



Little Brown Myotis

Arctic Energy Inspiration

The little brown myotis is nocturnal and hibernates all winter. That means it has to eat enough insects during short summer nights to provide all the energy it needs for the whole year! Bats need to conserve energy in order to survive, so they slow down their metabolism in the winter. They can eat their body weight in insects every night – up to 600 insects in one hour. Can you imagine eating your body weight of food every day?

Little brown myotis (2:30)

David Attenborough explaining hibernation in little brown myotis

 **SMART Board / Promixa Ready**

 **Northern Resources**

Gr.6 NWT Energy Pyramid

ARCTIC ENERGY

OBJECTIVE Students will learn about energy conservation in the NWT and be able to describe effective methods for conserving energy. They will also have the opportunity to learn about renewable energy through extension activities.

Meeting the energy needs of households, communities and industry in the Northwest Territories is difficult, but critically important. Imported fossil fuels provide a large percentage of heat and power used and our dependence on outside products puts us at an economic disadvantage; we are vulnerable to high costs, price volatility and supply disruptions. Burning fossil fuels also emits large quantities of greenhouse gases that contribute to the changing climate that is affecting the North. It is important to develop new plans to create energy independence and increase our energy security. The best way to responsibly increase our energy needs is to conserve energy, look for energy efficient alternatives and invest in renewable energy!

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CURRICULUM Links



The activities and resources in this document are intended to tie in with Grade 6 science and technology curriculum *Motion*, the Grade 6 physical education curriculum, as well as the **Dene Kede** and **Inuuqatigiit** curriculum relating to the land. You can find specific learning outcomes for each of these by following the links below. The Dene Kede and Inuuqatigiit curriculum contain a lot of useful advice about bringing northern culture, language and traditional knowledge into the classroom. In culture-based education, teachers are expected to offer students the opportunity to extend learning experiences necessary in K–12 skills.

Grade 6 Science & Technology - Motion

General Learning Outcome

Students will demonstrate an understanding of different kinds of motion (linear, rotational, reciprocating, oscillating).

Specific Learning Outcome

Students will describe, using their observations, ways in which mechanical devices and systems produce a linear output from a rotary use input, use appropriate vocabulary, including correct science and technology terms. In describing their investigation and observations.

Connected Lessons

Lesson 3 - Bikes are Changing the World!

Teachers are to involve students in key experiences, both on the land and in school. In addition, culture-based education is enhanced with the involvement of Elders. ECE has developed a resource to provide valuable information about inviting Elders to contribute to lessons and related activities. Interview templates are included as well as practical advice about compensation (see **Teacher's Resources**). Here are some examples of where the lessons in this resource connect with these different curricula. Some suggestions for making connections have been included in the lesson plans, too.

Grade 6 Physical Education

General Learning Outcome

- A** Developing locomotor, manipulative skills and application of skills in an alternate environment
- B** Physical fitness and well-being
- D** Active living in the community

CURRICULUM Links



Dene Kede - Land

General Learning Outcome

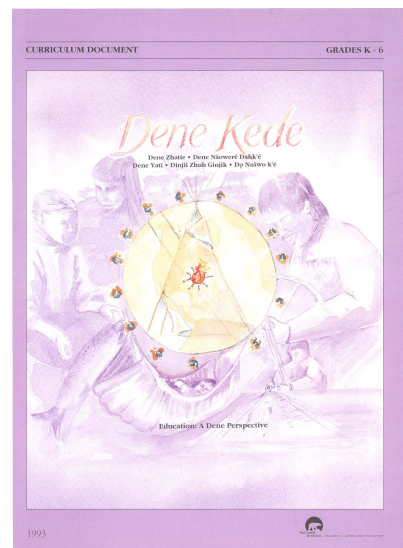
With the aid of the Dene Language, students can explore the following thematic units: Fire, Water and Rivers, Trees, Sun, Camping, Geography and Land Use, The Arrival of Non-Dene.

Specific Cultural Expectations

Students will understand the importance and meaning of their relationship to the land.

Connected Lesson

Lesson 1 - Energy Pyramid



Inuuqatigiit - Land

General Objectives

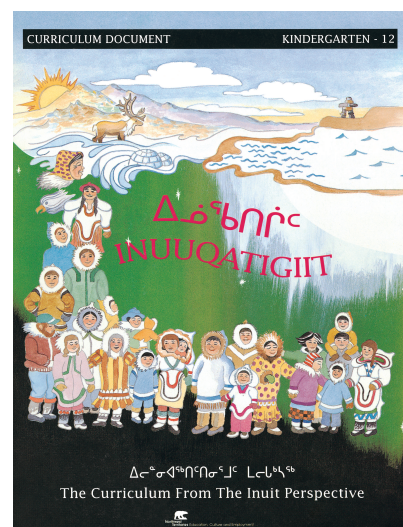
The following is a list of thematic units with relevant connections between the Inuuqatigiit curriculum and **NWT Energy Pyramid**.

Key Themes

Land, Water, Sky, Weather and Weather Predicting.

Connected Lesson

Lesson 1 Energy Pyramid



TEACHER'S Resources



Websites and Handouts

WWF's Earth Hour Toolkit

<http://schools.wwf.ca/Lessons/Grade/6/140>

Manitoba Hydro Electric Universe

<http://manitoba.electricuniverse.com>

Interactive Energy Exploration

<http://www.seedsfoundation.ca/els/Lobby/>

Food Miles:

Growing Local Food Connections

<http://fallsbrookcentre.ca/fbc/wp-content/uploads/2010/09/Food-Miles-Module.pdf>

Paths to a Renewable North

<http://www.anorthernvision.ca/documents/RenewableEnergyInventoryEN.pdf>

Guide to Ride Program

<http://www.phecanada.ca/programs/bicycle-safety-guide-ride>

Green Learning COOL 2.0 Education Database energy conservation lesson plans and resources

<http://cool.greenlearning.ca/database/?search=go&Keywords=energy+conservation&TypeID=&CatID=&SubjectID=&YearID=&GradeID=&StateID=&LanguageID=>

A Handbook of Power Smart energy Efficiency Learning Resources

http://www.edu.gov.mb.ca/k12/tech/imym/6/resources/pemp_2005.pdf

Greenhouse Gas Strategy

2007 - 2011
(interesting chart on page 9)

http://www.enr.gov.nt.ca/sites/default/files/strategies/greenhouse_gas_strategy_final.pdf

2011 - 2015

http://www.enr.gov.nt.ca/sites/default/files/strategies/ghg_strategy_2011-2015.pdf

Videos

Can-Bike Videos

<http://canbikecanada.ca/videos/>

People of a Feather Trailer (2:29)

<http://www.peopleofafeather.com/>

Books

Pedal It! How Bicycles Are Changing The World

Michelle Mulder
Orca Books, 2013
ISBN: 978-1459802193
www.orcabooks.com

Teaching about Climate Change

Tim Grant and Gail Littlejohn
<http://greenteacher.com/books/climate-change/>

Not Your Typical Book about the Environment

Elin Kelsey
Illustrated by Clayton Hanmer
Owlkids Books, 2010
ISBN: 978-1897349847
www.owlkidsbooks.com

This Is My Planet

Jan Thornhill
Owlkids Books, 2007
ISBN: 978-1897349076
www.owlkidsbooks.com

50 Climate Questions

Peter Christie
Illustrated by Ross Kinnaird
Annick Press, 2012
ISBN: 978-1554513741
www.annickpress.com

Who Wants Pizza?

Jan Thornhill
Owlkids Books, 2010
ISBN: 978-1897349977
www.owlkidsbooks.com

LESSON Plans



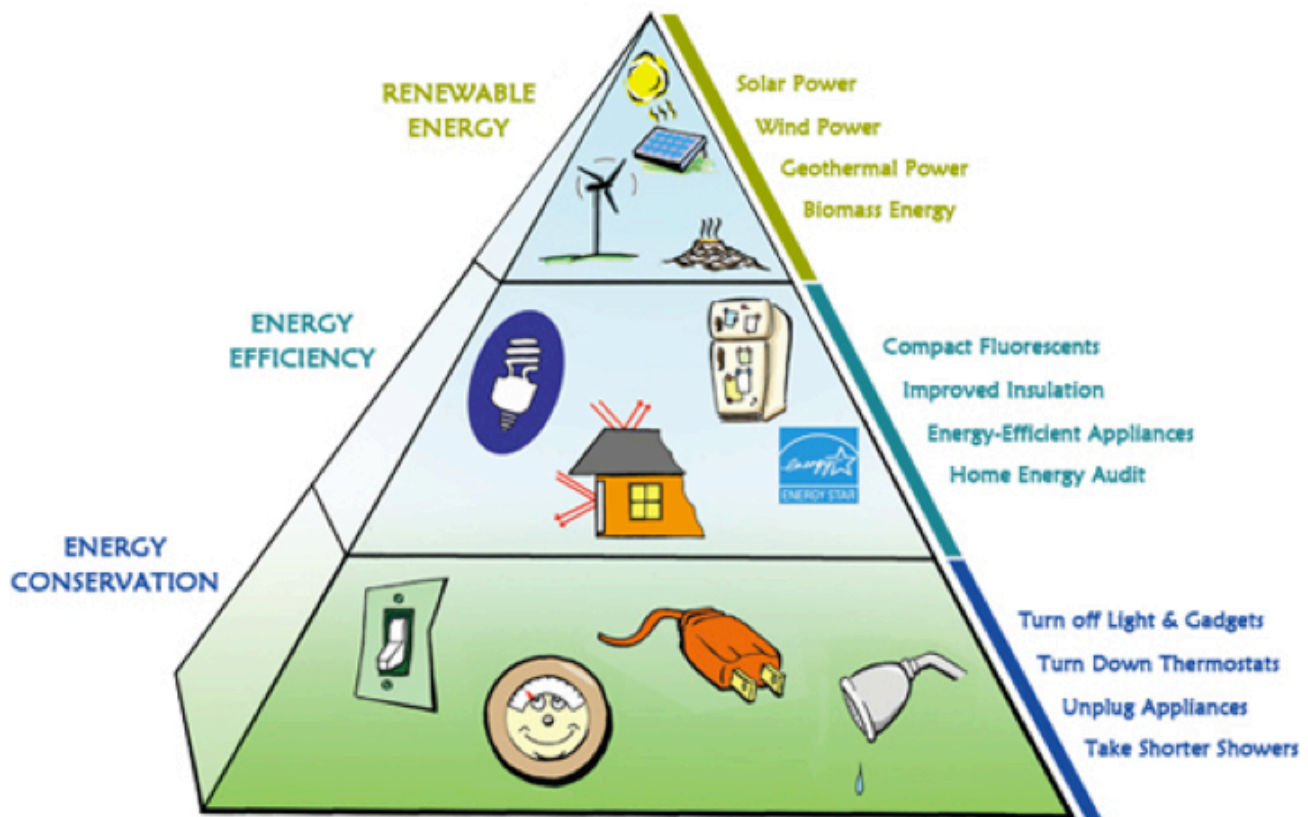
Lesson 1: Energy Pyramid

1 class period.

What's the best way for the world to reduce the cost of energy? Students might say “use solar” or “renewable energy.” When discussing smart uses of energy, people tend to tout the benefits of renewable energy, but, ultimately, **energy conservation** is the number one way to reduce your **energy footprint**. Your goal can be to use the least amount of energy possible, no matter what the energy source.

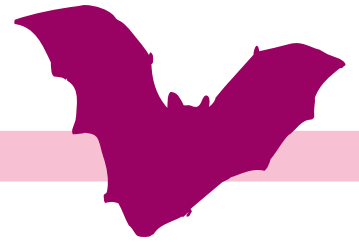
Divide students into pairs or small groups. Distribute the **Smart Energy** cards on the next page to students. In their groups, students discuss and assign a priority number between 1 and 3 to each card (e.g., 1 is a most beneficial energy-saving action). Groups may come to different conclusions, but the take-away should be energy conservation is the number one strategy for reducing your energy footprint in the NWT.

The Smart Energy Living® Pyramid



Source: <http://smartenergyliving.org/index.cfm/ID/4/Resources/>

SMART Energy



Cook more than one thing at a time

Open windows instead of using A/C

Ride your bike

Solar power

Wind power

Geothermal energy

Biomass energy

Make the switch to CFLs

Make the switch to LEDs

Improve home insulation

Buy energy-efficient appliances

Get a home energy audit

Turn off lights

Unplug gadgets

Turn down the thermostat/use less heating fuel

Unplug appliances

Take shorter showers

Use a laundry line to dry laundry

Grade 6/theme 2. This resource is available as a free download from WWF-Canada Schools for a Living Planet. Visit schools.wwf.ca.



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Lesson 2: Eating Up the Distances!

1 class period.

Tale of the Travelling Tomato

Modified from Falls Brook Centre's Food Miles (see **Teacher's Resources**). This activity will help introduce students to the understanding of how much energy is used when transporting our food long distances.

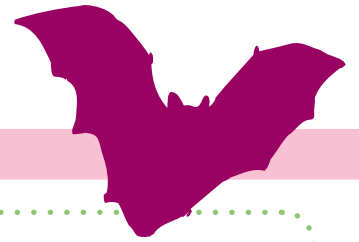
Materials

- **Tale of the Travelling Tomato** character cards (next page)
- A green tomato and red tomato from the grocery store (Mexico would be best)
- A locally grown tomato, if possible

Ask for 8 students to help you tell the tale of the travelling tomato. Give out the character cards and have the student acting as Carlos begin the story. When Carlos comes to the next name in the story, he should hand the tomato to student playing that role, once they identify themselves.

Debrief by discussing what parts of the tomato's journey consumed energy. *How might a travelling tomato's energy footprint compare to a local tomato's?*

TALE of the Travelling Tomato Character Cards



Janet

Grocery store owner

I'm the grocery store owner and I finally got my shipment! These tomatoes have travelled further than I ever have! They're a little banged up, but people will still buy them. *Hand to Donald.*

Jimmy

American truck driver

I have even farther to go than Gabriela! I'll make sure I drink some coffee to stay awake... all the way to the Canadian border where I give the tomatoes to **Jeffrey**.

Fred

Northern truck driver

I'll drive these all the way up to your community name. They took a whole week to get here; I hope everyone enjoys them! I'll deliver them to **Janet** at the grocery store.

Eduardo

The picker in Mexico

I am the picker and I know the tomato isn't ripe yet, but I have to pick the tomato while it is still green so it will survive its long trip! Once it is picked, I hand it over to **Gabriela**.

Jeffrey

Canadian truck driver

I'll drive this load of tomatoes from the American border to Edmonton. I'll stop and have a BLT at a diner, and then I'll hand these tomatoes over to **Wanda**.

Carlos

The farmer in Mexico

I am a farmer in Mexico and I have been growing this tomato. I know I have to grow a lot to meet demand so, to ensure it grows, I spray the tomato with pesticides. Once it's grown, I hand the tomato over to the **Eduardo**. *Pass green tomato.*

Gabriela

Mexican truck driver

It's a long way to Canada! These tomatoes have to travel thousands of kilometres... I'll take them to the American border and hand them off to **Jimmy**.

Wanda

Food services warehouse owner

I am the food importer warehouse owner. These tomatoes I received are still green, so I have to gas them with ethylene for 24 hours to make them turn red. Once they're red, I'll give them to **Fred** to drive north. *Pass red tomato.*

Donald

Shopper

I'm just shopping for my groceries. Some of these tomatoes are a little hard and some of them have spots already, but oh well! They travelled a long way, but I'll buy them anyways.

LESSON Plans



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Mapping Our Meal

Now that we are aware that some food has to be grown/gathered in other places, let's map our meals and see if we are making choices that help us eat food that is produced closer to home!

You'll need

- **Map Our Meal** worksheet for each grouping of food
- World map, map of Canada and map of the NWT or your community map
- Rulers/string for measuring distances
- Calculators
- Food items from around the world, across Canada and your community

Steps

1. Break the class into three groups. Give one group the world map and world food items from the grocery store, one group the Canadian map and options, etc. If you teach a small class, you could do this activity all together.
2. Using the maps, rulers and calculators, have students measure the distances their food items travelled and record their findings on their worksheets. They should be able to find product information on the label, and label the local items yourself (e.g., whitefish from Great Slave Lake).
3. Have students guess which types of transportation may have been used to get the food to its destination. Estimate the greenhouse gas emissions based on these stats (per km / per kg of food) from Environment Canada (2002): plane - 1.1010; boat - 0.1303; train - 0.0212; truck - 0.2699.
4. Gather all the data on one chart and compare your findings. Debrief with the following questions: *How much further did the around the world items travel? Why do people buy that stuff? What are the other benefits of country food besides saving energy? How can you eat more food from local sources?*

Extension

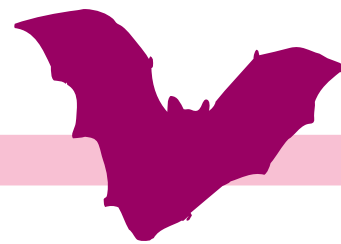
If your community has a community garden, you could get a student plot to plant in the spring. Students, parents, school staff or other community members can volunteer to weed, water and mulch the plot over the summer months. Harvest your garden in the fall. For more information, contact [Ecology North](#) and ask about the Weledeh Garden Program.

MAP Our Meal!



Food item	Where it's from	How it travelled and CO ²	Total Cost of travel
		Plane km x 1.101g of GHG =	KM..... GHG..... emissions
		Boat km x 0.1303g of GHG =	
		Train km x 0.0212g of GHG =	
		Truck km x 0.2699g of GHG =	
		Total Total	
		Plane km x 1.101g of GHG =	KM..... GHG..... emissions
		Boat km x 0.1303g of GHG =	
		Train km x 0.0212g of GHG =	
		Truck km x 0.2699g of GHG =	
		Total Total	
		Plane km x 1.101g of GHG =	KM..... GHG..... emissions
		Boat km x 0.1303g of GHG =	
		Train km x 0.0212g of GHG =	
		Truck km x 0.2699g of GHG =	
		Total Total	
		Plane km x 1.101g of GHG =	KM..... GHG..... emissions
		Boat km x 0.1303g of GHG =	
		Train km x 0.0212g of GHG =	
		Truck km x 0.2699g of GHG =	
		Total Total	
		Total Distance Our Meal Came From	
		Total GHG Emissions	

Lesson Plans



Lesson 3:

Bikes are Changing the World!

You can reduce your energy footprint by changing the way you travel! Walking, sharing rides (carpooling) and biking are easy ways to use less fossil fuels to get around. Learning to bike is an easy way to promote physical literacy and give students the opportunity for playground fun (BMX) to road racing! *How many of your students own a bike?* What's their favourite thing about cycling? Make a list on the board of all the good things about cycling.

Bikes in our community:

Teacher Note: You can use the “Understanding Biking” handout page, 7 in the Guide to Ride Program (see **Teacher’s Resources**) for this activity.

As a class, brainstorm why people ride bikes (exercise, transportation, independence, for fun, etc.).

What are the environmental benefits of biking?
Pollution-free, don't use fossil fuel⁸, decreased less infrastructure required (roads) and space (parking) requirements, less wear on roads, less noise... Read a selection from *Pedal It!* (see **Teacher’s Resources**) to help with your discussion.

Discuss how much energy is used when biking to school and how much energy is used when you drive to school. Hand out the Biking vs. Driving Calculator on the next page and ask students to complete it.

What are the Benefits of Riding?

How efficient is biking compared to other forms of transportation? Check out this neat explanation using eggs from Bike to Work Day Calgary.



Extension

Have students make posters with a catchy phrases about why people might want to bike more and display them around the school.

Bike History Investigator

Divide students into pairs and have them interview each other about their experiences with biking.

1. *How long you've been biking and often do you bike?*
2. *Who else in your family bikes?*
3. *What are your top five things you do when biking?*
4. *What is something that could be done to encourage more people to bike in your community?*

Extension

You could have your students do a larger project that includes a community survey. They could interview people at the store or at a community event over a weekend. *How many people use bikes in your community? Why do they bike? Why don't they bike?* You could give students the option to observe biking in the community for a week. *What do they notice?*

Biking vs. Driving Calculator



.....
Name

.....
Date

Distance to school

Distance travelled every day
(multiply by 2 if you stay at school for lunch or by 4 if you go home and come back at lunch time)

Distance travelled every year
(multiply by numbers of days in school year)

? Biking benefits

- How much fuel money could you save by biking to school? How much emissions?
- What other expenses would you be reducing besides fuel money?
- What other benefits would you get from biking to school?



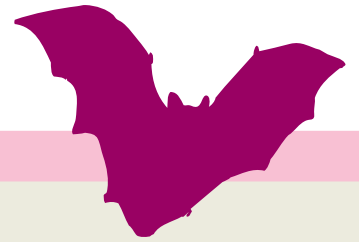
© Subway Academy II

Biking vs. Driving Calculator



	A	B	C	D
Type of Vehicle Fuel consumption CO2 emissions	Fuel per yr. in L X distance by fuel consumption	Price of gas Approx. \$1.70/L	Cost per yr. for gas A x B	Total CO2 emissions A x emissions rate
Diesel truck 12.6L/100km CO2: 2.6 kg/L		In your community Diesel costs \$/L		
Car 7.6L/100km CO2: 2.3 kg/L		Gas costs \$/L		
ATV 5.8 L/100km		Gas costs \$/L		
Snowmobile 8.0 L/100km		Gas costs \$/L		
Bike				

Lesson Plans



? Bike Mechanics

Have your students investigate the mechanics of a bike

- Label the parts of a bike
- Describe how energy is transferred
- Describe what can be done to make the bike work more efficiently

🌀 Get Biking!

- Plan an outdoor classroom or lunch trip that your class can bike to. Involve enough parents and volunteers so that there is a safe ratio of kids and adults. Make sure all the students own proper helmets or have access to them.

▶ Can Bike

Fun and educational videos on bike safety, including Bike Helmets 101.

▶ Tips for safe cycling in Yellowknife

Before you head out, go over safety tips for biking on roads and trails.

📖 Safe Routes

Organize bike relays and races in the school yard or parking lot.

Extension

One of the barriers for kids biking to school to reduce their energy consumption is that they may not have a bike, or their bike may be broken. Some schools have started a “Bike School” program where they can take donations or stolen/unclaimed bikes from the RCMP and learn how to fix them up so the school has a set of bikes!

▶ Bicycle Tutor

Bike maintenance tutorials

Barrie Central Collegiate

“I’m the Student Success teacher at Barrie Central Collegiate,” says Daryl O’Brien. “I work with students at risk of not succeeding at school. Firebird Community Cycle is one of our programs to keep students engaged.” Firebird Community Cycle is a student-run bike shop that operates out of what O’Brien calls a derelict small engines classroom. Working with scavenged tools and equipment during lunchtimes, the program has already managed to put dozens of disadvantaged students on the road. It’s also put students on the path to green living. “Firebird Community Cycle is a great vehicle to promote environmental awareness by teaching students unique ways of reducing their carbon footprint,” says O’Brien. “By working with donations of unwanted bikes from the community, we divert garbage from the landfill.” “While this program promotes recycling and emissions-free transportation,” says O’Brien, “it also provides students with the opportunity to develop the hard technical skills required to maintain bicycles that would otherwise end up in a landfill.”



© Barrie Central Collegiate

Lesson Plans



Lesson 4: Investigating Renewable Energy in the NWT

Renewable vs. Non-renewable

On the board, write the two types of energy sources: renewable and non-renewable. Visit the photo gallery [here](#) and project photos of renewable and non-renewable energy sources on the SMART Board or Proxima projector. Ask for volunteers to tell the rest of the class whether what's in the photo is renewable or non-renewable and why. Get students to help you create definitions of non-renewable and renewable energy sources:

Fossil fuels like coal, oil and gas are **non-renewable**. These took billions of years to form underground and there are two main problems with them: after we use them up they cannot be replaced, and they cause pollution that contributes to climate change.

Renewable energy sources are freely available and will last forever. They are also called “clean energy” or “green power” because they do not create the pollution that comes from burning fossil fuels. These energy sources include wind, solar, biomass, hydro-electricity and geothermal.

*Note: non-renewables are needed to create renewable energy technologies that can help us reduce greenhouse gas emissions. Switching to more focused energy efficient uses of our limited supply of fossil fuels can help us create longer lasting renewable energy technologies such as solar panels, wind turbines, concrete to make dams, etc.

Ask the class if anyone has heard of any renewable energy projects in the territory. Have some newspaper articles (see right-hand column) printed to reference or hand out. Have the students do a research assignment on a renewable energy project in the north and make a poster, oral or video presentation. *How does this renewable energy technology produce energy? Where is it being used? What are the benefits and what are the drawbacks?*

Some examples are

1. **Hydroelectric**

Most of the power generation for the Great Slave Lake communities come from the Snare/Bluefish Hydro Facility and the Taltson Hydro Facility. There was a small in-stream hydro-kinetic turbine that was being tested in the Mackenzie River near Fort Simpson.

[NWT seeks higher borrowing limit for 'legacy' hydro intertie](#)

2. **Solar**

Solar panels are being used in many communities! Lots of municipal buildings have solar panels and lots of families have them, too! There is a large solar project in Fort Simpson.

[Power Corp. expands Simpson solar project](#)

3. **Wind**

The hamlet of Tuktoyaktuk is planning for a 300 kW wind power project using regional hub-and-spoke model. Learn more below.

[Tuktoyaktuk to get 4 wind turbines by 2011](#)

[Tuktoyaktuk on front line of climate change](#)

4. **Biomass**

This is being used all over the NWT in homes, government buildings, schools and businesses! There are plans to increase this sector.

[Pellet plant gets green light from N.W.T. government](#)

5. **Geothermal**

There have not been any major geothermal projects, but much research has been done on the potential in Fort Liard.

[Ft. Liard Geothermal Energy Project](#)

WILD Ideas



WWF's Earth Hour toolkit

Have your classroom or school participate in this campaign! The toolkit contains activity ideas as well as some activity sheets.

YK2HR

Research the YK2HR (Yellowknife to Hay River) bike trip. Would you be interested in trying that type of long trip? What would you need to plan?

Bike/Walk Week

Plan a community-wide bike or walk to work week!

Winter biking

Winterize biking. *Do you know anyone who bikes in the winter? What would you need to do to make this work?* Warm hand protectors, spikes on the tires...

NTPC - Solar Generation at Fort Simpson

Track the Fort Simpson solar project. Every day, you can follow the solar energy production of the Fort Simpson project.

People of a Feather

Watch this film about the effects of Hydro-Quebec on Inuit culture and Arctic coast wildlife. Discuss the issues with the renewable energy source of hydro in mind.

Solar car sprints - Teaching About Climate Change

Try this activity from by Tim Grant and Gail Littlejohn (page 28).

Snap circuits green

Learn about energy sources and how environmentally friendly energy and electricity can work in your home (includes geothermal, hydrogen fuel cells, wind, solar, tidal and hydro).



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URLS



Some hyperlinks have been embedded throughout the **NWT Energy Pyramid** resource. If a link appears to be broken, try visiting the homepage or keying in the URL as it's written below.

Little Brown Myotis hibernation video

<http://www.arkive.org/little-brown-myotis/myotis-lucifugus/video-00.html>

Tips for safe cycling in Yellowknife

<http://www.cbc.ca/news/canada/north/tips-for-safe-cycling-in-yellowknife-1.1363872>

Can-Bike Bike Helmets 101

<http://canbikecanada.ca/videos/>

Bicycle Tutor for bike maintenance videos

<http://bicycletutor.com>

Safe Routes website

<http://www.saferoutespa.org/Resources/Final-Sixth-Grade-Lesson-Plans.pdf>

Contact Ecology North

<http://www.ecologynorth.ca/>

WWF's Earth Hour toolkit

<http://schools.wwf.ca/Lessons/Grade/6/140>

Fort Simpson in-stream hydro turbine

<http://norj.ca/2013/10/nwt-seeks-higher-borrowing-limit-for-legacy-hydro-intertie/>

Fort Simpson solar project

<http://norj.ca/2013/02/power-corp-expands-simpson-solar-project/>

Tuktoyaktuk wind power project

<http://www.cbc.ca/news/technology/tuktoyaktuk-on-front-line-of-climate-change-1.845397> and <http://www.cbc.ca/news/canada/north/tuktoyaktuk-to-get-4-wind-turbines-by-2011-1.807838>

Biomass plans

<http://www.cbc.ca/news/canada/north/pellet-plant-gets-green-light-from-n-w-t-government-1.1225742>

Geothermal research

http://www.borealisgeopower.com/uploads/Ft_Liard_Geothermal_Project_.pdf

People of a Feather film

<http://www.peopleofafeather.com/>

Teaching about Climate Change book

<http://greenteacher.com/books/climate-change/>

Snap Circuits Green

http://www.snapcircuits.net/products/product_details/snap_circuits_green_®=MzY0



ECOLOGY NORTH



WWF is Canada's largest international conservation organization, working to build a future where people live in harmony with nature. The Schools for a Living Planet program empowers educators and students of all ages with the tools they need to lead us into a sustainable future. Schools for a Living Planet is grounded in the principles that make WWF a global success - including strong science and a focus on solutions.

Ecology North is a charitable, non-profit organization that has engaged Northerners in hands-on learning opportunities in the Northwest Territories since 1971. Our mission is to bring people and knowledge together for a healthy Northern environment. Education, public engagement and youth involvement are integral to all of our program streams that include climate change adaptation, watershed protection planning, waste reduction, food sustainability and alternative energy promotion.

This project was made possible with the financial support of CIBC. For more information, visit www.cibc.com.

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