



United Nations
Educational, Scientific and
Cultural Organization



**MOUNT
ARROWSMITH**
BIOSPHERE REGION

BIOSPHERE BOOKLETS

Lesson Plans & Activities

RENEWABLE ENERGY

SUMMARY/OVERVIEW

Grades:
3-5

Prep Time:
5 Minutes*

**Learning
Environment:**
Indoor

**Total Lesson
Length:**
1.25 Hours*

DESCRIPTION:

This booklet explores different types of renewable energy sources by introducing the topic and providing local examples on Vancouver Island. By discussing each type of renewable energy source in detail, students can obtain an understanding of how each source works.

*Optional - educators can take students to one or more of the listed locations so students can see and understand the scale of these sources.

CURRICULUM

EXPECTATIONS:

Processing and analyzing data and information: Experience and interpret the local environment.

Evaluating: Identify some simple environmental implications of their and others' actions.

Questioning and Predicting: Demonstrate curiosity about the natural world.

BACKGROUND:

Renewable energy sources are a critical form of power in this modern age, as we are faced with the inevitable demise of non-renewable sources such as fossil fuels. British Columbia has abundant renewable energy sources, a natural advantage for new opportunities to meet our growing energy demands with clean, renewable power. The province has also set impressive targets to reduce greenhouse gas emissions by 40% by 2030.

LESSON PLAN

TIME	ACTIVITY	LOCATION	MATERIALS
30 mins	1. Introduction	Indoor	Printed worksheet
30 mins*	2. Renewable Energy "Tour"	Field trip*	Printed worksheets
15 mins	3. Conclusion	Indoor	N/A

*Option to take students to a renewable energy source location – will result in longer lesson length

TIME	ACTIVITY	LOCATION	MATERIAL
30 mins	1. Introduction	Indoor	Printed worksheet

Introduction

GOAL: Introduce students to the concept of renewable energy.

PREPARATION: Print page 3.

LESSON PLAN:

INTRODUCTION: Initial Discussion (15 minutes)

1. Ask students if they know what renewable energy is.
 - **Renewable energy** is **energy** that has been derived from earth's natural **resources** that are not finite or limited. Renewable energy is an alternative to the traditional energy that relies on fossil fuels, and it tends to be much less harmful to the environment.
2. Explain that a finite resource, such as fossil fuel, means that there is a limit to the quantity that is available to earth's citizens.
3. Ask students to name some examples of renewable energy sources. Examples may include:
 - Hydropower (water)
 - Solar energy (sunlight)
 - Wind energy (wind)
 - Biomass energy (organic material)
 - Geothermal (heat from earth's core)
4. Explain to students that renewable energy is also clean energy, which means it produces less pollution and greenhouse gas emissions which contribute to climate change. However, these types of energy sources have their challenges, as they can be less reliable. Meaning the amount of energy these sources produce can change from day to day (e.g., depending on the amount of sun or wind available that day).

HANDS ON: Word Search Review (15 minutes)

5. Have students complete the **word search** (page 3) to synthesize the information learned in this session.
 - See answer key on page 4.

Renewable Energy Word Search

R	C	H	S	O	L	A	R	Y	O	B	K	S	C	E	P
V	E	C	Y	A	D	F	O	I	B	K	C	F	L	E	Z
U	E	N	J	D	E	R	S	Y	A	K	Z	V	E	F	G
L	X	U	E	K	R	D	F	I	V	L	R	Y	A	F	M
P	F	Z	P	W	N	O	H	F	F	Z	K	J	N	B	G
O	A	O	V	F	A	R	P	F	U	P	Z	W	E	Y	E
L	F	O	S	A	O	B	U	O	Q	Y	A	O	N	K	O
L	E	K	H	S	L	Z	L	F	W	J	O	J	E	A	T
U	Q	M	J	N	I	Q	X	E	I	E	P	U	R	N	H
T	H	Y	D	N	D	L	A	N	E	N	R	P	G	W	E
I	P	R	W	L	L	Q	F	S	M	N	I	B	Y	J	R
O	R	D	Q	I	J	N	S	U	O	U	E	T	A	N	M
N	H	Y	Q	I	N	M	S	M	E	P	I	R	E	K	A
U	K	Y	M	R	U	D	W	F	T	L	J	F	G	V	L
G	U	G	X	B	I	O	M	A	S	S	S	Y	I	Y	N
Y	T	E	Z	B	T	W	I	K	Q	H	K	M	N	T	D

Word Bank

Wind Hydro Power Geothermal Fossil Fuels Finite Solar
 Renewable Energy Biomass Pollution Clean Energy

Answer Key

Renewable Energy Word Search

<u>R</u>	C	<u>H</u>	<u>S</u>	<u>O</u>	<u>L</u>	<u>A</u>	<u>R</u>	Y	O	B	K	S	<u>C</u>	E	P
V	<u>E</u>	C	<u>Y</u>	A	D	F	O	I	B	K	C	F	<u>L</u>	E	Z
U	E	<u>N</u>	J	<u>D</u>	E	R	S	Y	A	K	Z	V	<u>E</u>	F	G
L	X	U	<u>E</u>	K	<u>R</u>	D	F	I	V	L	R	Y	<u>A</u>	F	M
<u>P</u>	<u>F</u>	Z	P	<u>W</u>	N	<u>O</u>	H	F	F	Z	K	J	<u>N</u>	B	<u>G</u>
<u>O</u>	A	<u>O</u>	V	F	<u>A</u>	R	<u>P</u>	F	U	P	Z	W	<u>E</u>	Y	<u>E</u>
<u>L</u>	F	O	<u>S</u>	A	O	<u>B</u>	U	<u>O</u>	Q	Y	A	O	<u>N</u>	K	<u>O</u>
<u>L</u>	E	K	H	<u>S</u>	L	Z	<u>L</u>	<u>F</u>	<u>W</u>	J	O	J	<u>E</u>	A	<u>T</u>
<u>U</u>	Q	M	J	N	<u>I</u>	Q	X	<u>E</u>	<u>I</u>	<u>E</u>	P	U	<u>R</u>	N	<u>H</u>
<u>T</u>	H	Y	D	N	D	<u>L</u>	A	N	<u>E</u>	<u>N</u>	<u>R</u>	P	<u>G</u>	W	<u>E</u>
<u>I</u>	P	R	<u>W</u>	L	L	Q	<u>F</u>	S	M	<u>N</u>	<u>I</u>	B	<u>Y</u>	J	<u>R</u>
<u>O</u>	R	D	Q	<u>I</u>	J	N	S	<u>U</u>	O	U	<u>E</u>	<u>T</u>	A	N	<u>M</u>
<u>N</u>	H	Y	Q	<u>I</u>	<u>N</u>	M	S	M	<u>E</u>	P	<u>I</u>	<u>R</u>	<u>E</u>	K	<u>A</u>
U	K	Y	M	R	U	<u>D</u>	W	F	T	<u>L</u>	J	F	<u>G</u>	V	<u>L</u>
G	U	G	X	<u>B</u>	<u>I</u>	<u>O</u>	<u>M</u>	<u>A</u>	<u>S</u>	<u>S</u>	<u>S</u>	Y	<u>I</u>	<u>Y</u>	N
Y	T	E	Z	B	T	W	I	K	Q	H	K	M	N	T	D

TIME	ACTIVITY	LOCATION	MATERIAL
30 mins	2. Renewable Energy "Tour"	Field trip	Printed worksheet

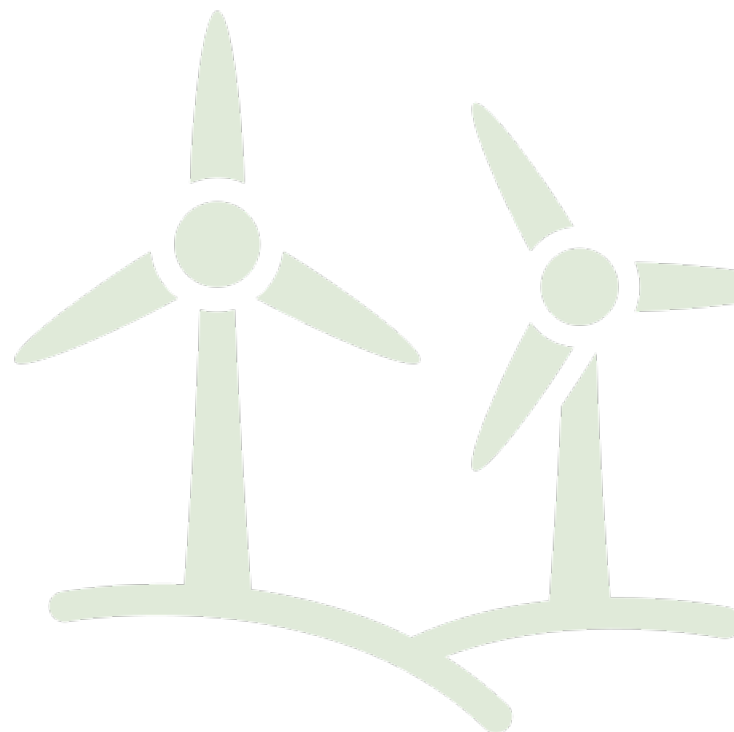
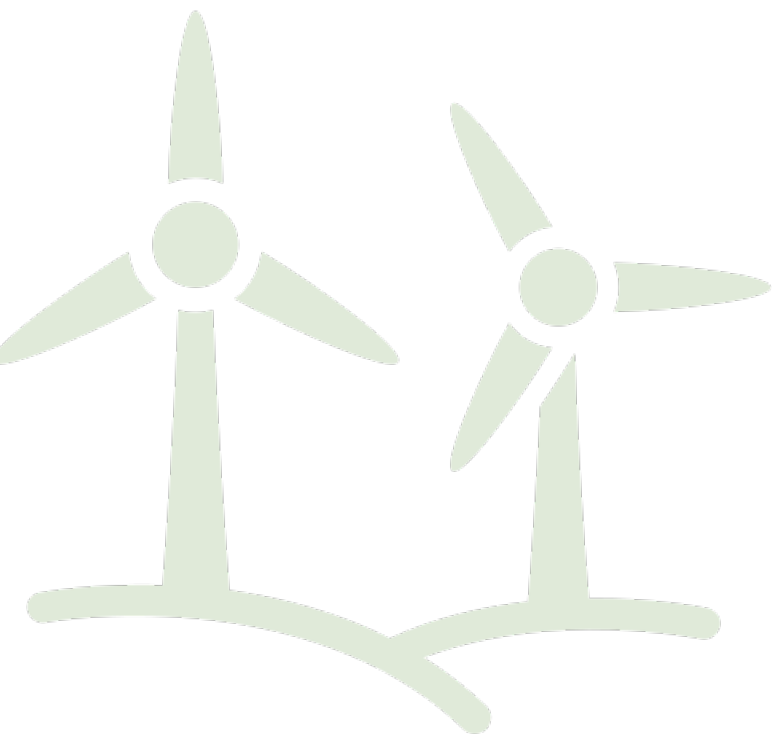
Renewable Energy "Tour"

GOAL: Provide students with the understanding of how sustainability can be included in city planning.

PREPARATION: Print pages 6-9.

LESSON PLAN:

1. The following sections outline places on Vancouver Island where renewable energy is created – along with talking points on each renewable energy source.
2. Hand out the **renewable energy fact sheet** (page 6-9). Review each source with students.
3. Photos or videos of each place can be shown for visual aid through the attached links (though if possible, students could visit one or more of the locations to help visualize the power of renewable energy).



Wind Energy

Places on Vancouver Island



- Cape Scott Wind Farm
 - 35km to the west of Port Hardy
 - For more information click [here](https://bit.ly/3L5IKFH) (<https://bit.ly/3L5IKFH>)

Disadvantages

- Days without wind means no power is being generated.
- Due to noise created from turbines, they must be placed away from cities and towns.

Talking Points


- Wind energy harnesses the kinetic energy from the wind and converts it into electrical energy for use in our homes and businesses.
- Winds are caused by the sun's heating of the earth, and the earth's rotation.
- Residents living near wind turbines often oppose them for visual reasons.
- Wind accounted for 5.1% of electricity generation in Canada in 2018.
- Watch this TedEd video that explains how wind turbines work: <https://youtu.be/xy9nj94xvKA>

Cape Scott Wind Farm on Vancouver Island



Solar Energy

Places on Vancouver Island

- **The T'Sou-ke First Nation Solar Project** 
 - Located west of Victoria.
 - Also utilizes greenhouses for sustainable food production.
 - Solar project is part of a unique eco-tourism project.
 - For more information, click [here](https://bit.ly/3iq9P95) (<https://bit.ly/3iq9P95>)
- **Calvert Island Field Station**
 - Up until 2010, the site burned up to 500 liters of diesel fuel per day. They then integrated solar energy to power the station with the help of Hakai Energy Solutions.
 - Although visiting may prove difficult, an effective [video](https://bit.ly/3wtW4i2) (<https://bit.ly/3wtW4i2>) was created to highlight their efforts.

Talking Points

- Solar photovoltaic (PV) power is the conversion of sunlight into electricity via solar cells within a solar panel or module.
- The potential for solar energy varies across Canada. The potential is lower in coastal areas, due to increased cloud coverage.
- The areas in southern Canada, where 90% of the population lives, receive more solar radiation than Germany, which is the world leading nation in the use of PV per capita.
- Solar power generation requires no fuel or moving parts. It makes no noise and produces no emissions with minimal maintenance.
- Watch this video on solar energy to learn more: <https://youtu.be/inPtRWtvDaM>

Disadvantages

- Batteries are required to store power, and require resources to maintain operation.
- Energy is only generated when the sun is shining. This means at night and on cloudy days the supply of power is interrupted.

T'Sou-ke First Nation Solar Project



Hydro Power

Places on Vancouver Island



- **John Hart Generating Station**
 - Located in Campbell River, beside the Elk Falls Provincial Park.
 - The facilities along the Campbell River system not only generate electricity, but also contribute to the surrounding communities by providing services such as flood control, domestic water supply, and recreation.
 - There is also an interpretive centre at the site.
 - For more information and a video click [here](https://bit.ly/3qvfa3q) (<https://bit.ly/3qvfa3q>)

Talking Points

- Hydro power uses the power of flowing water, without wasting or depleting it in the production of energy.
- Hydroelectricity is British Columbia’s largest source of electric power generation.
- There are a few types of Hydropower that are utilized on Vancouver Island:
 - Tidal Power – Harnessed from ocean currents and tidal height differences.
 - Wave Energy – captures the energy found near the surface of the water and converts it to power.
 - Run-of-River – uses natural stream flows in mountainous regions to generate electricity.
- Utilizing a number of different energy sources aids in energy security, decreasing the reliance on a single energy source, and increasing energy self-sufficiency.
- Use this link to watch a video on how hydro power works: <https://youtu.be/q8HmRLCgDAI>

Disadvantages

- Has the potential to harm the environment with damaged wildlife habitat, harmed water quality, and obstructed fish migration.
- Amount of power generated from hydropower depends on precipitation (rain) levels, which can change each year.

John Hart Dam in Campbell River, B.C.



Biomass Energy

Places on Vancouver Island

- Although there is nowhere to safely visit, Nextterra has created a community in Victoria using Biomass Energy. See the video by clicking [here](https://youtu.be/39blxH9PEi4) (<https://youtu.be/39blxH9PEi4>)

Talking Points

- Biomass energy generation is the creation of heat and/or power from carbonaceous substances such as wood, agricultural crops, animal waste, and aquatic plants.
- Most of Canada’s biomass energy is made in BC – particularly from the burning of wood waste from the forestry industry.
- FortisBC also captures gases (methane) generated by landfills and farming operations.
- Watch this video to learn how Biomass energy production works: https://youtu.be/nVl17JLn_uo

Nextterra Biomass Energy at Dockside Green, Victoria, B.C.



TIME	ACTIVITY	LOCATION	MATERIAL
15 mins	3. Conclusion	Indoor	Printed worksheet

Conclusion

1. Ask students to share what they found interesting in this session.
2. Explain to students that although renewable energy sources are not our only source of power, it plays an important part in our future.
 - a. Ask students to recall why renewable energy sources are not our only source of power.



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or email it to the MABR Coordinator at



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