

Instructional Recipe

How Sustainable is Sustainability?

Grade 9-12

Environmental Science

Cross Curricular Connection: Integrated Physics and Chemistry
Education Service Center Region 20



Online research and information resources available through a partnership between the Texas State Library and Archives Commission, the Texas Education Agency and Education Service Center, Region 20
<http://web.esc20.net/k12databases>

Step 1 – Ask

Objectives: The student will learn about the impact of energy transformations in everyday life and will understand that if society chooses to create a sustainable society, that society will require a new way of looking at its individual consumption, its current lifestyle, and the ways its can create sustainable resources for future generations.

Introduction: Most societies are aware of the four scientific principles of sustainability: reliance on solar energy, maintenance of biodiversity, limited population growth, with people and nature implicitly connected. As a responsible society, we should ultimately learn that if we choose to create sustainable societies, these societies require a new way of looking at their individual consumption, their current lifestyle, and the ways they can create sustainable resources for future generations.



<http://www.flickr.com/photos/davejglaves/393944108/>

Windfarm

Ask:

- ★ How is a resource sustainable?
- ★ What is the difference between sustainable and unsustainable resources?
- ★ What are sustainable resources?
- ★ What are unsustainable resources?
- ★ How is climate change connected to sustainable development?

Vocabulary:

- ★ Sustainability
- ★ Global warming
- ★ Human footprint
- ★ Climate change

TEKS: 112.44.5(A)(D)

Environmental Science

(5) The student knows the interrelationships among the resources within the local environmental system. The student is expected to: (A) summarize methods of land use and management (D) identify renewable and non-renewable resources that must come from outside an ecosystem such as food, water, lumber, and energy.

Cross-Curricular TEKS

112.42.6. Integrated Physics and Chemistry

(6) **Science concepts.** The student knows the impact of energy transformations in everyday life. The student is expected to (C) analyze the efficiency of energy conversions that are responsible for the production of electricity such as from radiant, nuclear, and geothermal sources, fossil fuels such as coal, gas, oil, and the movement of water or wind (D) investigate and compare economic and environmental impacts of using various energy sources such as rechargeable or disposable batteries and solar cells.

Technology Application

TEKS: 126.6.9(A)

Computer Science I

(9) **Solving problems.** The student uses technology applications to facilitate evaluation of work, both process and product. The student is expected to: (A) design and implement procedures, track trends, review/evaluate progress for continual improvement.

Step 2 – Investigate

[Click here for internet links/URLs](#)

K-12 Online Subscription Resources:

From EBSCO: Use search strategies (human footprint and sustainability), (climate change), and (global warning and planet).

- ★ [How Sustainable Is Sustainability?](#): Spedding, Colin. Biologist, Dec2005, Vol. 52 Issue 6, p315-315, 1p; (AN 19399822)
- ★ [The Down-To-Earth Summit -- Lessening Our Ecological Footprint](#) Preview (eng) By Schmidt CW, Environmental Health Perspectives [Environ Health Perspect], ISSN: 0091-6765, 2002 Nov; Vol. 110 (11), pp. A682-5; PMID: 12417495
- ★ [From Crimson to green](#) Preview Economist, 5/6/2006, Vol. 379 Issue 8476, p31-31, 1/2p, 1 color.

Additional Websites:

[EcoNet](#); [Renewable Energy Policy Project](#); [Global Environmental Outlook](#); [Ecotron Controlled Environment Facility](#)

Step 3 – Create

[Click here for internet links/URLs](#)

Examine both sides of the sustainability question:

- ★ Read the following article, [How Sustainable is Sustainability?](#), and think about both sides of the sustainability issue:

Ask the question: Why do we want to become sustainable?

- ★ Discuss the four scientific principles of sustainability: reliance on solar energy, maintenance of biodiversity, limited population growth, and the connection between people and nature.

Explain the following:

- ★ A sustainable society avoids dependence on unsustainable resources that are nonrenewable such as fossil fuels; a sustainable society avoids pollution of air, water, and land masses, and a sustainable society avoids unnecessary consumption of available resources that may be needed by its future generations.
- ★ Human activities leave a footprint in three essential areas: consumption, population, and landmass. Watch the [human activities animation](#) .
- ★ Create an [idea web](#) to show which human activities impact the environment.

Technology Link -

- ★ [Teacher Prepared Materials for Sustainable Societies](#)

**Look at this [human activities animation](#) from Wiley and Botkin to see how human activities impact the three essential areas

- ★ [Idea Web](#)

Step 4 – Discuss

[Click here for internet links/URLs](#)

- ★ Download the [Google Earth tutorial](#) from TeacherTube.
- ★ Students will watch and use the [Google Earth tutorial](#) which will introduce them to the Google Earth Tour and also give instructions for downloading the .kmz file that will be used for the Google Earth tour.
- ★ Students will take a virtual tour around the world where they look at different renewable energy sources and use the [Gathering Matrix](#) to make comparisons between the energy sources. At each site, the student will answer four basic questions:
 - a) What kind of energy is being harnessed?
 - b) Is this source of energy sustainable?
 - c) What is one advantage of this energy source?
 - d) What is one disadvantage of using this energy source?



Technology Link –


[Google Earth Blog](#) is an excellent site for obtaining the latest Google Earth information. Create a [Del.icio.us](#) bookmark tag for [Additional Web Links](#) that can be accessed by students at home or school.

Step 5 – Reflect

[Click here for internet links/URLs](#)

Allow students to present their projects to the rest of the class. Use the [PowerPoint rubric](#) to assess the students' work. Make sure that the students are familiar with the [PowerPoint rubric](#) *before* they begin creating their project. They should refer to the rubric repeatedly to monitor their progress in creating their project.

-  Students will prepare and present a short 8-slide PowerPoint containing some of the best ideas for renewable resources.
-  Students should consider these criteria as the slides are prepared:
 1. How sustainable resources should be conserved,
 2. What the human footprint is and how human activity leaves on the environment,
 3. How population growth affects the ecosystem, and
 4. Why solutions to ecosystem and environmental problems involve value judgments that have a scientific basis.

 **Technology Link:** You can also create your own rubric with your students at <http://rubistar.4teachers.org/index.php>.

Internet Links/URLs

Articles may be located by either the accession number (AN) or the persistent URL.

Step 2 – Investigate

- **How Sustainable Is Sustainability?**
<http://web.ebscohost.com/ehost/detail?vid=14&hid=13&sid=bb6f86a4-148a-4b2b-b787-e2a8f8d8e51d%40sessionmgr11&bdata=JnNpdGU9ZWwhvc3QtbGl2ZQ%3d%3d#db=a9h&AN=19399822>
- **The Down-To-Earth Summit -- Lessening Our Ecological Footprint**
<http://web.ebscohost.com/ehost/detail?vid=1&hid=5&sid=2d25b699-edfe-4110-80a6-1eb43a79b0a2%40sessionmgr11&bdata=JnNpdGU9ZWwhvc3QtbGl2ZQ%3d%3d#db=cmedm&AN=12417495>
- **From Crimson to green**
<http://web.ebscohost.com/ehost/detail?vid=1&hid=5&sid=0492a862-77f6-41fe-8181-1ac5de03b587%40sessionmgr11&bdata=JnNpdGU9ZWwhvc3QtbGl2ZQ%3d%3d#db=ulh&AN=20777260>
- **EcoNet**
<http://edcwww.cr.usgs.gov/earthshots/slow/tableofcontents>
- **Renewable Energy Policy Project**
<http://www.repp.org/>
- **Global Environmental Outlook**
<http://www.unep.org/geo/geo3/>
- **Ecotron Controlled Environment Facility**
<http://www3.imperial.ac.uk/cpb/research/biodiversityandecosystemfunction/theecotron>

Step 3 – Create

- **human activities animation**
http://higheredbcs.wiley.com/legacy/college/botkin/0470049901/animations/ch01/human_affect/environment.html
- **idea web**
http://lexiconsys.com/graphic_organizers/ideaweb.html
- **Teacher Prepared Materials for Sustainable Societies**
http://www.ecostudies.org/ed_eco_field_programs.html

Step 4 – Discuss

- **Google Earth tutorial**
<http://teachertube.com/videoList.php?pg=featuredvideolist>
- **Google Earth Blog**
<http://gearthblog.com/>

- **Del.icio.us**
<http://delicious.com/>

Step 5 – Reflect

- <http://rubistar.4teachers.org/index.php>.

Gathering Matrix for Sustainable Resources

Student _____

Date _____ Period _____

Wind Farms	Fossil Fuel Exploration	Category Characteristics	Solar Energy	Reforestation	Water Regeneration
		Example: Energy required to transform unsustainable resources to sustainable.			

Note:

The Gathering Matrix is for comparing up to four or five items and their different characteristics. This map allows the student to simultaneously compare various characteristics of several items using information they have gathered in their reading. Teachers may pre-populate this table, or, during a brainstorming activity, have students select the characteristics they want to research.

Additional Web Links

EcoNet.

A great resource for all sorts of web sites on sustainability, habitat and biodiversity loss, global change, and other ecology and environment issues.

<http://edcwww.cr.usgs.gov/earthshots/slow/tableofcontents>

Renewable Energy Policy Project.

The Internet source for sustainability and sustainable energy. Lots of sustainable solutions for home lighting, energy production, and solar energy, are provided here. Provided by the Center for Renewable Energy and Sustainable Technology (CREST), a private foundation.

<http://www.crest.org>

United Nations System of Organizations.

A comprehensive list of links to international information from the UN.

<http://www.unsystem.org>

United States Federal Agencies Directory.

A comprehensive listing of federal agencies.

<http://www.lib.lsu.edu/gov/index.html>

The EcoGateway.

A huge site containing thousands of links dealing with sustainability and environmental protection. Includes communities, agencies, academic programs, organizations, businesses, professional associations, and equipment providers. Also has full text articles from EcolQMagazine.

<http://www.ecoiq.com/onlineresources>

Eco-Portal.

The Environmental Sustainability. Info Source. This site contains current news about sustainability as well as thousands of links to sustainability websites, press releases, and technical literature.

<http://www.eco-portal.com>

SF Environment.

SF Environment's mission is to improve, enhance, and preserve the environment and to promote San Francisco's long-term environmental well being. Discusses San Francisco's employment of the precautionary principle.

<http://www.sfenvironment.com>

International Network for Sustainable Energy (INFORSE).

INFORSE is a worldwide NGO (non-governmental organization) network formed at the Global Forum in Rio de Janeiro, Brazil, June 1992. The mission is to promote sustainable energy and social development. The Web site provides links to other sites and on-line access to the publication Sustainable Energy News.

<http://www.inforse.dk>

United Nations Development Programme.

Information on sustainable human development and links to the UN Environment Programme and other UN sites.

<http://www.undp.org>

Global Environmental Outlook - 3.

Check out the new report on global environmental trends (GEO-3) over the last thirty years and four alternative scenarios for the future. The site also includes a data portal, a data compendium, regional highlights, and fact sheets. The earlier (GEO-2, 2000 and Geo-1, 1997) reports are also accessible from this site.

<http://www.unep.org/geo/geo3>

PowerPoint Rubric for Instructor Evaluation

(15 points possible)

Performance Criteria	3 Points	2 Points	1 Point	0 Points
Preparation		Presented work on the day you signed up for	Requested an extension and presented on a different day	Was not prepared to present, did not request an extension and had to present on a different day
		A copy of your "Notes" was printed and given to the instructor prior to your presentation	The "Notes" were printed after the presentation.	"Notes" were not available the day of the presentation.
	Presentation was successfully copied onto the desktop of the main computer	Needed assistance in copying presentation to the main computer	Copied presentation to the desktop after presentations had begun	Did not run presentation off the desktop
Organization		Information was presented in a logical, interesting sequence that was easy to follow	Information was somewhat difficult to follow because student tended to "jump around" from topic to topic	There did not appear to be any sequence or order to the information presented.
Technical Specifications			Show contained a digital photo of yourself	No digital photo was included
	Every slide contained at least one graphic	All but one slide contained a graphic	2 slides did not contain graphics	More than 2 slides did not contain a graphic
	Appropriate slide animations were used	Used some slide animations, however, more were needed	Overused slide animations to the point that they were distracting	No slide animations were used during the presentation
Mechanics		Presentation had no misspellings or grammatical errors	Presentation contained 1-2 spelling or grammatical errors	Presentation contained 3 or more spelling or grammatical errors
		Presentation contained an introduction, body and conclusion	Presentation contained at least 2 of the following: introduction, body & conclusion	Presentation contained only 1 of the following: introduction, body & conclusion
Use of technology	Demonstrated a total understanding of how the technology is used for this project	Demonstrated some understanding of how the technology is used for this project.	Showed little understanding of how the technology is used for this project	Showed no understanding of how the technology is used for this project

			Displayed proper respect and appropriate behavior when using the computer	Displayed inappropriate behavior when using the computer.
Overall Presentation	An outstanding presentation. The presentation kept my interest and was among the very best in class.	A good presentation. The presenter demonstrated the ability to utilize the various features of the program, however, the presentation did not always keep my interest	The presenter did not seem comfortable with the program and/or needed a lot of outside assistance in getting through the presentation.	The presenter displayed little knowledge and/or understanding of the components of assignment, software, computers, etc.