10. GOING GREEN

Activity overview

This lesson looks further into renewable energy sources in Canada. Students will explore the meaning of renewable energy, the relative amounts of greenhouse gas (GHG) emissions produced by each energy source and where renewable energy is produced.

Grade level

- 4–12

Time required

- 50–75 minutes

Materials

- Energy icon cards (43)
- Greenhouse gas teacher card (1)
- Global greenhouse gas emissions teacher card (1)
- Province and territory flags (14)
- Number cards (13)

Set-up

Divide the energy icons into four sets, each containing one icon for each type of energy produced in Canada. Read over your teacher card and the lesson plan and ensure that your students are comfortable with the content level. In particular, familiarize yourself with the Paris Agreement. Adjust to fit grade level.

Introduction

Once students have had an opportunity to explore the Giant Floor Map on their own, give each student an energy icon. Have students search the map and stand on a symbol that matches their energy icon. Ask students to identify their location in Canada. Can they name the province/territory/town? Can they determine how far it is from their hometown? Direct students to find another place in Canada that has the same symbol. Compare the physical landscape of these two places. What is similar? What is different?

Ask students to explore the map and stand on a symbol for a renewable energy source. Ask them to identify the type of energy and the spatial significance (physical and human features) of the area in which they are standing.

Ask students what the term "renewable" means and how it differs from "non-renewable." Renewable energy is also commonly referred to as green or sustainable energy. Renewable energy uses natural resources that are being continuously replenished by the Earth. Explain to your students that because these resources are continuously replenished, renewable energy is more sustainable, meaning that it can be used for a very long time with fewer long-term effects on the environment. Non-renewable resources are ones that are finite in amount and may, one day, run out.

Ask students which types of energy are renewable. Show the energy icons for each renewable energy source: wind, tidal, hydro, biomass, geothermal and nuclear. Ask students to estimate how much of Canada's total energy production comes from these sources based on the number of facilities they see on the map. Explain that, in total, only about 11 per cent of Canada's energy production comes from renewable sources. Highlight biomass, tidal and solar energy and explain that they do not play a major role on this map because they make up a very small percentage of the total energy produced in Canada. Still, they are labelled on the map because they are forms of energy that help us generate heat and electricity. Discuss the things that renewable energy is able to power. For instance, houses can be powered by renewable sources, but as of now, airplanes require non-renewable sources. Discuss the other aspects of our lives that use non-renewable resources, such as the development of new and existing products.

Development

Ask students to define the term "greenhouse gas." Explain that invisible gases, called greenhouse gases or GHGs, such as carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O) and many others enter our atmosphere as a result of different activities, such as the burning of fossil fuels. GHGs have been linked with climate change and, as a result, Canada and other countries are actively working to reduce their GHG emissions. Discuss with your students the Paris Agreement signed in 2016. Ask students what effect this agreement will have on climate change globally and if they think it was a good idea for Canada to sign it. Why or why not? Then, ask students how they might be able to reduce GHG emissions within their own lives.

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Bring attention back to the map. Explain that Canada produces a lot of energy, for itself and other countries, and because of this, GHGs are emitted into the air each year. Globally, Canada produces about 1.6 per cent of all GHG emissions; however, it is one of the largest producers of GHG emissions per capita. Using the GHG bar graph, discuss the emissions of each country and how students feel about Canada's level of emissions. Can any patterns be observed? What may account for these trends? How might this graph change over the next decade?

Divide students into four groups and give each group a pile of energy icon cards (each containing one icon for each type of energy produced in Canada). Ask the groups to brainstorm about the positive and negative aspects of their types of energy on local, national and global communities and share their ideas with the class. After all groups have presented, have students rank each sector from most renewable to least. Discuss the criteria used to rank. Allow each group to share their ideas with the class, and use the teacher card to assist students. After discussing different energy types and how renewable each type is, ask students how spatial significance (physical and human features of a place) affects the type of energy that is most suitable. How might the energy type for each region change in the future? Ask students to develop criteria for most sustainable energy form for the different regions in Canada. Ask the students if any type of energy produced in Canada can be 100 per cent renewable. Explain that this is a complicated question and there is no right or wrong answer.

Conclusion

Have your students place the provincial and territorial flags on the proper capital city. Place the Canadian flag on Ottawa, Canada's capital. Next, have eleven students stand up and receive a number card. Explain that the numbers represent the percentage of GHG emissions that each province is responsible for, with one number representing all three territories. As a class, predict which provinces and territories match the numbers, and place the cards beside the corresponding flags. How might spatial significance influence the numbers? Use the GHG emissions teacher card to ensure that students choose the right number. Compare the results with the diagram on the back of your pie chart card and discuss, from a geographic perspective, what may account for the differences between Canada and the United States.

Extend your geographic thinking

Research the potential for renewable energy in your community. Have students try ArcGIS Online or Google Earth to help determine the location for wind (use data from the Canadian Wind Energy Association: canwea.ca/wind-integration-study/wind-data/ or add Global Surface Wind Observations, NOAA, into ArcGIS Online directly) and solar farms (using federal government data on monthly climate summaries: climate.weather.gc.ca/prods_servs/cdn_climate_summary_e.html, convert excel files to CSV and drag and drop into ArcGIS Online Climate data). You can also convert CSV files into KML files and import them into Google Earth or Google My Maps. How might your community implement renewable energy to contribute to its sustainability?

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms

- Provinces and territories of Canada
- Distribution of major human and physical features at country and global scales

Essential Element 2: Places and Regions

- Physical and human characteristics of places and regions within the province and Canada

Essential Element 5: Environment and Society

- Renewable (land, forests, water) and non-renewable (minerals, fossil fuels) resources
- World patterns of resource distribution and utilization
- Changes in the importance of energy resources
- Environment issues (e.g., air pollution, water pollution and solid waste, including hazardous and toxic materials)
- Use and sustainability of resources

Essential Element 6: The Uses of Geography

- Role of multiple points of view in contemporary geographic policies and issues
- Local, regional and world politics and issues
- Local, regional and world policies and problems with spatial dimensions