



Natural Resources
Canada

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Canada



ecoENERGY
an ecoACTION initiative

ENERGY and the ENVIRONMENT

2009-2010

Activity
Book **2**



Canada



Natural Resources Canada's Office of Energy Efficiency
Leading Canadians to Energy Efficiency at Home, at Work and on the Road

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Foreword

Hi! I'm NRCat – the Natural Resources Canada Cat – checking in to see if you'll join my clutter of energy-conscious cats again this year in this second edition of the *Energy and the Environment Activity Book*. It's pretty urgent. I'll tell you why.

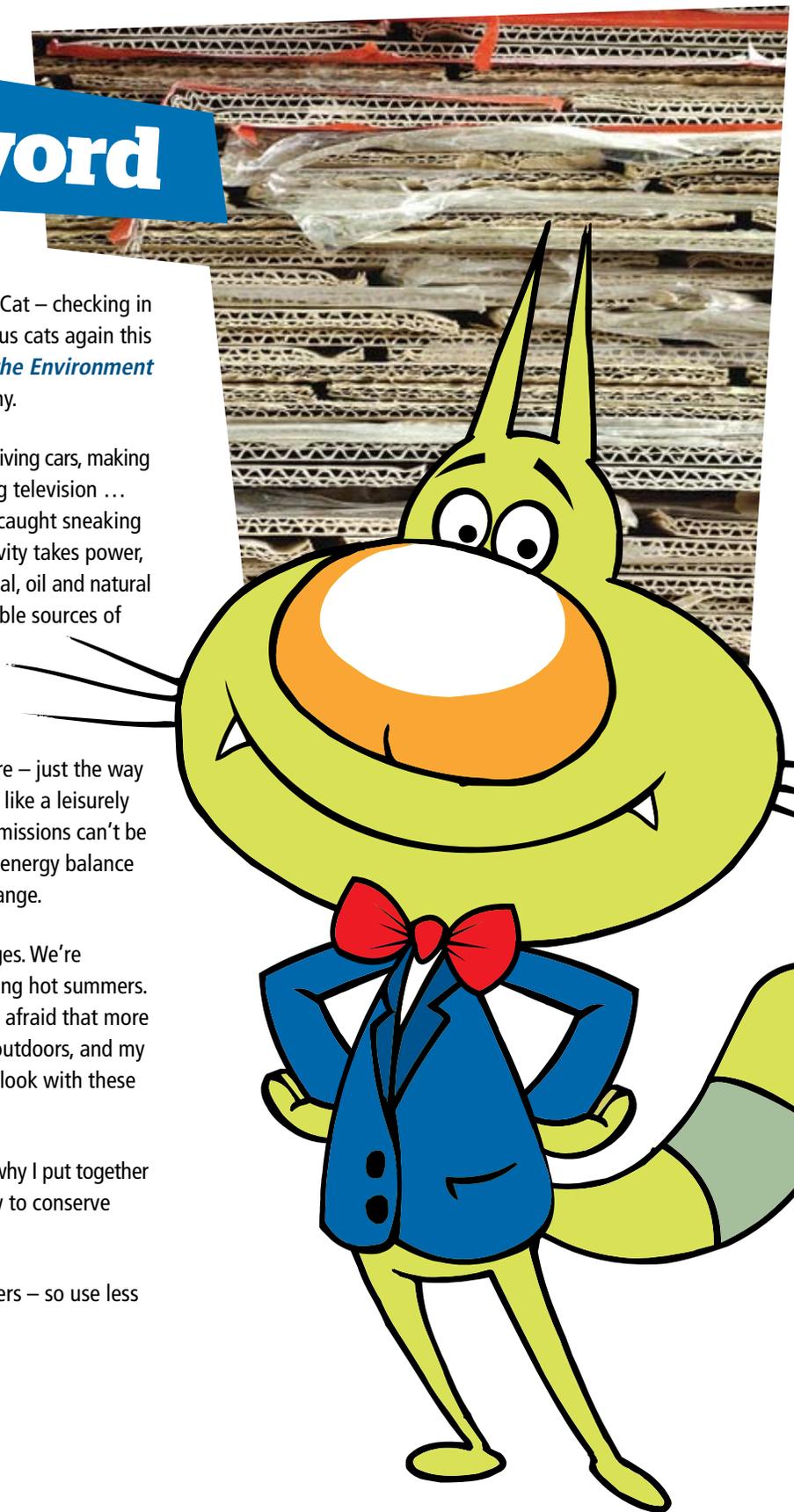
Humans are pretty busy creatures, flying planes driving cars, making computers and chocolate chip cookies, watching television ... and the list goes on! Even I, NRCat, have been caught sneaking a peek or two at the television! But all this activity takes power, and humans constantly rely on fossil fuels like coal, oil and natural gas to power everything. These are non-renewable sources of energy because one day they may run out.

We're learning that the burning of fossil fuels is releasing greenhouse gas emissions into the atmosphere, and they are moving about up there – just the way humans rush around down here! (Not like me, I like a leisurely pace!) The negative effects of greenhouse gas emissions can't be contained easily. They are changing the natural energy balance of our planet and are causing the climate to change.

All around the world, people are noticing changes. We're talking about ice storms, hurricanes and scorching hot summers. We're hearing about sea ice melting. And we're afraid that more wildlife will become extinct. I, for one, like the outdoors, and my nice fuzzy cat fur has been getting quite a new look with these constant strong winds.

What's a cat to do? Well, fortunately, lots. That's why I put together this activity book – to help you understand how to conserve energy and the environment.

Remember, every energy choice you make matters – so use less to live better!



Kids' Club RESOURCES

The Energy and the Environment Kids' Club offers teachers and students three linked tools for learning about energy conservation. Each tool engages students in different ways.

Energy and the Environment Activity Book

The practical hands-on workbook is designed for students aged 6 to 13. The content features energy conservation and energy efficiency as key paths to smarter energy choices.

- * There are 10 sets of Teaching Notes and Learning Activities in the book. Use, [photocopy](#) and adapt these exercises to meet your students' needs.
- * Look in the glossary for handy definitions and key concepts about energy conservation.
- * Help improve the book. Fill out the attached survey card or contact us through our Web site. Here's what readers said about the first edition of the book: "informative, fun and engaging," "easy to use" and "helpful for teachers." We have also made improvements based on your suggestions, such as "difficult to photocopy, use less saturated colours." Your comments can make this activity book even better, so it's important that we hear from you!

National art contest

Our annual national art contest brings out the beauty and the best of students. Their images and messages of energy conservation are inspiring. This year, winners from each participating province and territory are featured on a classroom poster. For details and the winning pictures, visit our Web site.

The Web site

Have fun learning with the special teaching assistants on our Web site. NRCat, Inspector Joules and Simon have great games, activities and cartoons goin' on. Explore the tree clubhouse, play detective on energy mysteries and click on some cool links.

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Acknowledgments

We extend our thanks to the following organizations for participating in the coordination and promotion of our art contest:

Alberta: Alberta Environment

British Columbia: Ministry of Energy, Mines and Petroleum Resources

Manitoba: Manitoba Hydro

New Brunswick: Enerplan Consultants

Newfoundland and Labrador: Lewisporte/Gander School Board

Northwest Territories: Arctic Energy Alliance

Nova Scotia: Conserve Nova Scotia

Nunavut: Department of Environment – Government of Nunavut

Ontario: Ontario Ministry of the Environment

Prince Edward Island: Environment, Energy and Forestry

Quebec: Agence de l'efficacité énergétique

Saskatchewan: Saskatchewan Energy and Resources

Yukon: Northern Climate Exchange

The greenhouse effect

TEXT AND COMPREHENSION QUESTIONS

Key points

The greenhouse effect: The greenhouse effect is a naturally occurring phenomenon. It describes the role the atmosphere plays in keeping the earth's surface at a livable temperature. Without the greenhouse effect, average annual global temperatures would be -18°C , rather than the present average of 15°C .

The atmosphere: The earth's temperature is regulated by the atmosphere, which contains **greenhouse gases (GHGs)**, such as carbon dioxide, water vapour and methane. These gases regulate the energy balance of our planet. While some of the sun's energy radiates back into space, the gases absorb just the right amount of heat to maintain our climate patterns. This balance between incoming and outgoing energy is crucial to life.

Human activity: All our activities – growing food, making things and getting around – have cranked up our energy use and put pressure on natural systems. For example, the burning of fossil fuels, such as gas, oil and coal, and the cutting down of trees (deforestation) increase the concentration of GHGs into the atmosphere. That's because burning fossil fuels produces GHGs, and trees help absorb them. This creates an "enhanced greenhouse effect" and results in **global warming**.

Instruction

Have students read the text and then answer the comprehension questions. Use this activity to initiate a class discussion on climate change.

ANSWER KEY

- 1 A greenhouse is warm because the glass allows the sun to shine in and keeps the heat in.
- 2 The earth is covered by the atmosphere, and like the glass of a greenhouse, the atmosphere absorbs enough heat from the sun to keep us comfortably warm.
- 3 Yes, it's natural because without the greenhouse effect, the earth would be freezing cold.
- 4 We and our activities are putting more greenhouse gases into the atmosphere, and more heat is being absorbed.
- 5 We can help produce less GHGs by
 - * turning off lights when leaving a room
 - * turning off computers and televisions and unplugging chargers when not in use
 - * saving water by taking quick showers
 - * dressing more warmly instead of turning up the thermostat
 - * walking or riding a bike instead of asking for a car ride
 - * closing the blinds and curtains on a warm day and opening them on a cold day to let the sun in

The greenhouse effect

Learning Activity **1**

Have you heard about how our world is getting warmer?

Read this explanation and see if you can answer the questions.

Greenhouse effect

Have you even been inside a greenhouse? It's very warm all year-round, even in winter! This is how plants grow so well inside it. But did someone crank up the heat in there? No! Greenhouses are made of glass, which allows the sun to shine in and keeps the heat in. The same thing happens with our planet, like it's inside a greenhouse. Earth is surrounded by the atmosphere, and like the glass of a greenhouse, the atmosphere absorbs enough heat from the sun to keep us comfortably warm. This is natural and a good thing too, because without it, we would be freezing!

Are we getting hot?

The atmosphere is made up of water drops and **greenhouse gases (GHGs)**, and these gases absorb the heat to keep us cozy. But we're busy creatures. We love to drive cars, fly planes and burn oil and coal to make electricity. Together this puts a lot more greenhouse gases into the atmosphere where they absorb a lot more heat from the sun. This creates an increased greenhouse effect, and the earth is becoming warmer than usual. This is known as **global warming**, and it can affect our lives.



Did you know?

With all our activities, like driving our cars and heating our homes, Canadians produce on average 5 tonnes of GHGs per year. Picture it: One tonne of GHGs would fill a two-storey, three-bedroom house!

1 Explain why a greenhouse is warm all year-round, even in winter.

2 Why is the earth compared to a greenhouse, or what keeps the earth warm enough so that there can be animal and plant life?

3 Is the "greenhouse effect" a natural thing? What would happen without it?

4 Why is the earth getting warmer? Explain what's happening.

5 Global warming is not a good thing for all living creatures on the earth. What can you do to help slow down global warming?

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Climate change

TEXT AND ERRORS

Key points

Climate change is the change in average weather over time and over a region. It includes changes in temperature, wind patterns and precipitation. The rate, magnitude and unpredictability of global climate change have scientists concerned.

Overall, the earth is warming more quickly than in the past, and some of the effects of this climate change we see happening now are Arctic sea ice and Polar ice caps melting, causing the sea level to rise. Some people may even have to move away from the coasts to other homes inland. If the warming gets worse, some animal and plant species won't be able to cope with new habitats and may become extinct.

Human activities – at home, at work or school and on the road – require constant energy, which we get from burning fossil fuels, such as oil, coal and natural gas. These contribute to global warming because they produce greenhouse gases, or GHGs.

Each of us has a responsibility to use energy more efficiently, so we help reduce the pace of climate change.



Instruction

Have students read the text, identify words containing spelling errors and write the corrections in the spaces provided.

ANSWER KEY

- 1 atmosphere
- 2 climate
- 3 depending
- 4 sea
- 5 travels
- 6 environment
- 7 conditioner
- 8 champions



SEE

Climate change

Understanding climate change is as easy as A-B-C!

Learning Activity

2

The earth is warming more quickly than in the past. This warming creates climate change, which is the change in weather over time and over a region. It includes changes in temperatures, wind patterns and precipitations.

Read the following sentences about climate change. Circle the word that is misspelled in each sentence and write it correctly in the space provided.

Did you know?

The Arctic ice at the North Pole has shrunk by about 10% in the past few decades, and the thickness of the ice above water has decreased by about 40%.



ERRROS

1 When we produce energy from fossil fuels, we release greenhouse gases (GHGs) into the atmsphere.

2 All over the world, GHGs are warming the planet and changing the climate: Rainfalls are heavier, hurricanes are stronger, and we experience more heat waves.

3 Canada is so big that climate changes are different dependng on where we live.

4 The northern see ice where polar bears live and hunt is shrinking because of climate change.

5 When stuff – food, clothes and toys – travels a long way to get to us, a lot of GHGs are created because of the fuel and emissions from transportation.

6 When we use our own energy – like riding our bikes to school – we help the enviroment.

7 We can use less energy in summer, too – for example, we can close the curtains instead of using the air condichener.

8 We can all be climate change champeons – by using only the energy we need.

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Energy conservation

**TRUE
OR
FALSE**

Instruction

Have students complete the true-false quiz. You can also use it as the basis of a class discussion on ways to conserve energy.

ANSWER KEY

- 1 True:** In areas where roads are regularly snow-covered, snow tires will improve traction, reduce tire slippage, improve safety and save fuel.
- 2 True:** Furnaces have to work extra hard at night because it's colder.
- 3 True:** Cold water doesn't have to be heated; heating takes a lot of energy.
- 4 False:** It will take the same amount of energy to run the dishwasher, regardless of how full it is.
- 5 True:** No fuel is needed to power your legs, except, perhaps, broccoli!
- 6 True:** Typically, the microwave will use only about 20% of the energy the conventional oven uses.
- 7 False:** Leaving the television on is a bigger energy use than switching it on and off. If no one is watching the television, go ahead and turn it off.



Key points

No matter our age, we use energy every day, in many ways. In recent years, with wider awareness of climate change, we are increasingly being asked to be part of the solution. Energy conservation is a way to do that.

Energy conservation can begin at any age. It's all about understanding that we have choices, and the choices we make have consequences. If we adopt behaviours that help conserve energy – taking the bus to school, turning off electronic devices when we're not using them – we produce fewer greenhouse gases and reduce our impact on the environment. For those who start young, energy conservation can last a lifetime.



Energy conservation

Test your energy conservation knowledge.

Learning
Activity

3

Did you know?

There are three ways to use less energy:

- * Conservation – such as turning off the air conditioner or riding a bike instead of taking the car
- * Energy-efficient technologies – such as hybrid cars and compact fluorescent light bulbs
- * Renewable and alternative fuels – such as solar and wind power

Energy doesn't go away. When we use energy – of any sort – we simply convert it from one form to another. Consider your favourite fruit – maybe a juicy peach. It draws energy from the sun to grow and ripen, and when you eat it, you get energy in the form of calories. This is good energy.

When we burn fossil fuels – oil and natural gas to heat our homes, gas in our cars, coal to create electricity – we get the energy we're after. But we also release carbon dioxide into the atmosphere, and this affects the climate in a bad way.

How do we avoid this? By using as little fossil fuels as possible. Taking steps to use less energy – at home, at school and on the road – is one way to do this and make a difference. And if we convince our families and friends to use less too, we'll make an even bigger difference!

True or false?

Test your energy conservation knowledge!
Circle the correct answer.

- | | |
|--|---------------|
| 1 Snow tires help save on gas when roads are snow-covered. | True or False |
| 2 In the winter, furnaces have to work extra hard at night. | True or False |
| 3 Running cold water instead of hot saves energy. | True or False |
| 4 The dishwasher uses less energy when it's only half full. | True or False |
| 5 Walking to school is good for the environment. | True or False |
| 6 The microwave uses less energy than the oven. | True or False |
| 7 The television uses more energy when you switch it on and off. | True or False |

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The power of “off”

Instruction

Ask students to evaluate electronic equipment in their homes – televisions, DVDs, game stations, computers, cell phones and audio systems. They can identify the number and type of devices. Is the device fully turned off (e.g. via a power bar) or just “napping” (i.e. using standby power)? Discuss.

Standby energy, or phantom load

Standby energy, sometimes referred to as “phantom load,” is the energy that a device draws while it’s waiting to be used. A device may appear to be turned off when, in fact, it’s on “standby” and still consuming power 24 hours a day, seven days a week (24/7). Consider the microwave oven. While you’re not using it, it’s still drawing power and keeping the clock on track.

A surprisingly large number of electrical products can’t be switched off completely without being unplugged. Typically, these devices don’t draw a lot of power. But because we have so many of the devices around the house, standby energy is a growing issue. In fact, in the average Canadian home, 5% to 10% of the electricity consumed is used to power appliances and home electronics on standby.

Power bar

The power bar – also called a power strip – allows us to plug in multiple devices. We can switch the power bar off to completely cut the supply of energy to the devices and eliminate standby energy. A good use for power bars is for home entertainment systems or the computer.

HOME AUDIT

Key points

We know about turning off lights for energy conservation. But what about other home equipment, like electronics, that not only uses operating energy but also consumes standby energy?

ANSWER KEY

Here are some basic steps to reducing standby electricity consumption:

- * Turn them all off!
 - * Turn off and unplug the television and, with it, the DVD player, cable connection, satellite box, game consoles and audio equipment.
 - * Turn off and unplug the computer and, with it, the monitor, printer and scanner.
- * How do you guarantee devices aren’t drawing power?
 - * Unplug them from the wall!
 - * Or plug related devices into a power bar and turn off the power bar.

The power of "off"

How scary is the phantom load at your house?

Learning Activity **4**

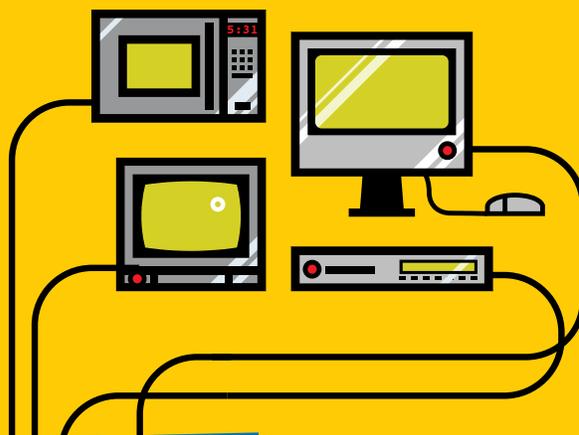
We use electricity every minute of the day in our homes.

Sometimes we need to keep appliances running all the time – like the refrigerator that keeps our food safe to eat and the alarm clock that wakes us up in time for school. Other energy-users that we can turn off with the flick of a switch: a light bulb, the dishwasher.

But electronic equipment – like televisions, computers and video games – is different. You may think you're turning off your electronic equipment but it's actually just "napping" – waiting to snap back into action. That's pretty convenient. But the equipment is still using energy called **standby energy**. To stop electronics from using energy, you need to either (1) unplug them or (2) plug them into a power bar that you can switch off. This can save up to 10% of the energy used in your entire home!

Did you know?

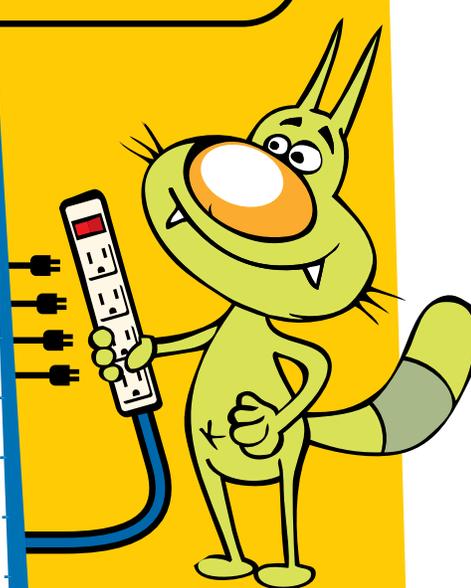
Electronic devices draw power even when you think they are "off." This standby energy is also called "phantom load" because it's invisible.



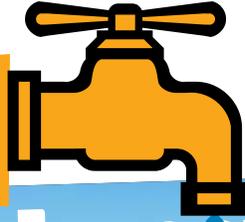
Be a ghost buster!

Take stock of all the equipment and appliances you have, and fill in the boxes below.

Equipment/ Appliance	How many are in your house?	How many are connected to a power bar? (with an off switch)
Microwave		
Toaster oven		
Television		
Audio system		
Cell phone charger		
Computer		
Others (please list):		



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Water and energy

MULTIPLE CHOICE

Instruction

Have students read each statement and choose the answer that they feel best completes it. They will gain a better understanding of our dependence on fresh water and why it's important to conserve it.



ANSWER KEY

- 1 d All choices will contribute to conserving water.
- 2 d Think of 10 milk cartons or 40 cups. That's a lot of wasted water.
- 3 d Water lawns and gardens only when necessary and in the morning when the sun is less hot.
- 4 d How about a quick shower next time?
- 5 a Is the lawn turning yellow? If so, it's because of a defence mechanism called "dormancy." The lawn will turn back to green when it receives enough water again.
- 6 c Use cold water whenever you can, e.g. for laundry and hand washing or taking a cool shower in summer.

Key points

About 70% of the earth is covered in water. Of this amount, 97.5% is saltwater and the remaining 2.5% is fresh water, like lakes and rivers. Brazil has the most fresh water; Canada is third, after Russia.

With a wealth of fresh water and a relatively small population, Canadians expect to have clean, safe water at the turn of a tap. While that's usually the case, climate change, pollution and environmental stress are making us more concerned about water conservation. We're beginning to realize that clean fresh water is a valuable natural resource.

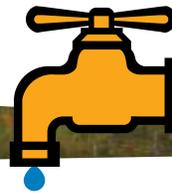
Saving water means saving energy. Water has to travel to us, and after we use it, water is treated and returned to its source – usually nearby lakes or rivers. All of this activity takes energy. The less water we use, the less energy is used to pump, treat, distribute and recover it.

a b c d

Water and energy

The less water we use,
the less energy we waste.

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Learning
Activity

5

Earth is sometimes called the “blue planet,” because from outer space, the oceans that cover most (70%) of our world appear blue. All this water is salt water, and while it may be good for some fish, that’s not so for us! We need fresh water, from lakes and rivers. But there isn’t a lot of that, so we need to conserve what we have. Also, saving water means saving energy. Water has to travel to us, and after we use it, it has to be treated and returned to its source. All of this activity takes energy, so the less water we use, the less energy we waste.

Did you know?

If all the earth’s water could be stored in a five-litre container, the proportion of that water good enough to drink would not even fill a teaspoon.



Read the text below and circle the answer that you think is best.

- Using less water in the kitchen is easy. A good way to save water is to
 - Fill the dishwasher before running it
 - Chill drinking water in the refrigerator
 - Wash vegetables in a bowl
 - Do all of the above
- If you leave the water running when you brush your teeth, how much water will you use?
 - 2 litres
 - 3 to 5 litres
 - 7 litres
 - 10 litres
- How much of the water that people use on their lawns and gardens is wasted because it evaporates or runs off?
 - Less than 10%
 - About 25%
 - Almost 30%
 - More than 50%
- How much of the water that we use at home every day is for baths and showers?
 - 10%
 - 15%
 - 25%
 - 35%
- How often should a lawn be watered in the summer?
 - Only when necessary
 - Three days per week
 - Four days per week
 - Every day
- It takes energy to heat water. How much of an average home’s energy bill is for heating water?
 - 3%
 - 5%
 - 10%
 - 15%



Reduce, reuse, recycle

MATCHING EXERCISE

Instruction

Introduce students to the three Rs concept: **Reduce, Reuse and Recycle**. Discuss the difference in the three actions. Then have them look at the list of actions and get them to match them with the proper R: reduce, reuse or recycle.

Reducing means less recycling

Students are conscious of their environment, and most are familiar with recycling, and that's a good thing. However, **recycling** is only part of the equation! Teaching them about choosing items containing less packaging – **reducing** – and then using a bottle and container that can be used over and over again – **reusing** – are important first steps for success. Now we can watch the pile of recycling shrinking away!

Key points

Mother Nature provides us with natural resources, such as land, water, plants, trees and minerals. We depend on these resources to survive – every day. Although our use of these resources is necessary, teaching students about making smart choices, rather than wasting, can go a long way in minimizing our impact on the environment. Fortunately, there are things we can do about it, starting with the 3Rs.

Reduce ... Only buy things you really need, and you'll create less waste.

Reuse ... Use things again and again. Can't find a use for something? Offer it to someone who can.

Recycle ... Take an item that's already been used and make a new use of it.

ANSWER KEY

Action	"R" concept
Use the microwave instead of the oven.	Reduce
Use a bottle that can be refilled again and again.	Reduce/Reuse
At home and at school, use different bins to discard paper, plastic and cans.	Recycle
Always walk, bike or take the bus to school.	Reduce
Choose toys that don't need batteries.	Reduce
When you grow out of your favourite clothes, give them to a charity.	Reuse
Your family saves food scraps and composts them in a bin.	Recycle
Decorate a glass jar for pens and other stuff as a birthday gift.	Reuse
Borrow a book from the library instead of buying one.	Reduce/Reuse



Reduce, reuse, recycle

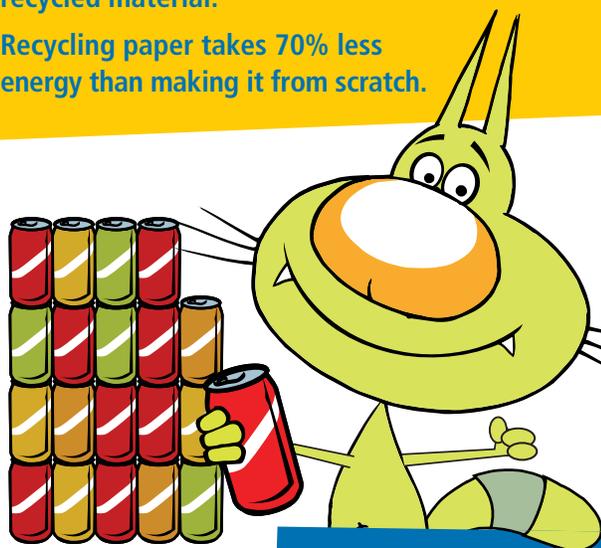
Learning
Activity

6

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Did you know?

- * It takes 17 trees to produce one tonne of paper.
- * With the same amount of energy it takes to produce only one new aluminum drink can, you can make as many as 20 cans from recycled material.
- * Recycling paper takes 70% less energy than making it from scratch.



Do you know the 3Rs? That's right! **Reduce, Reuse and Recycle**. These steps are some of the easiest things you can do for our environment, and you'll help save money, energy and our planet!

Reduce ...

Only buy things you really need and you'll create less waste.

Reuse ...

Use things again and again. Can't find a use for something? Offer it to someone who can.

Recycle ...

Take an item that's already been used and make a new use of it.

You're conscious of your environment, and chances are, you already recycle, and that's a good thing. But **recycling** all those individual wrappings from lunch is only part of the equation! Choosing to use items with less packaging – **reducing** – and then using a bottle and container that can be used over and over again – **reusing** – are important first steps for success. Now you can watch the pile of recycling shrinking away!

The 3Rs.

Draw a line to the correct "R" concept from the actions list. Some actions can link to more than one R!

Action

Use the microwave instead of the oven.

Use a bottle that can be refilled again and again.

At home and at school, use different bins to discard paper, plastic and cans.

Always walk, bike or take the bus to school.

Choose toys that don't need batteries.

When you grow out of your favourite clothes, give them to a charity.

Your family saves food scraps and composts them in a bin.

Decorate a glass jar for pens and other stuff as a birthday gift.

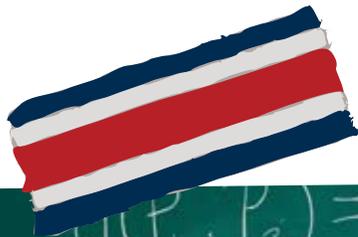
Borrow a book from the library instead of buying one.

"R" concept

Reduce

Reuse

Recycle



Greening your classroom

CLASSROOM AUDIT

Instruction

Adapt the steps below (“Where to begin”) to suit your classroom needs. Involve students as much as possible in coming up with ideas – if they own it, they’ll enjoy doing it!

Where to begin ... Just follow these steps:

- * **Class brainstorm** – Look around the classroom (or school) and talk about the ways energy, water and materials are used. Identify opportunities to reduce, reuse and recycle (e.g. use both sides of paper, turn off classroom lights on a sunny day, reduce litter from lunches).
- * **Choose green teams** – Divide the students into small teams and assign each team an area of responsibility (e.g. electricity, water, paper and other materials).
- * **Conduct an audit** – Try to determine how much water, energy and materials is used each week (or other period) or how often you do something green (e.g. we turn the lights off at the end of the school day).
- * **Set greener goals** – For example, turn the lights off at recess, as well as at the end of the day, use less paper, use all the space on the paper and use less packaging in lunches.
- * **Chart your progress** – Do a follow-up audit to see how much energy the class has saved.
- * **Celebrate!** – Enjoy your success and tell others about it. Hopefully, they will follow suit!

Key points

Making schools greener is an emerging trend across North America. It doesn’t have to be big-ticket items like building retrofits; there’s a lot of greening that can go on inside every classroom.

The **3Rs – reduce, reuse and recycle** – are probably the key to a greener classroom. Involve the class in finding ways to reduce energy use and the consumption of goods. It will teach students more than environmental stewardship – they’ll also learn about community involvement and the value of working together.

And who knows? Your students may become champions for bigger changes in your school, like the installation of programmable thermostats, more energy-efficient heating systems and windows, and newer lighting systems.



Greening your classroom

Let's play a game of "I spy!"

Look around your classroom and school. Can you spy some ways to save energy and protect the environment? For example

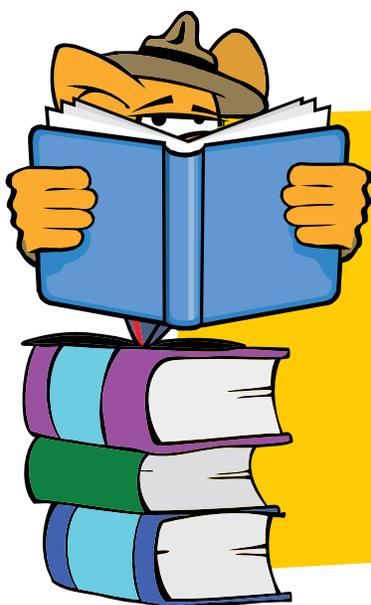
- * Do the lights need to be on right now?
- * Is there a lot of paper in the garbage?
- * How was your lunch wrapped today?

Before and after

Here's your mission: Do a green audit of your classroom. That means taking stock of the way you use energy, water and materials. Write down all the activities you do now. Give yourself one point in the "Before" column for each activity that you complete. Give yourself another point for each time you repeat an activity. Your class will then talk about ways to be greener. After you've added these ideas to your chart, you can do another audit in the "After" column. See how much greener you can be!

Here are some green ideas to get you going. You can fill in the blank lines with your own ideas.

Item or activity	Before	After
Use less electricity		
1. Turn off lights when it's sunny		
2. Turn computers off when they're not in use		
3.		
4.		
Use less paper		
1. Set up a paper recycling bin		
2. Make sure you use both sides of the paper		
3.		
4.		
Use less water		
1. Turn the water off while soaping your hands		
2. Report leaking faucets		
3.		
4.		
Green up your lunch		
1. Try for a litterless lunch – there's no paper or plastic to throw away		
2. Bring your drink in a re-usable container		
3.		
4.		
Total points		



Did you know?

There are about 11 000 elementary schools across Canada. And who knows how many classrooms? So greening up our classrooms can really add up!

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Renewable energy



CROSSWORD

Instruction

Discuss the following with your students to teach them about renewable energy sources. After the discussion, ask them to complete the crossword, which will test how much they understood about renewable energy terms.

Renewable energy sources are as follows:

- * **Biomass** – Biomass is any organic material made from trees, plants and animal waste. Examples of biomass fuels are wood, crops (like corn) and some garbage.
- * **Geothermal** – Geothermal energy comes straight from the earth. It means we take heat from the ground and use it to keep our homes, school and other buildings warm.
- * **Hydro-electricity** – Hydro means water-generated electricity. It accounts for more than 60% of the electricity used in Canada. And water is one of Canada’s plentiful natural resources.
- * **Solar** – There are two key forms. Passive solar energy is like opening curtains in winter so the sunshine helps heat the room. Active solar energy uses solar panels to create electricity.
- * **Wind** – Wind is energy on the move. It flows over the blades of a wind turbine, causing them to turn – they power a generator that produces electricity.

Key points

Some of the energy nature provides is renewable, meaning that it doesn’t deplete the earth’s limited resources. This makes these sources very important to energy conservation. They have an added benefit – unlike fossil fuels, many renewable energy sources release few or no greenhouse gases into the atmosphere.

ANSWER KEY

1 CORN
2 CO
3 WIND
4 SUNSHINE
5 Y
6 WATER
7 SOL
8 W
9 T
10 G
11 RENEWABLE
12 BIOMASS
13 RIVER
14 PASSIVE
15 DAM
16 ENERGY

Renewable energy

Use your energy to find the answers

Learning
Activity

8

Did you know?

Renewable energy is energy that doesn't run out and can renew itself:

- * Even though we use solar energy, the sun keeps shining and continues to produce solar energy.
- * Wind is air in motion, and as long as it's blowing, we can use it to produce other forms of energy.
- * We build a dam in a river to create hydro-electricity, and the water still flows.
- * We harvest crops for biomass energy, and we can plant more.
- * We draw heat from the earth to create geothermal energy, and more heat is made every day in the earth's core.

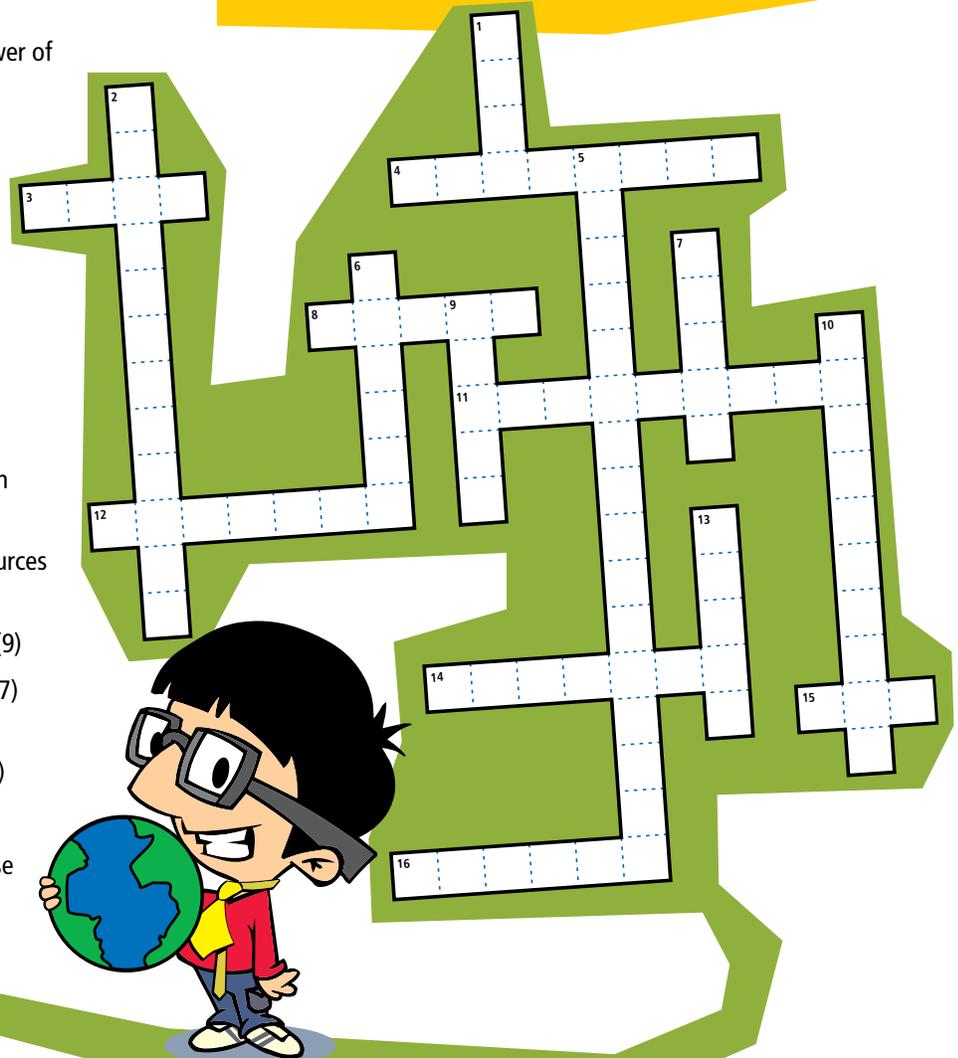
Find as many renewable energy words as you can in the puzzle below.

DOWN

- 1 So yummy with butter but can also be used to produce biomass (4)
- 2 Describes our effort to use less. Think opposite of waste (12)
- 5 Form of energy that uses water as its main source (2 words: 5 + 11)
- 6 We use them to make electricity from the sun. They can heat a pool! (6)
- 7 Type of energy created by using the power of the sun (5)
- 9 It's our own, we need to protect it! (5)
- 10 Type of energy that comes from the earth (10)
- 13 Natural water course that flows toward the ocean (5)

ACROSS

- 3 Type of energy that's on the move (4)
- 4 Natural source of heat and light that can warm your room in winter (8)
- 8 One of our most important natural resources in Canada. We can't live without it (5)
- 11 Type of energy that can be replenished (9)
- 12 Type of energy that comes from plants (7)
- 14 Form of solar energy that requires no equipment – just open your curtains! (7)
- 15 Barrier used to retain water (3)
- 16 It comes in many forms, but we often use too much of it (6)



New technologies



SCRAMBLED WORDS

Key points

Energy-efficient technologies – those that require less energy to perform the same function – help us slow down climate change. The opportunities for and applications of energy-efficient technologies are vast and varied – from entire condominium developments using advanced building materials and techniques to compact fluorescent lamps (CFLs), also known as compact fluorescent light bulbs, that use 75% less energy than regular incandescent bulbs.



Instruction

Explain to students that advancing technologies are key to energy efficiency. Just as improvements were made to technologies to make our lives easier, many of today's advances focus on using energy more efficiently. Have your students complete the sentences about the benefits of energy-efficient technologies.

ANSWER KEY

- 1** It will soon be possible to charge cars using electricity from **SOLAR ENERGY**.
- 2** Compact **FLUORESCENT** light bulbs (CFLs) are more efficient because they use 75% less energy.
- 3** **HYBRID** vehicles get their power not only from conventional gas but also from electricity, and that's good for the environment.
- 4** Newer, energy-efficient refrigerators use less than half the **ELECTRICITY** of models 10 years older.
- 5** Use the **SLEEP** mode on your computer to save energy.

No matter how small the **savings**, it all adds up. And that's good for our **health**, the **environment** and **our future**.



New Technologies

Learning
Activity

9

Test your energy efficiency knowledge to unscramble the words in the sentences below.

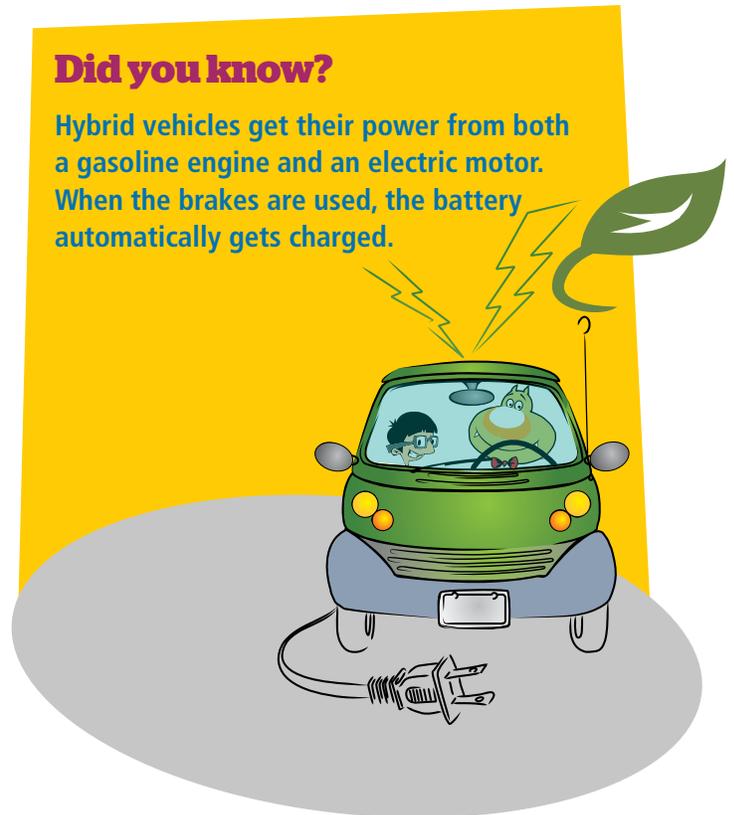
All around the world, people depend on energy drawn from the earth. Because there are so many of us using so much energy, the earth is under stress. It needs our help.

Energy-efficient technologies – like light bulbs and appliances that use less electricity and hybrid vehicles – are already helping today. They allow us to do things we need to do – make dinner, read at night and visit grandma – while using less energy.

- 1 It will soon be possible to charge cars using electricity from **RALSO NEYEGR**.
- 2 Compact **FORUETNSCEL** light bulbs (CFLs) are more efficient because they use 75% less energy.
- 3 **RDYHBI** vehicles get their power not only from conventional gas but also from electricity, and that's good for the environment.
- 4 Newer, energy-efficient refrigerators use less than half the **TYTELCEIRIC** of models 10 years older.
- 5 Use the **PLESE** mode on your computer to save energy.

Did you know?

Hybrid vehicles get their power from both a gasoline engine and an electric motor. When the brakes are used, the battery automatically gets charged.



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Energy-smart choices

WORD PUZZLE

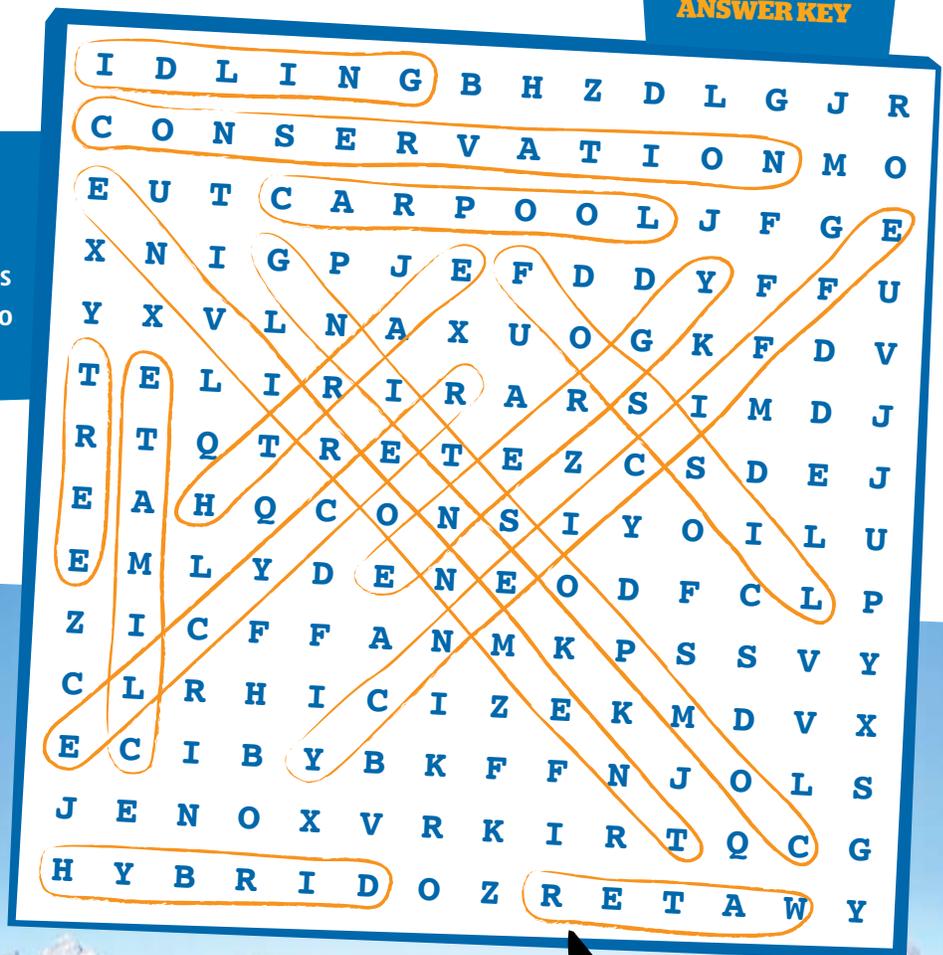
Instruction

Have the students test their search skills on this word-find puzzle while learning some interesting facts about energy-smart choices.

Key points

Like the word-find puzzle in this activity, we have to teach ourselves how to see clearly what we need to do to be energy smart.

ANSWER KEY



IDLING



Energy-smart choices

Test your search skills

Learning Activity

10

Word puzzle

All the circled words in these fun facts are hidden in the puzzle. Can you find them?

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

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Did you know?

Composting is a way to recycle, and it's good for planet Earth.

You can do something good for the environment and lessen the negative effects of climate change by planting a tree or conserving water.



Energy efficiency and cars:

- * Ask your parents if they carpool.
- * No idling please, it uses more fossil fuel.
- * Hybrid cars help with energy conservation.

Glossary of terms

Biomass energy (renewable energy)

Biomass energy is made from plant material and animal waste that are available on a renewable basis. They are burned to produce heat or are converted to fuel, like ethanol.

Climate change

Climate change is the long-term change in weather over a specific region. It includes changes in temperature, wind patterns and precipitations. It's occurring because of an increase in the earth's average temperature.

Deforestation

Deforestation is the removal of trees and the permanent destruction of forests and woodlands. Trees absorb carbon dioxide (CO₂). The increase of CO₂ into the atmosphere is one of the key causes of the increase in the greenhouse effect and global warming.

Energy conservation

Energy conservation is about adopting new behaviours that result in the use of less energy. Turning the lights off when you leave a room and recycling are ways of conserving energy.

Fossil fuels

Fossil fuels are made of decomposed plants and animals that lived millions of years ago, even before the dinosaurs! Their bodies were buried in layers of the earth and over a long, long period became coal, natural gas and oil.

Geothermal energy (renewable energy)

Geo means "from the earth" and thermal means "heat," so geothermal energy uses heat from the earth. Even when the surface of the earth warms up in summer and freezes in winter, the ground below the frost line maintains the same temperature. So during winter, water pipes underground absorb the heat from below, and then heat pumps transfer it to a building above. The reverse happens in summer. The water pipes absorb the coolness from the ground, and the pumps then transfer it to the building.

Global warming

Global warming means that the average temperature on the earth is getting significantly warmer. An increase in greenhouse gases in the atmosphere is causing more heat to be trapped, which makes the earth warmer. This warming has serious impacts, such as melting polar ice, rising sea levels and increases in severe weather.

Greenhouse effect

Greenhouses are designed to capture and concentrate the sun's heat to grow plants that would not survive outside. Similarly, the earth's atmosphere acts like the glass of a greenhouse and keeps just the right amount of the sun's heat in to support life on our planet. This is called the greenhouse effect.

Greenhouse gases (GHGs)

Greenhouse gases – such as water vapour, methane, ozone, nitrous oxide and, especially, carbon dioxide – are part of the atmosphere. They are responsible for trapping the heat and making sure that the earth's temperature remains constant. Human activity, like burning fossil fuels, produces too many GHGs, upsetting the natural balance and retaining too much heat.

Glossary of terms

Hybrid vehicle

Hybrid vehicles are a new technology that can help reduce the production of greenhouse gases. Hybrid means that the vehicle “combines two sources of power.” Most hybrid cars on the road today are powered by gasoline and electricity – they use gasoline and a battery. By switching between the two sources, the hybrid uses less gas, reduces emissions and increases efficiency.

Hydro-electricity (renewable energy)

Moving water is moving energy. It’s very powerful and can drive a turbine to generate electricity. (Think Niagara Falls!) Have you experienced the energy of moving water in a waterfall, a river or the ocean? Hydro-electricity means “water-generated electricity.” It accounts for more than 60% of the electricity used in Canada.

Power bar

The power bar, or power strip, allows us to plug in multiple devices. We can switch the power bar off to completely cut the supply of energy to the devices and turn off everything. This eliminates standby energy.

Renewable energy

Renewable energy comes from sources that are freely available (such as sunshine), are replenished naturally (like rivers) or can be replenished (like biomass crops) about as fast as we use them. The main types of renewable energy are biomass, geothermal, hydro-electricity, solar and wind.

Solar energy (renewable energy)

The sun is our ultimate source of energy. It continuously radiates the light that supports life on the earth. We can take advantage of solar energy in two main ways. Passive solar energy means doing something as simple as opening the curtains in your bedroom in winter to heat the room. Active solar energy typically means using solar panels to make electricity. Solar panels have photovoltaic cells – a fancy word that means using light (photo) to create power (volts). A solar-powered calculator is a common example of photovoltaic cells.

Standby energy

Standby energy, sometimes referred to as “phantom load,” is the energy that a device draws while it’s waiting to be used. A device may appear to be turned off when, in fact, it is “standing by” and still consuming power.

Wind energy (renewable energy)

Wind is energy on the move. We have used windmills – towers with propellers, blades or sails – for almost 2000 years to capture this free, clean, renewable energy. A turbine is the machine that turns the wind (flowing air) into electricity. Today windmills are often grouped together on wind farms.

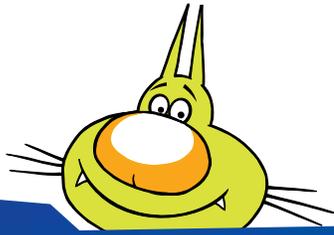


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Survey

This is the 2009/10 edition of the *Energy and the Environment Activity Book*. We'd like to hear your comments.

Please grade us on the following:

A B C D

Comments (especially if we get a C or D)

Overall book

Teaching notes

Learning activities ... In particular, are they

* easy for students to understand?

* interesting for students?

* useful in delivering the lesson?

Classroom poster

Fold here

How many of the 10 activities did you use?

1-3 4-7 8-10

What are the book's best features?

What would you change?

The activities are appropriate for grades:

1-3 4-6 7-8

About you

Name

Which grade(s) do you teach?

Municipality

Province/Territory

E-mail (optional)

Thank you for your participation! Just drop your response in the mailbox!

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