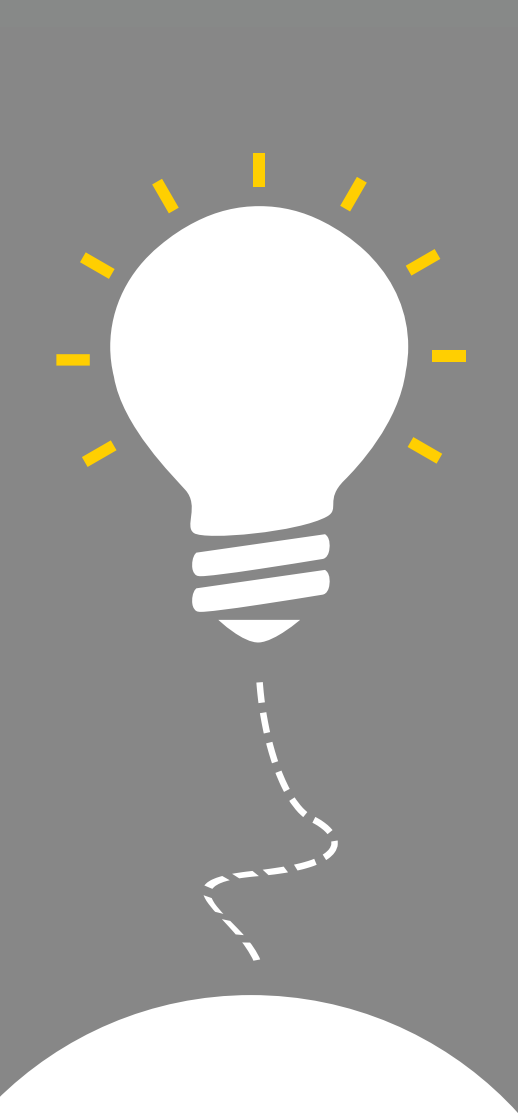


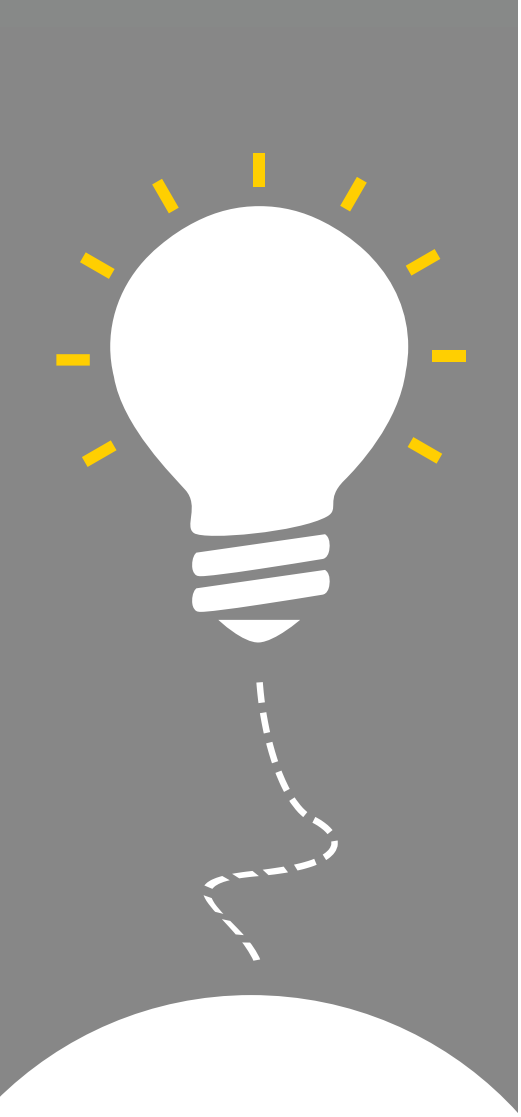
INTRODUCTION

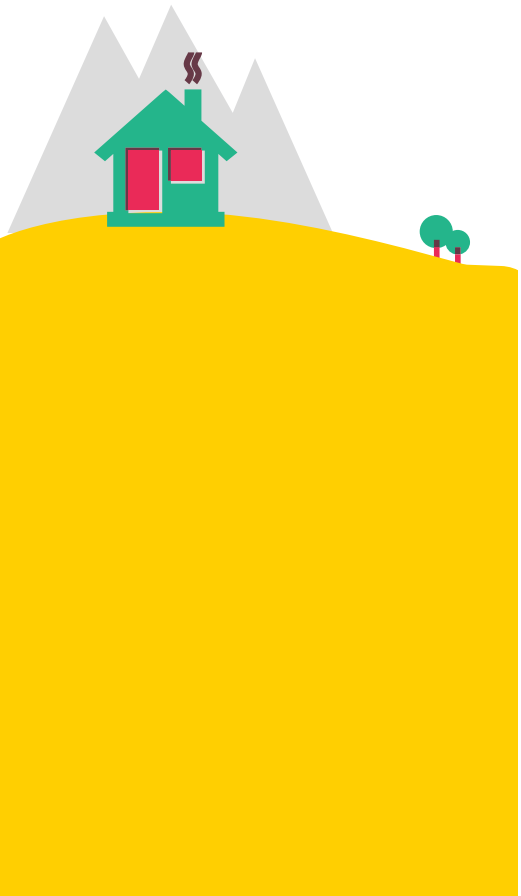
Canada is rich in energy resources. It produces 10 types, from fossil fuels to renewables, which travel through a network of pipelines and transmission lines that could circle the Earth more than 20 times. As global demand for energy increases and some resources start to wane, it is vital for future generations to understand where our energy comes from and how it gets to us. Canadian Geographic Education and the Canadian Association of Petroleum Producers have produced this Giant Floor Map to assist Canadian students in learning Canada's energy story and to help them make informed decisions about the country's energy future. With hundreds of energy facilities, transmission lines, shipping routes and more, this map depicts an abundance of information. Before diving into the 10 curriculum-linked activities included in the teacher's guide, we recommend that both you and your students spend some time exploring the map and the hand-held legends. We have also included some additional readings and information to help you and your students understand Canada's energy mix. Included in the trunk are printed materials and below is a list of websites we encourage you to explore with your class. We would love to hear how your class interacted with the map and how the lessons took shape. Please send us your feedback and photos at info@cangeoeducation.ca.

Enjoy your time with the map!

Resources

- energyiq.canadiangeographic.ca
- canadiangeographic.ca/topic/energy
- canadahydro.ca
- canbio.ca
- cansia.ca
- canwea.ca
- capp.ca
- centreforenergy.com
- cga.ca
- cna.ca
- coal.ca
- neb-one.gc.ca
- nrcan.gc.ca
- pembina.org





ABOUT THIS RESOURCE

1. UNDERSTANDING CANADA'S ENERGY MIX

This activity teaches students how to read the Giant Floor Map by taking a closer look at its symbols, colours and labels. The students will then examine where Canada's energy is produced and how it is transmitted.

2. PICTURING ENERGY

This activity teaches students to read latitude and longitude in order to locate energy facilities and key energy production regions in Canada.

3. CANADA'S ENERGY STORY

This activity investigates how energy is produced in each province and territory. Students will create a visual explanation of the energy produced in each region and how it influences Canada as a whole.

4. RESOURCES IN MOTION

This activity explores the different ways Canada's energy resources are transported across the country. Students will compare each type of transportation and determine how Canada's geographical landscape influences the movement of energy resources.

5. IMPORTS AND EXPORTS

This activity examines the role of energy imports and exports in Canada. Students will use their mathematical skills to understand how much energy is imported, exported and consumed. They will also discover the importance of energy resources to Canada.

6. DEVELOPING ENERGY

This activity looks at the roles of current pipelines and transmission lines in Canada and the challenges that come with creating new infrastructure.

7. WATER, WATER, EVERYWHERE

This activity examines the close relationship between Canada's water resources and the production and transmission of energy. Students will explore Canada's main watersheds and the interrelationship between water and the extraction, production and transmission of energy resources.

8. ON TOP OF THE WORLD

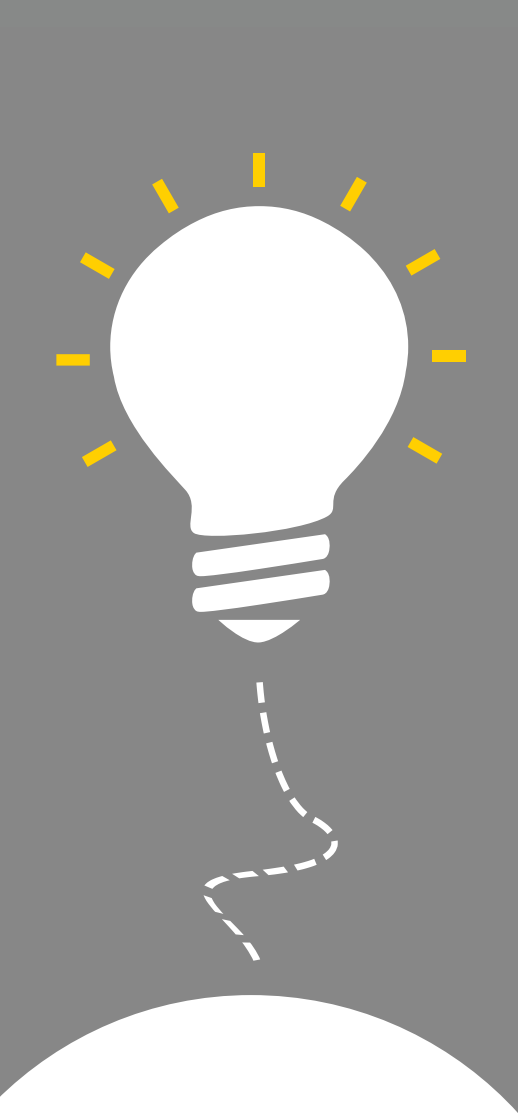
This activity explores Canada's North as a region that is rich in energy resources. Students will investigate how energy is transported to the North, the challenges faced by northern communities and how the region compares to the rest of the country.

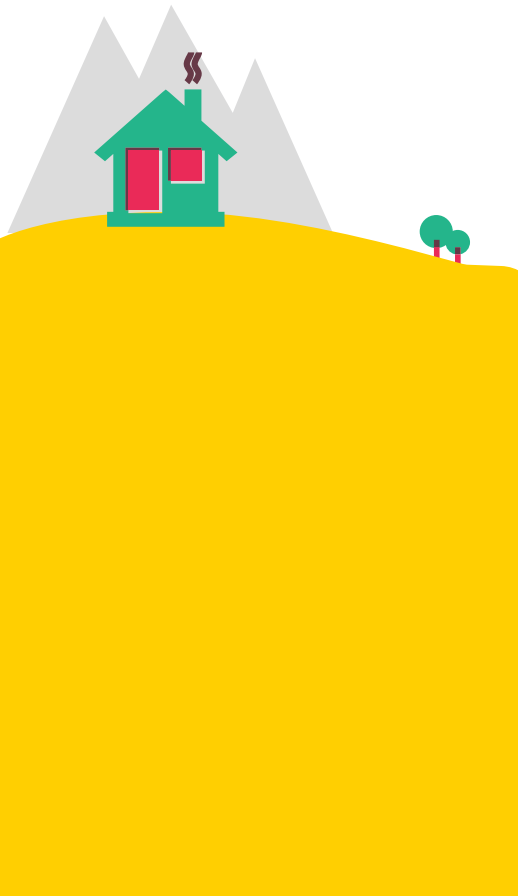
9. SHIFTING THE OIL SANDS

Students will take a look at the oil sands and their role in Canada's energy landscape. Students will predict how Canada's environment and economy would change if the oil sands were in another part of the country.

10. GOING GREEN

This activity 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.





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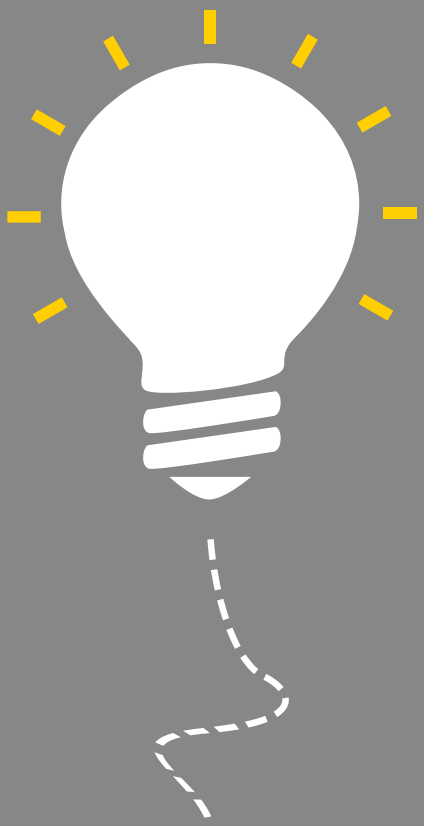

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ENERGY IQ
QI ÉNERGÉTIQUE

1. UNDERSTANDING CANADA'S ENERGY MIX

Activity overview

This activity teaches students how to read the Giant Floor Map by taking a closer look at its symbols, colours and labels. The students will then examine where Canada's energy is produced and how it is transmitted.

Grade level

- K–12

Time required

- 20–25 minutes

Materials

- Energy icons (43)
- Coloured stacking blocks (100)
- Coloured chains (4)
- Arrow cards (30)
- Map legend cards (4)
- Teacher energy information card (1)

Set-up

Organize the energy icons by type and read over the teacher energy information card to familiarize yourself with Canada's different energy resources.

Introduction

Introduce students to the map and give them time to explore it. Ask how the five main components of a map have been implemented: title, border, compass, legend and scale. Have students find each component on the Giant Floor Map and discuss its location.

Teach students how to read the map in further detail by examining its different colours. Begin by asking them to explain why certain colours are used for the land and for the water. Next, bring their attention to the layer of colours that depicts energy on the map. Ask them to explore what each colour and line represent.

Finally, using the legends, have students look at the energy symbols on the map. What symbol is used for oil sands mining? What symbol is used for nuclear energy? Where are processing plants and refineries located? Where are renewable energy symbols located versus non-renewables? Ask students if they observe any patterns. What might account for these patterns? What is the most common symbol on the map? What is the least common symbol on the map?

Explain that in Canada, energy is produced in 10 different ways: crude oil, natural gas, hydroelectricity, wind, coal, biomass, solar, nuclear, natural gas liquids and tidal. Ensure that students can locate on the map at least one symbol for each type of energy, and make note of the ease or difficulty they have in finding each symbol.

Development

Using the percentages on the teacher information card, have students use props to create a visual representation of the relationship between all 10 types of energy. Students may want to use chains to make a line graph, or blocks to show the percentage of energy produced by each energy source. Ask students to use the map as the backdrop for their visual representations, and have them observe any patterns that develop.

Ask students to identify how the spatial significance and the geography of Canada play a role in the location of each energy type. Discuss with your students whether they were surprised by these percentages or locations. Do these percentages match the dominant colours on the map (red, purple and blue transmission lines)? Remind students that the information on the map is showing the types of energy produced and transmitted, not the types of energy used.

Have students list the different ways they interact with energy and which types of energy are required in their daily lives. Remind students that they should think about transportation, housing, hobbies, food and all other aspects of their lives. Next, ask

1. UNDERSTANDING CANADA'S ENERGY MIX

students to look at your province or territory and determine the relationship between how they interact with energy and the types of energy produced in your province or territory. Discuss whether your province or territory is able to produce all the types of energy that your students use.

Conclusion

Conclude with a group discussion about the different types of energy produced in your province or territory specifically and in Canada more broadly. Lead the discussion by asking: What patterns and trends can be observed in the production and transmission of energy in Canada? How does Canada's geography influence the type of energy produced, how is this energy produced, and how is it transmitted in Canada? How might these challenges affect relationships among provinces, territories and/or other countries?

Extend your geographic thinking

For younger students, do this as a class. For older students, divide the class into groups and assign each a different type of energy. Have each group determine the direction of energy flow during the production phase and during the transmission of Canada's resources, and have them show this by placing the arrow cards on the map. Once all groups have placed their arrows on the map, discuss what might account for any patterns that appear. Highlight how some energy sources, like natural gas and crude oil, are first transported to production facilities. Energy sources like wind, nuclear and hydroelectricity do not need to be processed in this way. Ask students what factors might determine how an energy source gets to a community.

Discuss whether the direction of flow for all types of energy is what they expected, or if they were surprised to see where Canada's energy comes from and goes to.

With older students, discuss the Paris Agreement, North American Free Trade Agreement (NAFTA) and other major international agreements that Canada is a part of. Discuss whether they think these agreements, new and old, will have any effect on the current flow of energy and energy resources, and have them alter the map accordingly.

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms

- Locations of continents and oceans
- Major cities of the provinces
- Provinces and territories of Canada

Essential Element 2: Places and Regions

- Concept of physical features (e.g., mountains, plains, hills, oceans and islands)
- Regional analysis of geographic issues and questions

Essential Element 4: Human Systems

- Transportation (people and goods) and communication networks
- Types of economic activity (resources, manufacturing, service)
- Regional development in Canada and the world

Essential Element 5: Environment and Society

- Introduction of resources
- Human modification of the physical environment (e.g., construction of dams, strip mining, draining wetlands)
- Effects of human modification of the physical environment (e.g., global warming, deforestation, desertification, urbanization)

2. PICTURING ENERGY

Activity overview

This activity teaches students to read latitude and longitude in order to locate energy facilities and key energy production regions in Canada.

Grade level

- K–12

Time required

- 30 minutes

Materials

- Provincial and territorial flags (14)
- Image cards (40)
- Coloured chains (4)

Set-up

Disperse the image cards around the perimeter of the map.

Introduction

Briefly review the five essential components of a map (title, border, compass, legend and scale) and how to use a legend (see the lesson "Understanding Canada's Energy Mix" for detailed instructions). Ask students if everything they see on the map physically exists in real life. Point out the white lines of latitude and longitude on the map and explain that although they appear on the map, you cannot actually see them in real life.

The horizontal lines on the map are lines of latitude, also known as "parallels"; they measure north and south positions between the Earth's poles. To show that these lines never touch, choose three volunteers from your class and ask each of them to follow one line of latitude. Lines of longitude run vertically on the map. Explain that these imaginary lines measure degrees east and west, meet at the poles and are farthest apart at the equator. Again, ask three volunteers from your class to follow a line of longitude starting at the northernmost point on the map. Have students describe what is happening as they move south toward the equator. Together, lines of latitude and longitude help us find the exact location of places and objects on the Earth.

Assess your students' understanding by asking them to find the latitudinal and longitudinal coordinates of:

- their hometown
- the capital of Canada (place the Canadian flag here once the coordinates have been found)
- the capital cities of each province and territory (have students mark them with the correct provincial or territorial flags)

Development

Ask your students to read out the coordinates on the back of the image cards and place them, image side up, in their correct locations on the map. When all cards have been placed on the map, walk around the perimeter and look at all of the images. Lead a class discussion about Canada's energy mix based on what they see on these cards. Ask students what they have learned about Canada from the location of the images. Why are there more images in one province or territory than others? Can they see any patterns? Do they think any images are missing? What might be some of the interrelationships between the images? Ask students to develop questions based on the images and share them with the class.

2. PICTURING ENERGY

Conclusion

Connect Canada's landform regions to the images on the map. Using the chains provided in the trunk, have students find Canada's different landform regions (Cordillera, Interior Plains, Canadian Shield, Great Lakes–St. Lawrence Lowlands, Appalachian, Arctic Lands). What connections can students make between the location of the landforms and the location of the various types of energy produced? How might some images apply to more than one location? Explain.

Extend your geographic thinking

Have students clear the cards off the map and ask them to stand on areas of Canada that are highly populated. What criteria did they use to determine that these are highly populated areas? Next, have students stand on mountainous regions. How were they able to identify these regions? Finally, ask your students what kind of map they are standing on (they could answer either "a thematic map" or "a physical map"). How would this map be different if it were a political map? A road map? A climate map? How might the energy story change?

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms

- Personal directions (e.g., left/right, up/down, front/back)
- Latitude, longitude and the global grid
- Map types (e.g., topographic, navigational, thematic)
- Map projections (e.g., size, shape, distance and direction)
- Major cities of the provinces

Essential Element 2: Places and Regions

- Factors that influence people's perceptions of places and regions
- Regional analysis of geographic issues and questions

Essential Element 3: Physical Systems

- Basic components of Earth's physical systems (e.g., landforms, water and weather)

Essential Element 4: Human Systems

- Patterns of land use and economic activity in the community (e.g., agriculture, industrial, commercial, residential, educational, recreational)
- Human settlement patterns and land use
- Regional development in Canada and the world

3. CANADA'S ENERGY STORY

Activity overview

This activity investigates how energy is produced in each province and territory. Students will create a visual explanation of the energy produced in each region and how it influences Canada as a whole.

Grade level

- 7–12

Time required

- 30–40 minutes

Materials

- Provincial and territorial flags (14)
- Province and territory information cards (13)
- Coloured stacking blocks (100)
- Energy icons (43)
- Coloured chains (4)
- Coloured pylons (4)
- Arrow cards (30)

Set-up

See the "First Nation Profiles Interactive Map" at fnpim-cippn.aandc-aadnc.gc.ca/index-eng.html for reference prior to lesson.

Place one energy icon, one arrow card and several coloured stacking blocks on each province and territory information card, and set them near the map's black-and-red border.

Introduction

Once students have had an opportunity to explore the Giant Floor Map on their own, test their geographical knowledge by having them place each provincial and territorial flag on its respective capital city. Connect each capital city with the story of Canada's energy production and transmission on the map by asking what role each city plays in Canada's energy mix. Ask students about the interrelationships between energy resources and the development of large cities and Indigenous communities. How might spatial significance (importance of a place for living things) contribute to the interrelationships, such as the effects of human activity on Canada's physical characteristics?

Development

Explain to students that each province and territory has different energy needs based on its geography. Divide the class into 13 groups, and ask each to choose a province or territory information card and a pile of props. Using these props, have each group explain the interrelationship between their province or territory and energy, as described on the information card. They should use the blocks to show the percentage or amount of energy produced in their province or territory and use the arrow card to show the direction in which energy resources move. Finally, ask students to present their province's or territory's energy story, making reference to its geographic perspective, in an engaging and entertaining way to the class, such as a skit or an interview.

3. CANADA'S ENERGY STORY

Conclusion

When all students have presented, discuss the differences and similarities of each province's and territory's energy story. Read each phrase below to the class and have the groups raise their flag when a phrase is true of their province or territory. Have students explain any patterns and trends that arise.

- Natural gas is produced here.
- Crude oil is produced here.
- Nuclear energy is produced here.
- Biomass energy is produced here.
- Tidal power is produced here.
- Hydroelectricity is produced here.
- Wind energy is produced here.
- Coal is used to generate electricity here.
- Uranium is used to generate nuclear power here.
- The oil sands are found here.
- Offshore oil extraction is found here.
- A major energy production facility is found here.
- Many energy resources are exported from here.
- More energy resources are imported than produced here.
- This area is resource rich but does not have many production facilities.

Extend your geographic thinking

Use the chains to connect the movement of energy resources in Canada. Where does the majority of Canada's energy go? What factors might account for this distribution of energy? Which provinces and territories produce the most energy? Discuss the spatial significance of where the country's energy resources are located. How might all Canadians have equal access to affordable energy?

Show students the two maps from the "On Top of the World" activity highlighting oil and natural gas deposits. Explain that there are many oil and gas fields across Canada and that more are discovered every day. Explain that this map shows primarily where Canada's energy is produced and transmitted, not where every resource exists.

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms

- Provinces and territories of Canada
- Major cities of the provinces, Canada and the world

Essential Element 2: Places and Regions

- Physical and human characteristics of places and regions in Canada and the world

Essential Element 4: Human Systems

- Population characteristics of the province and Canada (e.g., density, distribution, growth rates)
- Types of economic activity (resources, manufacturing, service)
- Types and patterns of human settlement (from villages to megacities)
- Regional development in Canada and the world
- Economic development by world regions, countries and regions within countries

Essential Element 5: Environment and Society

- Renewable (land, forests, water) and non-renewable (minerals, fossil fuels) resources
- Use and sustainability of resources

4. RESOURCES IN MOTION

Activity overview

This activity explores the different ways Canada's energy resources are transported across the country. Students will compare each type of transportation and determine how Canada's geographical landscape influences the movement of energy resources.

Grade level

- K–12

Time required

- 30 minutes

Materials

- Energy icons (43)
- Coloured chains (4)
- Transportation image cards (5 x 5)
- Transportation fact cards (10)
- Teacher answer sheet (1)

Set-up

Lay the transportation fact cards along the map's border.

Introduction

Begin by having students explore the map independently, paying attention to the legend and scale. Ask groups of students to calculate the size of your province or territory, the distance to the nearest coast, and the overall width and length of Canada using the scales in the corner. Next, discuss the population distribution of Canada, highlighting that more than 80 per cent of Canada's population lives within 200 kilometres of the American border. Discuss how this distribution of people is reflected in the energy production and transmission information on the map. Have students explore the various communities displayed on the map and discuss how these communities, and the many other ones that are not shown on the map, power their lives and access essential energy resources.

Development

Explain to students that they will be looking at the energy transportation network in Canada. Have them list all the transportation methods they see on the map (train, ship, pipeline, roads, transmission lines) and ask students to reflect on how these have changed over the past several decades. Have students consider what this map would have looked like in the past and what it may look like in the future.

Take a closer look at the various transportation methods used in Canada. Divide your students into five groups and distribute one set of transportation image cards to each group. As students explore the map, have them use the legend to locate their group's mode of transportation and then place their cards in the appropriate locations on the map. Have each group discuss and present on their form of transportation, sharing the benefits, drawbacks and considerations of each type of transportation. Also, ask students to identify any proposed transportation methods that they see on the map and what benefits and drawbacks these proposed transportation methods will have for Canada.

Ask for your students' opinions about which mode is the most cost-effective, which is the most environmentally friendly and which covers the most distance. Make sure they explain their reasoning.

4. RESOURCES IN MOTION

Conclusion

Once all groups have presented, bring attention to the 10 fact cards placed around the map's border. There are two fact cards for each mode of transportation examined in class. As a class, work to match these fact cards with the various modes of transportation. Encourage students to explain their reasoning. Use the teacher answer sheet to confirm that the cards have been matched correctly.

Extend your geographic thinking

Lead a class discussion about how resources might be transported in the future. Which modes may become more or less common? How might this possible change affect the sustainability of communities across Canada and around the world?

Links to the Canadian National Standards for Geography

Essential Element 2: Places and Regions

- Perceptions of places and regions
- Changes in places and regions over time

Essential Element 4: Human Systems

- Transportation networks in daily life
- Transportation (people and goods) and communication networks
- Transportation and communications networks in Canada and the world

Essential Element 5: Environment and Society

- How human activities change Earth (e.g., agriculture, transportation, industry)

Essential Element 6: The Uses of Geography

- Role of multiple points of view in contemporary geographic politics and issues

5. IMPORTS AND EXPORTS

Activity overview

This activity examines the role of energy imports and exports in Canada. Students will use their mathematical skills to understand how much energy is imported, exported and consumed. They will also discover the importance of energy resources to Canada.

Grade level

- 4–12

Time required

- 30–40 minutes

Materials

- Arrow cards (30)
- Stacking blocks (100)
- Country flag cards (6)
- Number cards (3)
- Teacher guide card (1)

Set-up

Ensure that all materials are present.

Introduction

Once students have had an opportunity to explore the map on their own, divide them into three groups, each group representing one of the main types of energy production displayed on the map (red = natural gas, purple = crude oil and blue = electricity). Ask students to discuss patterns and trends they observe based on where their colour is displayed on the map.

Explain that energy plays a pivotal role in our lives and will continue to do so in the future. In fact, global demand is projected to increase by about 36 per cent by 2035, according to the International Energy Agency. Have students explore the main types of energy produced in each province and territory, and then discuss where the rest of the power is sourced from. For instance, in Prince Edward Island, students will see that only wind power is being produced, but the residents of Prince Edward Island rely on more than wind power to live. How do they meet the rest of their power needs?

Development

Review the terms “import” and “export” with your class, and ask students what commodities Canada is known for importing and exporting. Place a pylon on Halifax and on Vancouver. Explain that these two cities have Canada’s busiest ports and play a role in exporting and importing energy resources. Near each city, have students locate the purple dotted arrows and share the name of the country next to these dotted lines. Have volunteers place the country flag cards on these transmission routes.

Explain that Canada imports and exports many different energy resources, such as oil, natural gas, electricity and coal, and that exporting these resources to other countries (almost all to the United States) helps fuel Canada’s economy. In 2016, Canada exported $49.8-billion worth of crude oil, $8.8-billion worth of natural gas (via pipeline), and $2.9-billion worth of electricity. Place the American flag somewhere on the United States to highlight the importance of the United States as an export market.

Using the same three groups as in the intro activity, ask students to place an arrow card on an area of the map where they think Canada is exporting an energy resource to another country. Ask students to pay particular attention to the geography of the area and discuss how this might affect the amount of energy that can be transported and exported.

5. IMPORTS AND EXPORTS

Divide the blocks among the three groups, and give each group a number card. Have your students estimate and show with blocks how much of their natural resource or energy form is exported from Canada each day. Ensure that all students understand how much energy is represented by one block. Give all groups time to share their answers. Next, ask students how much of their resource or energy form is imported to Canada each day. Ask them to show this with the blocks, using the numbers and statistics outlined on their cards. Brainstorm reasons why Canada may need to import energy when it is already so rich in energy resources. How might these patterns of imports and exports affect sustainability?

Conclusion

Ask your students what similarities and differences they notice between their two piles of blocks. Explain that although Canada is rich in natural resources, some energy resources are still imported. Looking at the transmission routes on the map: Can students think of a reason why Canada must import so many resources? Why might there be gaps in the transmission routes? Ask students if they see any proposed energy projects that could alter the amount of energy imported and exported by Canada each year. Why or why not?

Bring attention back to the country flag cards used at the beginning of this lesson. Ask students which type of resource is mainly imported into Canada and which countries it is coming from. Discuss the energy industry in these countries and use this as an opportunity to bring current media into your classroom to discuss Canada's economy.

Extend your geographic thinking

Explain to your class that the 2016 census counted 35,151,728 people living in Canada. Ask students to use blocks to represent how many people they think have jobs in the oil and gas industry. After students have shared their estimates, explain that more than 425,000 Canadians have jobs related to the oil and gas industry. If one block is equal to 100,000 people, how many blocks would that be? (about 4 blocks) Ask your students to look at the map and consider where they think most oil and gas jobs are located. Have them do the same for all other types of energy. Encourage your students to research the types of jobs associated with the energy sector in Canada and where they are located. Have each student create a profile of a job that supports the energy sector in Canada.

Links to the Canadian National Standards for Geography

Essential Element 2: Places and Regions

- Physical and human characteristics of places and regions
- Factors that influence people's perception of places and regions

Essential Element 4: Human Systems

- Types of economic activity (resources, manufacturing, service)
- Development of transportation and communication networks
- Global economic interdependence (e.g., regional specialization, trade, transnationalism, multinationals)

Essential Element 5: Environment and Society

- Renewable (land, forests, water) and non-renewable (minerals, fossil fuels) resources
- World patterns of resource distribution and utilization
- Use and sustainability of resources

6. DEVELOPING ENERGY

Activity overview

This activity looks at the roles of current pipelines and transmission lines in Canada and the challenges that come with creating new infrastructure.

Grade level

- 4–12

Time required

- 75 minutes

Materials

- Coloured chains (4 colours)
- Coloured pylons (4 colours)
- Rule cards (4)
- Arrow cards (30)
- Energy icons (43)

Set-up

Place a coloured chain, a coloured pylon and a rule card on each corner of the map. Make sure the arrow cards and energy icon cards are handy.

Introduction

Once students have had an opportunity to explore the map on their own, ask them to locate either a pipeline or an electrical transmission line and stand on it. Ask each student to determine the type of pipeline or transmission line and its start and end points. Give an arrow card to each student and ask them to determine the direction in which the energy flows through the pipeline or electrical transmission line. Note that some pipelines and transmission lines flow towards production facilities, and some flow away.

Explain to your students that pipelines and electrical transmission lines are a convenient way of transporting large volumes of oil, natural gas and electricity over long distances. Discuss the benefits and drawbacks of Canada's energy infrastructure. What story do pipelines and electrical transmission lines tell us about Canada's energy? Where are most of Canada's pipelines and electrical transmission lines located? What patterns might be noticed? What role does spatial significance (the physical and human features of a particular place) play in determining the location of the pipelines and transmission lines? How does geographic perspective (social, political, economic and environmental) help explain why there are very few pipelines and electrical transmission lines in the North? How are the East and West different? How do regions with no transmission lines get their energy?

Challenge your students to calculate the length of the pipeline or transmission line on which they are standing. Have younger students use their feet for measurement and encourage older students to use the scale found in each corner of the map to roughly calculate its length. Why might the length of the pipeline or transmission line affect the cost of the energy?

Development

Bring your class's attention to the dashed lines connected to pipelines and the outlined offshore oil platforms on the map. Explain that these dotted lines and outlined symbols show proposed energy projects that have not yet been approved by the Canadian government. Ask students to trace over some proposed pipelines using the chains provided in the trunk and place pylons on the proposed energy projects. What kind of energy resources would these projects move? In which direction would the energy flow? Why might these proposals not have been approved yet? Why might these locations have been selected for new energy projects?

6. DEVELOPING ENERGY

Designing and building pipelines and transmission lines is a long and complicated process. Geographic perspective (social, political, economic and environmental) plays a big role in where a new energy project can or cannot go. Have your students look at the map and identify at least five geographic features that could factor into the decision of where to build a new energy project (e.g., where people live, mountains, rivers).

Next, divide the class into four groups. Give each group a rule card and tell them they are in charge of deciding where a new energy project will go. They must follow the rules on the card and pay close attention to the physical and human geography when deciding where they will develop a new energy project. Have each group use the props included with the map to show their energy project. Instruct your students to focus on a route that would have the least environmental and/or social impact.

Conclusion

When all groups have mapped their proposed energy project, allow each group to share their proposal with the rest of the class. After each presentation, the other students can act as the governing body and question the group using the regulations found on the rule cards as a guide. Vote as a class to approve or decline each proposal. How many energy projects did your class approve? What factored into their decision-making process?

Extend your geographic thinking

Research existing and proposed pipelines and electrical transmission lines in your local area. What kind of newspaper articles can you find about pipelines and electrical transmission lines in Canada? What messages do these stories convey? How might geographic perspective play a role in the development of these lines? How might spatial significance affect the decision-making process?

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms

- Location of major human and physical features on Earth
- Physical/political maps of the province, Canada and the world

Essential Element 2: Places and Regions

- Physical and human characteristics of places and regions
- How culture affects places and regions (e.g., cultural landscapes)

Essential Element 4: Human Systems

- Development of transportation and communication networks
- Types and patterns of economic activity (primary, secondary, tertiary, quaternary)

Essential Element 5: Environment and Society

- Renewable (land, forests, water) and non-renewable (minerals, fossil fuels) resources
- World patterns of resource distribution and utilization
- Impacts of technological hazards/disasters on the physical environment

Essential Element 6: The Uses of Geography

- Role of multiple points of view in contemporary geographic policies and issues

7. WATER, WATER, EVERYWHERE

Activity overview

This activity examines the close relationship between Canada's water resources and the production and transmission of energy. Students will explore Canada's main watersheds and the interrelationship between water and the extraction, production and transmission of energy resources.

Grade level

- 4–12

Time required

- 45–60 minutes

Materials

- Coloured pylons (4 colours)
- Coloured chains (4 colours)
- Watershed maps (4)
- Arrow cards (30)
- Water energy information card (4)

Set-up

Place coloured chains, pylons and arrow cards on the border of the map. Familiarize yourself with Canada's watersheds by visiting the interactive map at canadiangeographic.ca/watersheds.

Introduction

After students have had a chance to explore the map on their own, ask them to stand somewhere on Canada. Ask anyone standing on water to sit down. For those not standing on water, ask them to measure the distance between them and the closest body of water. Can any patterns be noticed? (Note that no matter where you are in Canada, there is water nearby.) As a class, locate and name the three oceans near Canada, the five Great Lakes, big rivers and any other large bodies of water found in Canada. Discuss the different types of water that Canada has, as well as the role that fresh water plays in Canada. Explain that Canada has about 20 per cent of the world's freshwater resources. Have the students brainstorm ideas as to why Canada's large amount of fresh water might be significant. Next, discuss how Canadians use water in their daily lives and how Canada's geography might affect water usage. Explain that water also plays an important role in the production and transmission of energy in Canada.

Development

Divide your class into four groups, each representing a main watershed in Canada (Arctic Ocean, Pacific Ocean, Hudson Bay and Atlantic Ocean). Give each group a watershed map, and direct them to outline their watershed on the Giant Floor Map using a coloured chain. Have students read the information aloud and locate the main river within their watershed using another chain or pylon. Then ask them to look at the physical landscape of their watershed and use an arrow card to guess which way the water flows. Explain that all water in a watershed flows in the same direction and is influenced by surrounding mountains, hills and valleys.

Point out the small part of southern Saskatchewan that is not included in the four outlined watersheds. Explain that there is one more major watershed — the Gulf of Mexico watershed — that covers this area. This is a very large watershed that drains into the Gulf of Mexico, over 2,750 kilometres farther south; the Mississippi River is its primary route.

Leaving the watershed outlines on the giant map, give each group of students a water energy information card. Instruct each group to use the coloured pylons to locate their energy resource on the map and discuss the spatial significance (the physical and human features of its location). When they are finished, invite each group to present their information to the class, defining their energy resource, explaining how water is used and describing the places they have highlighted on the map. Discuss any patterns that may be seen. Ask your students if they can think of any ways that less water could be used during any of the energy production processes.

7. WATER, WATER, EVERYWHERE

Conclusion

Explain that water is also used indirectly for energy transmission to ship energy across Canada and around the world. Ask students which types of energy can be transported over water (crude oil and natural gas liquids can be shipped). Have students stand on the purple dotted lines. What do these lines represent? Explain that the oil used in eastern Canada is imported from other countries by ship. Additionally, diesel is shipped to Canada's territories through northern ports. What could be the spatial significance of these ports? The ships used to transport oil are called oil tankers and can carry up to 500 tonnes of oil in one shipment — about the weight of 115 elephants. Ask students about the benefits and drawbacks of shipping energy resources over water. Can they come up with alternative ways of transporting the needed energy?

Finally, highlight Canada's offshore oil platforms on the East Coast. Describe how large deposits of oil and natural gas deposits are found deep below the ocean floor, and that massive offshore oil platforms drill deep to extract these resources. Canada has four major offshore projects: Hibernia, Terra Nova, White Rose and Hebron. What might be the spatial significance of these oil platforms (why is the oil there, why are they drilling in deeper water, etc.)?

Extend your geographic thinking

Conclude your lesson by connecting how Canadians use water directly and indirectly every day. When we take a shower, we use water directly, but when we turn on our lights and drive a car, we use water indirectly.

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms

- Location of major human and physical features on Earth
- Map, globe and atlas use (e.g., observing and analyzing relationships)

Essential Element 2: Places and Regions

- Physical and human characteristics of places and regions in Canada and the world

Essential Element 5: Environment and Society

- Renewable (land, forests, water) and non-renewable (minerals, fossil fuels) resources
- Environmental issues (e.g., water supply, air quality, solid waste)
- Watershed management
- Use and sustainability of resources

8. ON TOP OF THE WORLD

Activity overview

This activity explores Canada's North as a region that is rich in energy resources. Students will investigate how energy is transported to the North, the challenges faced by northern communities and how the region compares to the rest of the country.

Grade level

- 4–12

Time required

- 55–70 minutes

Materials

- Coloured chains (16)
- Coloured pylons (20)
- Energy icons (43)
- Potential energy cards (4)

Set-up

Place the oil and natural gas map cards, along with chains and pylons, on two different corners of the map.

Introduction

Once students have had an opportunity to explore the Giant Floor Map on their own, challenge them to locate the Arctic Circle (66.33 degrees latitude). Using coloured chains, outline the Arctic Circle and ask students to estimate how much of Canada's land is located above it. Facing north, have a class discussion about what life is like in Canadian communities located above the Arctic Circle. Discuss stereotypes and common beliefs that are held about life in Canada's North and whether they are accurate or not. Highlight that Canada's Arctic makes up more than 40 per cent of Canada's landmass and is home to more than 100,000 Canadians.

Discuss the patterns they see on the Giant Floor Map with respect to energy transmission lines and production facilities located above the Arctic Circle. Since there is little energy infrastructure in the North, ask students why there might not be much infrastructure and how they think Arctic communities get the energy resources they need. Next, point out the purple dotted lines in the Arctic Ocean. Ask students to say what they think these lines represent, without looking at the legend. Explain that the purple dotted lines illustrate shipping routes. Discuss how these may change as the effects of climate change are increasingly felt in the North. Energy resources, such as oil and gas, are brought into Canada's North by ship because large production facilities do not exist. Ask students where these energy resources are shipped from. Ask the students to discuss the interrelationships involved in transporting energy to the North and how communities might be affected.

Development

Discuss the lack of energy production facilities in Canada's North and why infrastructure development in that region may be more difficult than in other parts of the country. What factors may have inhibited the development of more energy infrastructure in the North? Explain that although most of Canada's northern regions have their energy resources shipped in, Canada's North is filled with pockets of oil and natural gas fields. Ask your students to reflect on the geographic perspective (social, political, economic and environmental) to discuss why energy resources are shipped in when the region has the same resources.

To illustrate the known energy resources in Canada's North, divide your class into two groups. Have each group refer to their map card and use the chains and pylons to map out where those resources are located in the country's northern and southern regions. Have students explore, using their geographic knowledge of the land and climate in Canada's North, which types of renewable and non-renewable energy could be produced in the region. Look at energy resources other than oil and gas in Canada's northern region, and use energy icons to mark them on the map. How might alternative energy such as wind, solar, hydroelectricity, nuclear, biomass and coal be used in Canada's North now and in the future?

8. ON TOP OF THE WORLD

Reflect on news stories that students may have come across about the development of the Arctic for energy production. Using the map as a backdrop, debate the benefits and drawbacks of additional exploration and development.

Conclusion

New technologies are being developed, new facilities are being built, and entire communities are being expanded because of the development of new energy projects. Ask each group to think of two pros and two cons for the expansion of energy resource production in the North and share them with the class. Make sure they consider the geographic perspective, technology, international relations and future demands. Allow each group to share their views with the class.

Extend your geographic thinking

Have your class do a case study on Inuvik, in the Mackenzie Delta in the Northwest Territories. For years, this small community relied on the local natural gas reserve for up to 90 per cent of its electricity and heating. Today, however, the reserve is almost depleted. There are still large natural gas fields below the surface, as indicated by the chains and pylons the students placed on the map. Discuss why this community is not currently drawing on a new reserve. The answer is related to the Mackenzie Valley pipeline, a proposed pipeline designed to tap into northern natural gas reserves and transport it to communities in the North and then south. In 2012, however, this pipeline was put on hold, and at the end of 2017, it was announced that the project participants had dissolved the joint venture for now.

For the case study, ask students to consider the following questions: What problems are facing Inuvik? What are some possible solutions? What concerns have been voiced by members of the community? Why was the Mackenzie Valley pipeline put on hold? How might this pipeline affect communities in the valley? How might geographic perspective determine the next steps for the pipeline? Come up with an alternative route the Mackenzie Valley pipeline could take that would be acceptable to the stakeholders (i.e., the people, organizations and governments that might be affected by the pipeline). Use maps from any of the following Websites: ArcGIS Online, eurasiangeopolitics.com/arctic-maps/ and native-land.ca. What role might spatial significance (the physical and human features of the location of the proposed pipeline) have played in this issue?

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms

- Latitude, longitude and the grid of the world
- Map, globe and atlas use (e.g., observing and analyzing relationships)

Essential Element 2: Places and Regions

- Perceptions of places and regions
- Regions defined by multiple criteria
- How culture affects places and regions (e.g., cultural landscapes)
- Interdependence of places and regions

Essential Element 3: Physical Systems

- Climate types
- Ecozones (major ecological communities such as boreal forest, polar regions, grassland, wetlands and desert)

Essential Element 4: Human Systems

- Processes of cultural diffusion
- Patterns of culture in Canada and the world (e.g., religion, language, ethnicity, economy)
- Types and patterns of economic activity (primary, secondary, tertiary, quaternary)

9. SHIFTING THE OIL SANDS

Activity overview

Students will take a look at the oil sands and their role in Canada's energy landscape. Students will predict how Canada's environment and economy would change if the oil sands were in another part of the country.

Grade level

▷ 7–12

Time required

▷ 30 minutes

Materials

▷ Coloured chains (4 colours)
▷ Oil sands information card (1)
▷ Oil sands map cards (4)

Set-up

Place one coloured chain and one oil sands map on each corner of the map.

Introduction

Once students have had an opportunity to explore the Giant Floor Map on their own, bring their attention to the province of Alberta. What do they see in Alberta and how does this differ from other provinces and territories? Based on the geography of Alberta, why do they think this province is so rich in energy resources? Ask students to locate any patterns or trends of human development related to energy development in Alberta.

As a class, refer to the oil sands information card and use the red chains to outline the general area of the oil sands. Have students sit in a circle around the area and discuss what the oil sands are, using the information on the back of the card. Discuss, from a geographic perspective, the positive and negative perceptions of the oil sands and their exploitation. Ask your students to guess the size of the oil sands, and then calculate the area using hands or the scale on the map.

Discuss how the development of the oil sands affects humans, both positively and negatively, using the map to illustrate your points. Be sure to factor in communities that may not be shown on the map, including Indigenous ones.

Development

Divide students into four groups, and instruct each to sit on a different corner of the map. Have each group outline the new location of the general area of the oil sands on the Giant Floor Map, using the coloured chains and the oil sands map.

After all groups have outlined the new oil sands locations, ask them to decide how the oil (called bitumen) will be extracted and transported, and to think about how local communities might be impacted. When all groups have presented, ask how Canada might change economically, environmentally, culturally and politically as a result of continued extraction from the oil sands. Have students refer to the questions on the back of the map card to organize their answers. As a class, decide how the oil sands might affect different communities across Canada. Be sure to examine as many different parts of Canada as possible. What predictions can students make regarding the oil sands?

9. SHIFTING THE OIL SANDS

Conclusion

In recent years, some companies have lowered or stopped their production in the oil sands. Discuss how these changes have affected energy production and transmission in Canada. Look to the future and discuss as a class if Canada will ever be able to not rely on the energy and products of the oil sands. Would such a shift be possible? If so, what would have to change? Be sure to focus on direct and indirect energy uses, needs and innovations. Have students illustrate the changes on the Giant Floor Map.

Extend your geographic thinking

The Canadian oil sands are world-leading in innovation, technology and safety regulations. Once the Giant Floor Map has left your school, complete an online research project that focuses on one or more of the ground-breaking advances that Canadian technology has brought to the world.

Links to the Canadian National Standards for Geography

Essential Element 1: The World in Spatial Terms

- Map projection (e.g., size, shape, distance and direction)
- Location/allocation situations (e.g., the best location for a fast food outlet and the extent of its market area; the best location for a hospital and the area it serves)

Essential Element 2: Places and Regions

- Physical and human characteristics of places and regions in Canada and the world
- Concepts of formal, functional and perceptual regions
- The importance of places and regions to individual and social identity

Essential Element 3: Physical Systems

- Physical processes shape patterns in the physical environment

Essential Element 4: Human Systems

- Economic development by world regions, countries and regions within countries

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.

10. GOING GREEN

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