answers will vary depending on what's in your classroom.
3. Answers will vary. For example, students may suggest that wood may be used as a substitute for plastic or metal in chairs and other equipment.
4. Answers will vary. Students may suggest that some materials are cheaper than others, that products made from renewable resources are better since the materials to make them can always be available, or that some materials from non-renewable resources are superior to others because they're lighter in weight or have other properties.
5. If the students don't come up with answers to this question, don't worry. And don't give them an answer! The Popcorn Generation activity should teach students conditions under which this could occur.
6. Solar, energy, winds, tides, etc.



## EXTENSIONS

Try a variation of this lesson as a social studies extension. You'll need a large world map, 58 pieces of candy (or other snack item), and some paper.

1. Label different parts of the room with signs saying Africa, Asia, Europe, South America, North America, Australia and Antarctica. Make slips of paper for students labeled with a region according to the chart below (numbers are provided for a class of 30 students). Display a large world map.

Region / Continent	Population (2005)	# of students (for a class of 30)	Gross Domestic Product U.S.-\$ in trillions (2005)	# of candies
Asia	3,879,000,000	17	21.5	10
Africa	877,500,000	4	2.1	2
Europe	727,000,000	3	14.2	7
North America	501,500,000	3	12.8	6
South America	379,500,000	2	2.9	2
Australia	32,000,000	1	6.1	3
Antarctica	0	0	N/A	0

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2. Divide students into groups that represent the relative population of the regions based on the chart and have them gather in the labeled areas of the classroom. Each group appoints an “ambassador” to represent their region.
3. Hand out candies according to the chart; the candies represent each region’s Gross Domestic Product.
4. Explain that each person must have at least one candy to survive. Students can exchange candy freely between regions, but only the ambassadors can leave the group’s designated classroom area.
5. Allow the game to go on for 10 to 15 minutes. Let the students work out the inequalities of resources any way they like. Take notes on what you hear and see happening.

In this activity, students realize that population does not directly relate to the amount of resources a country has or uses. Although North America has significantly fewer people than Africa or Asia, they have a greater amount of resources. Discuss these questions with the entire group:

- What was your overall experience?
- What was your initial reaction?
- How did you feel when you looked around the room and saw who had what?
- Did you think you would survive?
- Did you ask others for food? How?
- What did you do with your food? Share it, hide it, eat it?
- What choices are available to nations that do not have enough money to buy food from other countries?
- What are some important ideas involved in this game?



### RELATED EXHIBITS

*Smart Home: Green and Wired*

*Lesson adapted from Project Learning Tree*

# RENEWABLE OR NOT? STUDENT WORKSHEET

## CLUES

1

On Earth, there are limited amounts of fossil fuels such as oil, coal and natural gas. There are also limited amounts of minerals such as iron, copper, and phosphates. These resources either cannot be replaced by natural processes or require millions of years to replenish.

3

Renewable natural resources include plants, animals, and water, when they are properly cared for. Minerals and fossil fuels such as coal and oil are examples of non-renewable natural resources.

2

Some non-renewable and renewable natural resources can be recycled or reused. This process decreases the rate at which the supplies of these resources are depleted. For example, aluminum cans can be recycled and turned into new cans or other aluminum products many times. Recycling reduces the need to mine bauxite, the mineral used to make aluminum. Another example is recycling oil. The motor oil from your vehicle can be reprocessed into fuels or re-refined into other oils.

4

Trees, wildlife, water, and many other natural resources are replaced by natural processes. Plants and animals can also be replenished by human activities. Water is continuously cycled and reused. Sunlight, wind, geothermal heat, tides and flowing water are resources that are constantly or perpetually being renewed or restored.

## QUESTIONS

1. Categorize the following as renewable or non-renewable resources:

Corn	Sunshine	Tuna	Wind
Oil	Tides	Gold	Water
Coal	Trees	Sand	
2. Look around the classroom and list as many items as you can that are made from renewable natural resources. Make another list of all the items made from non-renewable natural resources.
3. What renewable natural resources could be used to replace the non-renewable ones used in the items listed in question #2?
4. What advantages and disadvantages might there be for using renewable natural resources in place of the non-renewable ones?
5. Which resources, if any, would continue to be available no matter how much people used them?