



Renewable World

Objectives

Students will be able to

- identify renewable energy resources being used worldwide;
- name countries throughout the world that use renewable energy; and
- use technology to create a class Google Slide presentation showing the use of renewable energy around the world (optional).

Rationale

When studying renewable energy, its uses and implications, it is important for students to be aware of the “big picture.” Through this activity, students explore where renewable energy is being used throughout the world.

Materials

- Copy of the book or posters of *Material World* (optional—See **Resources**)
- Writing utensils and paper
- Reference materials related to energy resource development (see **Energy Fact Sheets** on KEEP website)
- World map
- Magazines or Internet access for student exploration of renewable energy use worldwide
- Copies of the **Material World Data Sheet** (optional)
- Camera (optional)

Getting Ready

Collect magazines with renewable energy photographs or provide students time to find photos online. Many renewable energy magazines now exist, along with a number of environmental and business magazines that highlight renewable energy use. If possible, arrange for student access to a computer and Internet use during the first class period or print out facts and photographs about renewable energy use worldwide.

Background

Energy comes from many sources and is found in many forms. This wide range of form and scale lends itself to a diversity of applications. Energy is used for heating, for fuel, to sustain life, to move objects, to generate electricity, etc. Yet, there are environmental costs for the use of energy resources. Extracting fossil fuels affects the cultures, environments, and health of individuals of a region. Using renewable energy can help mitigate the effects of extracting fossil fuels. Many developing nations are benefiting from the development and deployment of renewable energy equipment from industrialized nations. At the same time, the use of renewable energy technologies in developing countries is providing a market and increased knowledge base for applications in industrialized nations. The use of renewable energy resources also allows countries that are dependent on foreign energy resources to become more energy independent.



Summary: Through designing a class book, students will explore renewable energy use worldwide.

Grade Level: 9–12 (5-8)

Subject Areas: English Language Arts, Science, Social Studies

Setting: Classroom, library, and community

Time:

Preparation: Two hours

Activity: One week

Vocabulary: Centralized energy system, Decentralized energy system, Developing nation, Industrialized nation, Renewable energy resource

Major Concept Areas:

Theme II

- Development of energy resources
- Consumption of energy resources
- Development of renewable energy resources

Theme III

- Quality of life
 - Lifestyles
 - Economic
 - Cultural

Theme IV

- Managing energy resource use
- Future outlooks for the development and use of energy resources

Standards Addressed:

Wisconsin Model Academic:

ELA: A.12.4, B.12.1, B.12.2,

B.12.3, C.12.1, F.12.1

SC: A.12.2, A.12.5, B.12.1, G.12.3,

G.12.4, H.12.5

SS: A.12.1, A.12.5, A.12.8,

A.12.10, A.12.11

Common Core ELA: SL.9-12.4, W.9-12.2

(Standards cont.)

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NGSS: MS-ESS3-4, MS-ESS3-5
SEP: Asking Questions and Defining Problems
DCI: ESS3.C: Human Impacts on Earth Systems; ESS3.D: Global Climate Change
CCC: Stability and Change

Renewable energy is being promoted worldwide. For instance, in Europe, SunDay is an annual celebration of the power of the sun. On this day, a wide variety of events happen to promote renewable energy. In southern African countries, workshops are held on rural energy and electrification through renewable energy. In Australia, renewable energy is being promoted through industry development.

In every country, renewable energy can be found. Yet, support for renewable energy varies within and among countries, cultures, and governments. Support for renewable energy development is influenced by society and politics. Sociopolitical processes result in laws and regulations that govern renewable energy development, availability, and use. Access and zoning laws are developed to guide, and sometimes hinder, renewable energy system placement and installation. While renewable energy technologies use clean sources of energy that have a lower environmental impact than nonrenewable energy sources, there are still environmental costs involved in the development, manufacturing, distribution, and installation of renewable energy technologies. Each renewable energy technology and its application (e.g., centralized or decentralized) has unique environmental costs and benefits.

Procedure

Orientation

Allow students to begin thinking about other countries and the material objects they might own. Pass out the *Material World* Book(s) or provide groups of students with one of the *Material World* posters. HINT: Buy one book, tear out the main “country

portrait page” showing the material goods from their homes, and laminate the photos. This will provide you with a classroom set of *Material World* photos.

Assign each student, or group of students, a country (or have them select one). Give each student, or group of students, a **Material World Data Sheet**. Allow students ten minutes to look at the photo(s) from the country they were assigned or chose and have them locate vehicles, phones, computers, televisions, and stoves (you may change the items they look for). Have them place the number of each item in the correct column on the **Material World Data Sheet**.

Once students are done with their country, place a **Material World Data Sheet** on an overhead projector/document cam and have each group share the number of each item with the rest of the class. Fill in the table so all the students can see the totals. At the bottom of the chart in the “Our Group” row, survey the class and place the average of the class data for each item.

Ask the students if they are surprised that the world’s “wealth” is not equal. Are they surprised at the number of countries that seem to have versus those that have not? Ask the students if they believe there is a connection between consumerism and energy. Have them elaborate on what that connection might be (i.e. it takes energy to create material goods and transport those products to different locations). Ask students to elaborate on how social media and the Internet are contributing to consumerism.

Have students focus on the evidence from their **Material World Data Sheet**. Ask them if they think there is a correlation between energy consumption and the amount of material goods countries seem to have in their possessions. Some ideas may include that the countries that have more and varied sources of energy may have the ability to create more material

goods and/or the residents of those countries might have more money to buy more material goods. Ask students why some of the families featured don’t have all of the goods that the family from the USA has. Ask the students what might happen to our environment if every family, in every country, was able to buy or obtain all of the material goods that were included in the photo of the family from the USA. Discuss whether they think some countries throw away too many things. Have them provide examples. Ask students how we might be able to reduce the amount of energy needed to produce all of the goods we own. Discuss how the utilization of renewable energy would still allow us to make material goods while lessening the consumption of fossil fuels.

Ask students where in the world they know renewable energy is being used today. Students may need to be prompted with the reminder that renewable energy refers to solar, water, wind, biomass, and geothermal resources. Students may identify hydroelectric dams in Wisconsin, geothermal technologies in Iceland, solar cookers in Nicaragua, wind farms in Spain, and biomass in Asia. They may come up with a long list of specific uses, or simply ‘guesses’ based on prior knowledge.

Steps

1. Inform the class they are going to develop a picture book of renewable energy use around the world. Optional: Students can make a Google Slide presentation of renewable energy around the world. The teacher can begin a slide presentation and ask each student/group to add a slide which will showcase the renewable energy utilization of assigned country. When it is complete, it can be a shared resource for the entire class.
2. The class can work together or can be divided into small groups with each group having one country or continent to research. Make sure that within the

class, students choose a variety of countries/regions. Locations that will be researched can be noted on a world map with a pin or flag.

3. Tell students that they will be designing a two-page spread for each country researched. Provide text size, margin, and other considerations for students. Suggest that they include aesthetic and cultural graphics (e.g., the country flag or colors).
4. As a class, brainstorm the areas of interest to include in the two-page spread and class book. Some possible areas include the following:
 - Country name, population, size, political structure and standard of living
 - Photographs of renewable energy use in their country (students may have to use photos of countries from their region)
 - Energy sources used for heat, fuel, electricity, etc.
 - Major renewable energy resources used (solar, geothermal, biomass, etc.)
 - Significant applications of renewable energy use (e.g., hydropower provides 70% of countries' electrical needs)
 - Major investments or developments in renewable energy (e.g., major oil company provided for photovoltaic arrays in remote locations of a developing country)
 - World map with location of country
5. Give students one week to complete their assignment. For photographs of renewable energy use worldwide, students can search through magazines, articles, and the Internet.

Closure

Before compiling the book, have students present their investigations in front of the class, sharing the details of renewable energy use that they found in their country. Have students place color-coded markers on the class map signifying the significant

renewable energy resources (you may want to establish criteria, e.g., the top three renewable energy resources) that are used within the country or region. Have students turn in their country pages in alphabetical order according to country (or choose another method of organizing). This will provide for easy compilation and grading. Once compiled, copy pages and provide each student with a copy, or ask for a student volunteer to design a cover and keep original in room for students to see.

Assessment

Formative

- Did students work together cooperatively in groups?
- What strategies did they use to gather information about their resource?
- How many components of renewable energy use in their country did students present?

Summative

Have students write a paragraph of recommendations on how we, as Americans, can learn from another country's use of renewable energy resources.

Extension

As an addition to their country page, have students research the political and societal influences that impact renewable energy use around the world. Ask students to include answers to one or more of the following questions:

- What types of incentives impact renewable energy use in my selected country (e.g., tax incentives)?
- What influence does "payback" have on the renewable energy resources that are used (e.g., biomass vs. PV installations)?
- What support or hindrance is provided by the political structure (e.g., zoning regulations)?
- What impact is large business having on renewable energy development (e.g.,

utility sponsored PV systems)?

- What environmental or societal costs or benefits are involved in the development and use of the renewable energy technologies being used (e.g., hydroelectric dam influencing fish communities or biomass replacing coal)?

Material World Data Sheet

Country	Vehicles	Phones	TVs	Computers	Stoves
Bhutan					
Brazil					
China					
Haiti					
Iceland					
India					
Italy					
Japan					
Kuwait					
Mali					
South Africa					
United States					
Uzbekistan					
Our Group					

