

ENERGY



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INTRODUCTION

Energy is vital to sustain our lives. We use energy in every aspect of our lives; growing, transporting food and cooking it, heating or cooling our homes, for light, in manufacturing and for powering our cars.

Currently most of the world's energy is from fossil fuels: coal, gas and oil. Burning of fossil fuels not only creates carbon dioxide, but affects our air quality and exacerbates climate change.

This effect particularly impacts children, and those most vulnerable are in developing countries. Youth in Canada are also affected; issues of asthma and breathing disorders are on the rise and quality of life is compromised.

Children have the right to clean air, and the **good news** is we **can** use renewable energy sources to help reduce our dependence on fossil fuels. We can start by understanding the issues and then doing our part to make a difference.

Cape Verde, 2008

Wind turbines generate electricity in the mountains of Praia, the capital of Santiago Island.

ACTIVITIES

The curricula links below are addressed in this theme. For an extensive list of relevant provincial expectations/outcomes, refer to Appendices A and B: Curriculum Links on pages 91 and 95, and Appendix I for links in Alberta, Saskatchewan, Manitoba and Quebec. .

Province	Course	Expectation/Learning Outcome
Ontario	SVN3M Environmental Science, Grade 11, University/College Preparation <i>Conservation of Energy</i>	F1. assess the impact on society and the environment of the use of various renewable and non-renewable energy sources, and propose a plan to reduce energy consumption; F3. demonstrate an understanding of energy production, consumption, and conservation with respect to a variety of renewable and non-renewable sources.
Ontario	SNC1P Science 9 Applied <i>Physics</i>	E1. assess the major social, economic, and environmental costs and benefits of using electrical energy, distinguishing between renewable and non-renewable sources and propose a plan of action to reduce energy costs.
British Columbia	Science 9 <i>Physical Science: Characteristics of Electricity</i>	Relate electrical energy to power consumption.
British Columbia	Sustainable Resources 11	Describe the processes associated with the generation and use of energy resources.

Setting the Stage

Objective: Students discuss viable renewable energy sources.

Time: 15 minutes

Materials

- Renewable Energy Cards (optional)
- Renewable Energy Defined answer key
- Appendix G: Reflect and Act (page 105)

ACTIVITY

1. Distribute Appendix G: Reflect and Act (page 105) to each student and ask them to journal lessons learned during discussion and activities around the theme.
2. Arrange the class into six groups. Give each group a set of the Renewable Energy Cards. If the students have basic knowledge of the different renewable energy sources, play this game without the cards, or list of the answers.

3. Read to the class the first definition (only) from the Renewable Energy Defined answer key. Each group is to decide what renewable energy source matches the definition, and choose a renewable energy card from their deck. Once that card is played (or the answer is recorded if you did not use the cards), that card or answer cannot be used again.
4. Discuss the answers. You might want to discuss the advantages and disadvantages of each.

Nim Dolma is 18 and a grade 4 dropout because her parents could no longer afford her education. Today she is back at school thanks to the Non-Formal Education Programme (NFE), established by the government of Bhutan in 1992 with the support of UNICEF.

Classes are held in the evenings to accommodate students who have to work during the day, like Nim who is very busy collecting bamboo, weaving blankets, etc. during the day. In the evenings it is dark outside; since there is no electricity in the school, solar lanterns light the classrooms at Sakten Primary School. For more information see <http://www.unicef.org>.

Renewable Energy Defined

ANSWER KEY

Renewable Energy Source	Definition
Wind	This energy source works well in places like Kingston, Ontario. This source emits no carbon dioxide. We have an unlimited supply, and it works if set up on a flat expanse with no barriers in its way.
Geothermal	This energy source uses the heat from the interior of the earth.
Solar	This energy source uses a certain radiation. This source is extremely powerful and a perpetual resource.
Heat recovery	This energy source collects the warmth from sewer waste, drainwater, landfills and ventilation air.
Biomass	This energy source is an organic material that can be burned or converted to other energy forms like methane gas or transportation fuels.
Water from rivers and dams	The energy from this source is captured falling from a vertical distance. The higher the fall, the greater potential for energy.
Off shore tidal	The energy from this source harnesses the power of the ocean. This is a large underwater 'farm' remote from the shoreline.
Hydrogen	A colorless, highly flammable gaseous element, the lightest of all gases and the most abundant element in the universe, used in the production of synthetic ammonia and methanol, and in petroleum refining.

RENEWABLE ENERGY CARDS

Wind	Biomass
Geothermal	Rivers and dams
Solar	Off shore tidal
Heat recovery	Hydrogen

Solar Cafe

Objective: To learn about and construct a simple solar oven and discover how using solar technology helps in the fight against climate change.

Time: 60 minutes (or longer)

Materials

- A reflective accordion-folding car sunshade (6)
- A cake rack (or wire frame or grill) (6)
- 12 cm (4 ½ in.) of Velcro
- Black pot (6)
- Bucket or plastic wastebasket (6)
- A plastic baking bag (6)
- Scissors (6)
- Needle and thread (6)

According to the World Health Organization, in 23 countries, more than 10% of deaths are due to two environmental risk factors: unsafe water and indoor air pollution due to solid fuel use for cooking. Around the world, children under five are the main victims and make up 74% of these deaths. For more information see

ACTIVITY

1. Arrange the class into six groups.
2. Brainstorm with the class ways in which people who cook creating indoor pollution can develop a healthier way to cook.
3. Explain that one solution is a solar oven, which cooks food using only the power of the sun. Tell students that they will work together to build solar ovens.
4. Here are the instructions written by Kathy Dahl-Bredine from Oaxaca, Mexico or, you can visit http://solarcooking.wikia.com/wiki/Kathy_Dahl-Bredine or **Solar Cookers International** at <http://solarcookers.org/> for more details:
 - Lay the sunshade out with the notched side toward you.
 - Cut the Velcro into three pieces, each about 4 cm long.
 - Hand sew one half of each piece, evenly spaced, onto the edge to the left of the notch; sew the matching half of each piece onto the underneath side to the right of the notch, so that they fit together when the two sides are brought together to form a funnel.
 - Press the Velcro pieces together, and set the funnel on top of a bucket or a round or rectangular plastic wastebasket.
 - Place a black pot on top of a square cake rack placed inside a plastic baking bag. A standard size rack in the U.S. is 25 cm (10 in.). This is placed inside the funnel, so that the rack rests on the top edges of the bucket or wastebasket. Since the sunshade material is soft and flexible, the rack is necessary to support the pot. It also allows the sun's rays to shine down under the pot and reflect on all sides. If such a rack is not available, a wire frame could be made to work as well. Note: the flexible material will squash down around the sides of the rack.
 - The funnel can be tilted in the direction of the sun.
4. If there is time, share other examples of solar ovens:
 - PBS — Nova Teachers has detailed plans, with follow-up resources, on how to build a sophisticated solar oven at http://www.pbs.org/wgbh/nova/teachers/activities/3406_solar.html#materials.
 - Try to construct an oven from a pizza box and aluminium foil.

If you want to add a challenge to the solar oven construction, you might want to give the students the supplies only, with no directions. The group must work together and construct an oven that works. This is best done on a sunny day so groups can test the oven.

The other option is to give students a project to research solar ovens, draft plans and construct the oven. You could make it into a solar challenge with the winning group being the first to bring water to a certain temperature.

Keep the Discussion Going

Besides reducing indoor air pollution, why else would people want a solar oven?

Using solar power eliminates the need for fossil fuels. Also, in some countries it is a matter of personal safety. In Darfur, for example, women who have solar ovens don't need to leave the camp to collect firewood, helping keep them safe from attack.

How can we further use solar power in every part of the world to lessen the effects of climate change on children?

Solar water pumps help with water collection from wells. Learn about Somali villages investing in solar-powered pumps at http://www.unicef.org/wash/somalia_44827.html.

YOUTH TAKE ACTION

Challenge for Change!

Distribute Student Handout #22: Youth Take Action (page 88) and discuss the inspirational profiles. Instruct students (groups, pairs or individuals) to select ONE student project listed under the Challenge for Change Action, or invite them to create their own challenge. Set appropriate timelines and criteria. Evaluate each project using Appendix E: Culminating Task Rubric (on page 103).

BACKGROUND ENERGY

What are the issues?

The world's primary source of energy is fossil fuels. Not only are they a finite fuel source (non-renewable), but using fossil fuels also creates carbon dioxide, a major contributor to climate change. As we cut down trees faster than they can replenish in many parts of the world, we are also losing the valuable carbon sinks to store the excess CO₂ created when we burn fossil fuels.



Energy facts in developing countries:

- The burning of fossil fuels is accelerating climate change.
- 80% of the population that has no access to electricity lives in developing countries, mainly in South Asia and sub-Saharan Africa.¹
- Many people in developing countries do not have electricity.
- It is estimated that currently 1.6 billion people do not have access to electricity, and 2.4 billion people are lacking the modern fuels necessary for cooking and heating their homes safely.
- More than 3 billion people must use wood, crop waste and/or dung to cook with and heat their homes. One of the immediate issues related to these energy sources is that they produce large quantities of smoke inside buildings, which contributes to the deaths of 800,000 children annually, due to their immature respiratory systems. In addition to the health effects of these energy choices, communities are affected on a long-term basis by the fact that their local resources and natural environment are being degraded.²



Renewable Solutions

We need to find ways to provide people in developing countries (and developed countries) with renewable energy sources such as wind, solar, biomass, geothermal, etc. instead of burning solid fuels. Not only would the immediate concerns of air pollution and associated health issues be eliminated, but the planet would also benefit from the reduction in carbon being released into the atmosphere. We need to end our world dependency on fossil fuels and this is starting to happen in parts of the world. For instance, China has programs to support affordable solar energy to pump water, produce electricity and heat water. The government is also promoting household biogas plants to treat human excreta.³

"Yes, I do agree that trees shouldn't be cut down unnecessarily, but we should think about those people who have to cut down trees so that they may survive. The major cause of excess tree abuse is the cutting of trees for fuel. People around the world lack basic necessities such as fuel and need to chop down trees if they want heat and warmth. Every government needs to make an effort in providing alternative resources for our mission to succeed." Amre, age 18, Somalia⁴

To learn more about climate change connected to energy, view the UNICEF UK Climate Change Report 2008: *Our climate, our children, our responsibility* at

<http://www.unicef.org.uk/campaigns/publications/pdf/climate-change.pdf>.

NOTES

- 1 UNICEF UK, *Our climate, our children, our responsibility*, 2008, p. 17.
- 2 Ibid.
- 3 Ibid.
- 4 Ibid.

Student Handout #22

YOUTH TAKE ACTION

Challenge for Change Action Items

Be part of the solution! Complete ONE project from the list below or create your own! You will be evaluated on criteria including knowledge of the issue, expression of ideas and connections made between personal, local and global views of the issue.

1. People-powered transit is the most environmentally friendly way to travel! If we can walk, run, or bike to our places of destination, we drastically reduce the use of fossil fuels in our lives.

PROJECT: Organize a commuter challenge for both students and teachers with a Bike to School Day in May (or any other time of year)! Make it a fun event with refreshments for all the cyclists. Look into having a lunch demonstration of music and/or bike tricks.

2. Youth need to spread the message on how to get our planet out of our energy crisis.

PROJECT: Partner with an elementary school in your area. Develop a 'Save Energy' board game or storybook and share this with the elementary students.

3. Research solar ovens that can be purchased and distributed to places in the world that primarily cook indoors using fossil fuels. Check out <http://www.solarovens.org/> to learn more.

PROJECT: Get your school involved in a fundraiser to sponsor a family for a solar oven, or organize a Solar Oven Cook-Off at the school. Teams enter their solar oven design and have to cook a simple recipe. The judges decide on the best solar meal!

King David Secondary School, Vancouver, BC

For the past few years, students at King David Secondary School have raised money to support The Solar Cooker Project, which supplies solar ovens to women in Darfur, a region of Sudan. The ovens allow women to stay close to their families to prepare meals instead of leaving the camp to collect firewood for cooking. Leaving the camp can result in danger to women and children in this area of the world. For more information see <http://www.jewishworldwatch.org>.

Mount Kilimanjaro, Tanzania

Ten amazing youth from impoverished urban centres in Kenya, Tanzania and Ghana will soon be challenged even further! They will join a team that will attempt to climb Mount Kilimanjaro. The purpose of this adventure is to draw attention to the global effects of climate change due to our dependency on fossil fuels and how it can devastate urban centres as it deals with increased population, unemployment, and unacceptable health care systems. For more information see <http://www.un.org>.