



EarthCircles

Climate Change





EarthCircles

Climate Change

TABLE OF CONTENTS

INTRODUCTION	3
LESSON 1: What Makes Weather and Climate?	10
LESSON 2: The Heat Is On!	16
LESSON 3: Megalopolis	21
LESSON 4: Guarding the Green.....	31
LESSON 5: Climate Challenges.....	37
LESSON 6: What Can We Do?	46



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Climate Change

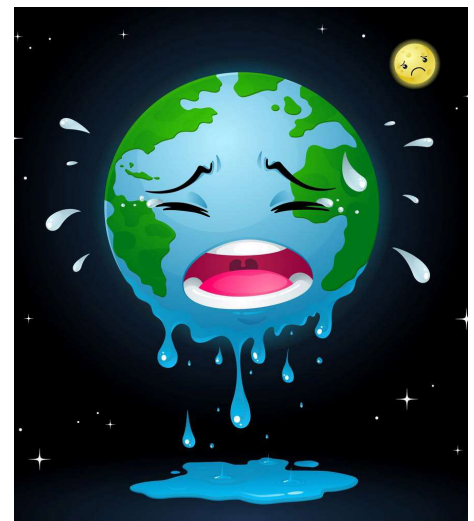
INTRODUCTION

Climate change is a major concern in today's world. Scientists around the world agree that climate change is under way and more or less inevitable. Some people deny that it is happening at all beyond usual variations in the weather. Other people maintain that changes already underway are affecting life as we know it on planet Earth, in some regions more than others. The rest of us wonder what we can do about it. How much do we need to worry?

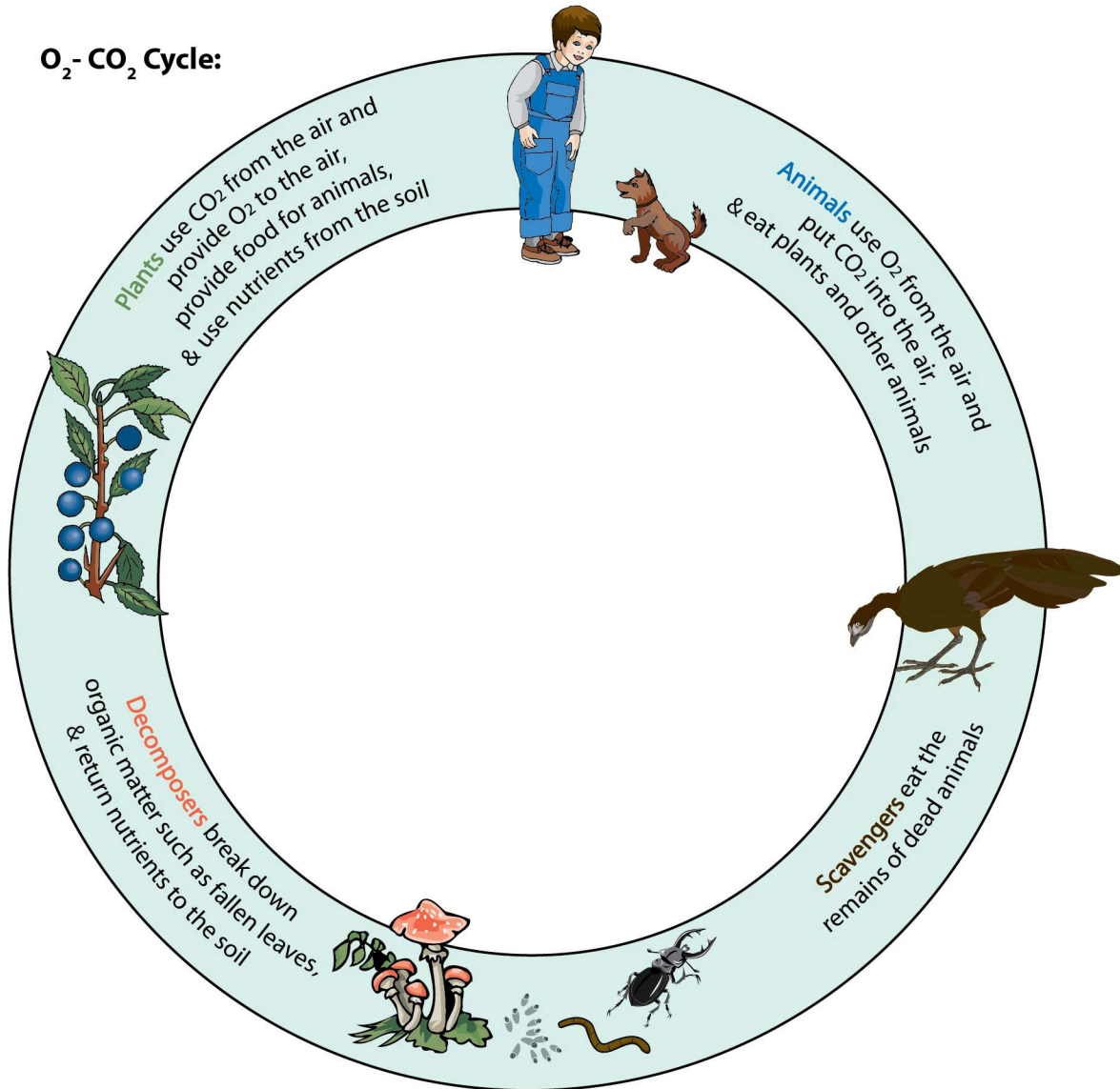
Many people point the finger of blame at the fossil fuel industries such as "big oil" that power our lives. But we are the users of that power. We depend on it for every aspect of life in our homes, our cars, our places of work; worldwide businesses that supply our needs, transportation systems that cover the planet. Do we need to modify our lifestyles to be less energy dependent? Can we put more effort into developing Earth-friendly sources of power?

Current concerns about global warming and climate change stem from an over-dependence on fossil fuels for our energy needs. Burning these fuels releases carbon dioxide and other greenhouse gases into the atmosphere in unsafe amounts. This process also pollutes the air we breathe, aggravating such problems as asthma and chronic bronchitis.

At the same time the planet's forests are being cut down and grasslands have been plowed under. Making way for agriculture to feed the world's growing population and for housing and other development takes precedence. Along with all green plants, grasslands and forests are important for human survival because they absorb carbon dioxide and release oxygen into the air we breathe. Maintaining balance in this transfer of gases is essential for the survival of life in general, not just humanity.



O₂ - CO₂ Cycle:



As global warming progresses, we already see dire effects around the world. The air quality in major cities is deteriorating. The rise of sea levels threatens island nations in the Pacific. Disappearing ice threatens the Inuit way of life in Alaska and survival in Greenland. Earthquakes, tornadoes, droughts are more severe and more numerous here in the United States and across the planet. The litany of problems grows.

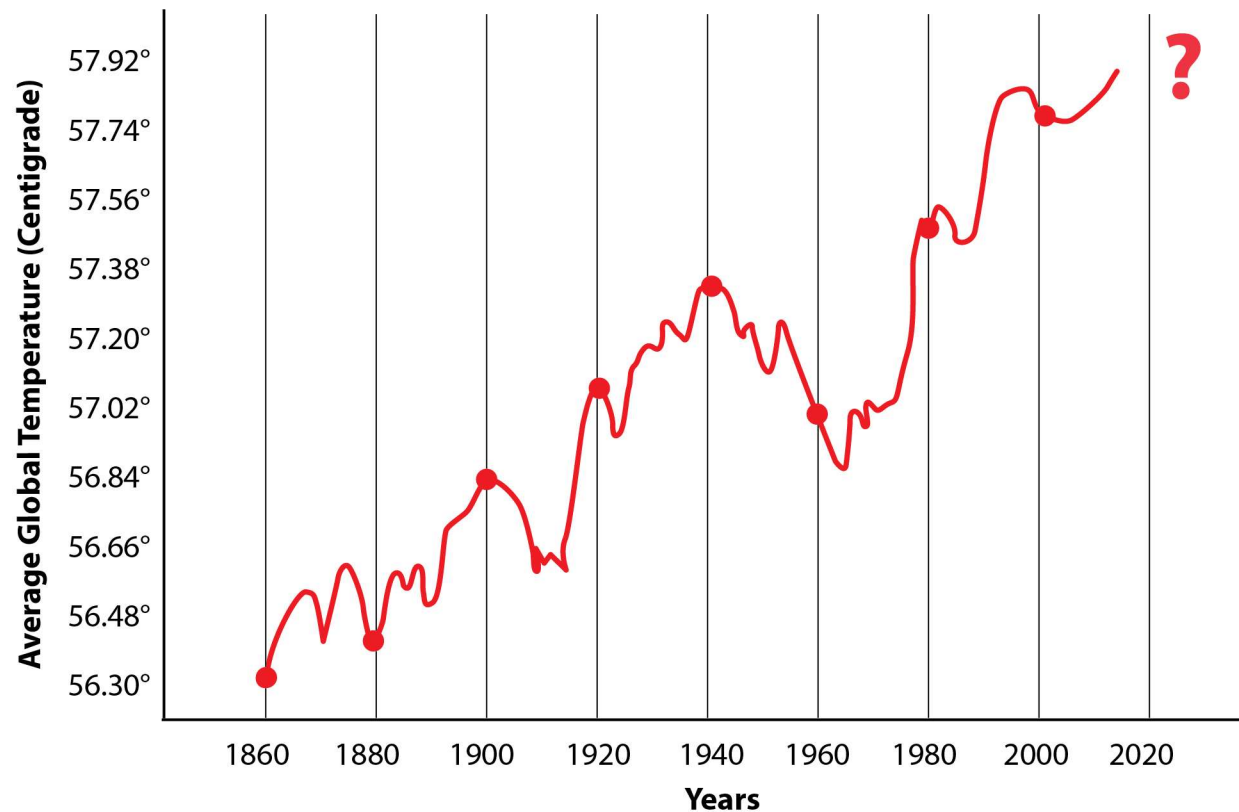
Kids may have questions about these issues:

- What causes global warming? Is it for real?
- Where does all the heat come from?
- How does burning fossil fuels affect our weather and climate?
- What about alternative energy sources?
- What do people in less developed countries do for energy?
- How does climate change affect people in less developed countries?
- Does climate change involve issues of social justice?

We do not want to overwhelm Kids with worries about Earth and the future of their home planet. But we do believe that people are better problem solvers when they understand the causes of difficulties, and that Kids can be confident and capable problem solvers as they grow into adulthood. These lessons are intended to give Kids a foundation of understanding, social awareness, and confidence in their own abilities to deal with problems.

Early in the last century, H.G. Wells observed that human history is more and more a race between education and catastrophe. Every bit of education helps!!

Global Warming Graph:



LESSON PLANS

Lesson 1: What Makes Weather and Climate?

Concept: Hot air rises and cold air sinks, creating winds that cause weather. Climate is the usual weather pattern in a given region.

Action: Kids set up an investigation of the greenhouse effect and observe temperature rising in an enclosed space. They compare climates in different regions of Earth.

Lesson 2: The Heat Is On!

Concept: We all contribute to rising heat in Earth's atmosphere in our daily lives. Even small changes in the atmosphere can have widespread effects on climate and plant life.

Action: Kids observe burning candles producing light, heat, and air pollution. Then they investigate how heat affects the movement of air.

Lesson 3: Megalopolis

Concept: The use of energy resources by crowded populations results in a concentration of heat and greenhouse gases going into the atmosphere and contributing to global warming. Rural populations also contribute to the problems.

Action: Kids play a Megalopolis game and discuss the benefits and problems of city living.



Lesson 4: Guarding The Green

Concept: Forests, grasslands and green plants in general are essential resources for maintaining critical balances in Earth's atmosphere.

Action: Kids roleplay a local dispute about the future of an adjacent woodland and discuss the value of forests worldwide.

Lesson 5: Climate Challenges

Concept: Forests, grasslands and green plants in general are essential resources for maintaining critical balances in Earth's atmosphere.

Action: Kids in small groups read brief stories about lifestyles in different countries and the natives' worries about global warming. Each group informs the class about its country.

Lesson 6: What On Earth Can We Do?

Concept: Many small actions add up to large results. Each of us can do some things to help our Earth.

Action: Kids plan and carry out an action project to address climate change problems.



Resources:

For Kids:

Branley, Franklyn M., *Hurricane Watch*, HarperCollins Children's Books, N.Y. 1985

This simple text for younger children explains how and why hurricanes develop, why they can be dangerous, and how to protect yourself when one is coming.

Cole, Joanna, and Degen, Bruce, *The Magic School Bus and the Climate Challenge*, Scholastic, Inc., New York, 2010

This amusing tale introduces Kids to the elements of climate change with a flying trip in the magic bus. Informative notes and diagrams enrich every page.

Maloof, Torrey, *People and the Planet*, Teacher Created Materials, Inc., Huntington Beach, CA, 2015

Written for younger Kids, this book provides clear explanations of our planet's problems and suggests little things we all can do to help.

Sper, Emily, *What On Earth Can We Do?* Jump Press, Newtonville, MA, 2016

Another book for younger Kids, it offers suggestions for how we all can help to protect Earth and a brief, clear explanation of the source of problems.

Suzuki, David, *You Are The Earth*, Greystone Books, Vancouver, British Columbia, 1999

This important book for Kids explains how everything on Earth is connected and how different cultures honor our connections to nature with myth and song.

Taylor, Barbara, *Weather and Climate*, Kingfisher Books, New York, 1993

A lively approach to weather patterns, seasons and climate, it is enriched with directions for many simple activities that clarify concepts.

For Teachers Who Want to Know More:

Cool It: The Climate Issue, National Geographic, November 2015

The issue begins with a statement, “Climate change is here” and asks “How can we power the planet without making things worse?”

Brown, Lester R., *Plan B 2.0*, W. W. Norton & Company, New York, 2006

The author, president of the Earth Policy Institute offers a plan for restoring Earth, feeding seven billion people well, and stabilizing the climate.

Hawker, Paul, *Draw Down: The Most Comprehensive Plan Ever Proposed to Reverse Global Warming*, Penguin Books, New York, NY, 2017

Klein, Naomi, *This Changes Everything*, Simon & Schuster, New York, 2014

The subtitle of this book, Capitalism vs. The Climate, clearly expresses its theme, the way our economic model is waging war against life on Earth.

Pipher, Mary, *The Green Boat*, Riverhead Books, NY, NY, 2013

This passionate book is a wake-up call about Earth’s greatest problems, our need to face our fears and learn what actions we can take to address them.

Solnit, Rebecca, *Hope in the Dark*, 3rd edition, Haymarket Books, Chicago, IL, 2015

This book celebrates the power of thoughtful dissent by individuals in protests all over the world, with hope as the spark that ignites action for the future.

Wilson, Edward O., *Half-Earth: Our Planet’s Fight For Life*, W. W. Norton & Company, New York, 2016

Winner of the Pulitzer Prize, this book by a renowned biologist presents a plan for saving our biosphere: devote half the surface of Earth to nature.

On the Web:

Wake Up, Freak Out – Then Get A Grip, A short animated film about climate change.

<http://wakeupfreakout.org>

David Suzuki Foundation looks for ways for society to live in balance with nature using science and education to promote solutions that help conserve our planet.

<http://www.davidsuzuki.org>

UNESCO (United Nations Education, Scientific, and Cultural Organization) believes that education, social and natural science, culture, and communication are the means to promote peace.

<http://www.unesco.org>

Finding Your Legislators on the Web:

<https://www.usa.gov>

This site gets you to government agencies and elected officials. You can click on state-by-state lists of senators and representatives by local districts for complete contact information. State, local and tribal governments also are listed.

Massachusetts Federal Legislators:

Senator Elizabeth Warren
317 Hart Senate Office Building

202-224-4543
<http://www.warren.senate.gov>

Senator Edward Markey
255 Dirksen Senate Office Building

202-224-2742
<http://www.markey.senate.gov/contact>



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Climate Change

LESSON 1: What Makes Weather and Climate?

OVERVIEW:

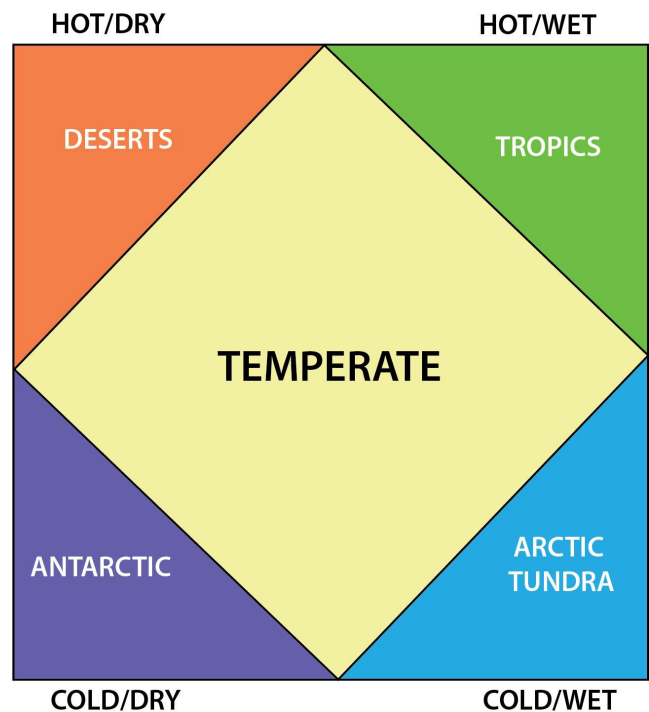
Concept: Hot air rises and cold air sinks, creating winds that cause weather. *Climate* is the usual weather in a given region, affecting how people in the region live.

Background:

Actually, the sun creates the weather. The sun heats the land and the waters. The air absorbs heat from these surfaces. We know that the sun shines more directly at the equator than at the poles, causing differences in the surface temperatures. *Wind* is moving air molecules. Water molecules form gas and rise in the air as the sun heats the water. In the air the water molecules form droplets as they get cool. Enough water droplets in cold air form rain, ice and snow.

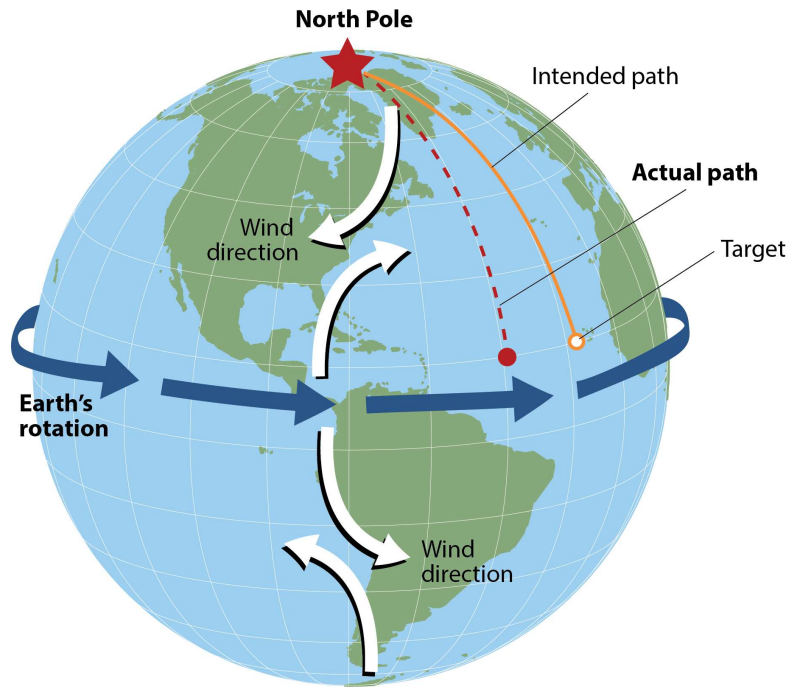
Excess heat from the sun bounces back up through the atmosphere and normally escapes into space. Gases such as carbon dioxide and methane in the atmosphere block heat, normally retaining the right amount of heat for life to flourish on Earth. Too much of these gases in the air hinder the escape of excess heat from our atmosphere. This is called the *greenhouse effect*, which contributes to global warming and climate change. Burning fossil fuels is a major source of carbon dioxide and excess heat.

Changes in air pressure also cause changes in the weather. *Air pressure* is a measure of the weight of air molecules pressing down on planet Earth. Air pressure changes when air warms up or cools down, and it changes with height. Air is thinner the higher up we go.



Two important things about wind are its speed and which way it is blowing. Hot air moves faster than cold air. When a hot air mass and a cold air mass collide, the result is thunder and lightning, usually with heavy rain. Strong winds cause powerful storms such as cyclones, tornadoes, hurricanes, and blizzards. The spinning of Earth on its axis determines the overall direction of wind masses.

Coreolis Effect:



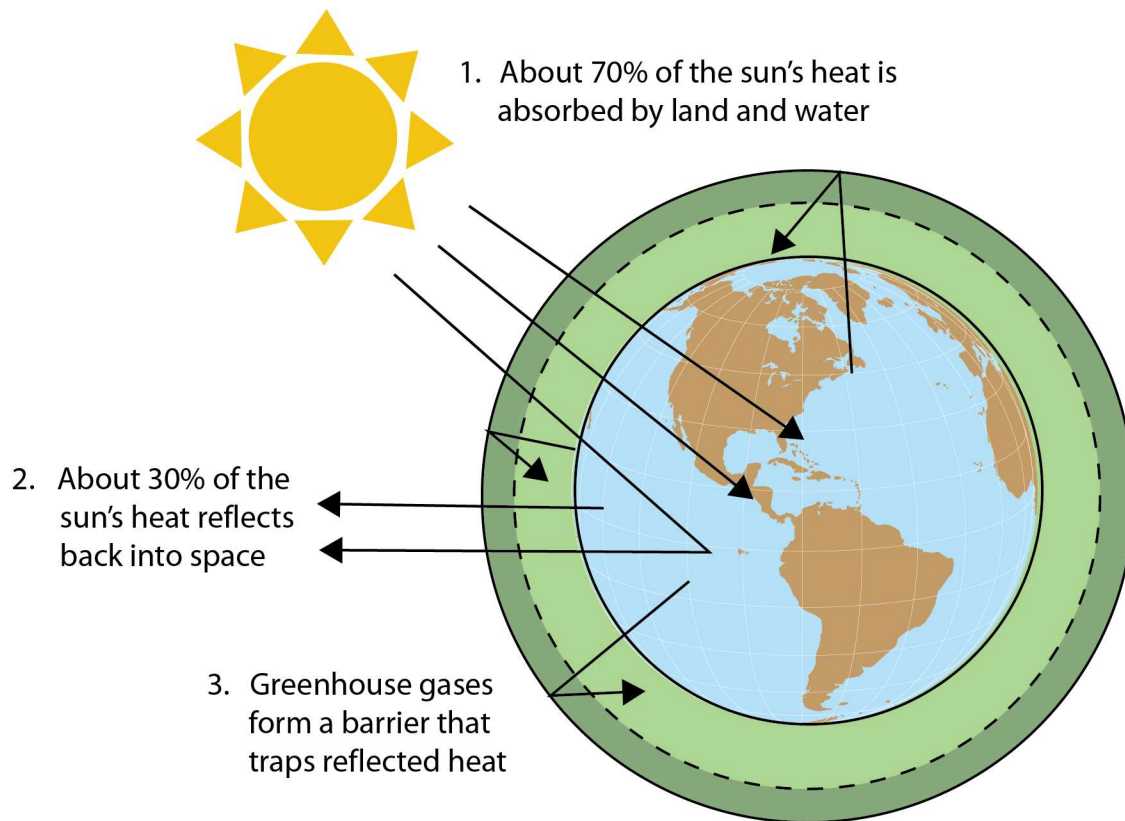
The *climate* of a region is its usual weather pattern. Earth has a variety of climates in different regions, various combinations of hot and dry, cold and dry, hot and wet, or cold and wet. The climate in a given region depends on how close it is to the equator or the poles, its altitude, and how close it is to an ocean. Climate affects how people live.

For example, the Inuit people of northern Alaska have a high protein diet of fish, whale, and seal meat. They hunt polar bears both for meat and for fur to make warm clothing. Their social life is limited by ice conditions. It is easier to get around by dog sled or snowmobile when the ice packs hard. The Pacific Islands people whose homes are near the equator have very different lives. They grow fruits and vegetables for themselves. Fish is their source of protein. Communities are ocean oriented, with frequent feasts on the beaches and regular outdoor recreation. Their homes may be on stilts to raise them above high tides. Then there are people of the desert, nomads whose homes are tents wherever they go. Generally, all of these people lead contented lives. But they are concerned about what is happening to their lands.



These days global warming and climate change are major concerns worldwide. Climate change does happen naturally and slowly over eons of time. Current change is occurring much more rapidly. The temperature of our atmosphere and oceans is rising much faster than is normal. Air pollutants such as carbon dioxide and other noxious gases are produced when we burn fossil fuel. The Industrial Revolution of the past two hundred years is a primary contributor to these changes. These pollutants trap heat in the atmosphere, causing what is called the *Greenhouse Effect*.

Green plants function to control levels of greenhouse gases in the atmosphere, especially carbon dioxide. Plants absorb carbon dioxide from the air and use it to make the sugars and starches that ultimately give us our food. In turn plants put oxygen, which we breathe, back into the air when the carbon dioxide breaks down. In addition, the action of soil bacteria breaks down carbon dioxide and increases carbon in the soil, making it available to plant roots. Thus, when we raze forests and plow grasslands under, then cover the wild land with farms and cities, we contribute to greenhouse gases and global warming.



In this lesson Kids observe how the sun heats enclosed air. They discuss how weather affects living conditions and compare their own lifestyles with that of Kids in other places; what greenhouse gases are and what they do to Earth's atmosphere and climates.

LESSON:

Action:

Kids set up an investigation of the Greenhouse Effect and observe temperature rising in an enclosed space. They compare climates in different regions of planet Earth.

Materials:

For option 1:

- Access to several parked cars
- Notebooks and pencils
- Thermometers
- Sunny day

For option 2, for each team of 2 students:

- 2 thermometers
- Notebooks and pencils
- Glass jar pint sized with lid (1 per 2-4 Kids)
- Sunny day

Book: *The Magic School Bus and the Climate Challenge*, by Joanna Cole and Bruce Degen

Preparation:

Read through the lesson and decide which option to use.

- Option 1 needs a sunny day. Recruit 4-5 cars to be available at the church on the Sunday of the lesson. It takes 5-10 minutes for Kids to set up at the start of the lesson, and 10-15 minutes at the end of the lesson for Kids to read thermometers and have a discussion. Cars should have the windows open for a few minutes before setting up the thermometers and be parked in a sunny spot close to where the class meets.
- Option 2 also works best on a sunny day. Check outdoors for a suitable area to set up thermometers. A variety of spaces is good; shady, direct sun, grass, cement, etc.
- Option 2 also can be used indoors, setting up thermometers in a sunny window and in shadow in the classroom.
- Simple small thermometers are available in school or science supply stores, some toy stores and supermarkets.
- Reserve the book at the library for when you need it.
- You may want to recruit some volunteers to assist Kids with setup.

LESSON PLAN:

Opening Circle:

Greet the Kids as they arrive and note who is present. If there are volunteers present, introduce them.

Discussion:

Begin with a question: “Who can describe the greenhouse effect?”

If some Kids have answers, commend them and comment, using background information to augment discussion. Tell the group that today we are going to investigate some greenhouse setups and consider what happens with Earth’s atmosphere when too much heat is trapped.

Activity:

Explain the activity to the Kids (option chosen). Note that we need to put the greenhouse setups in place quickly to maximize time in the sun.

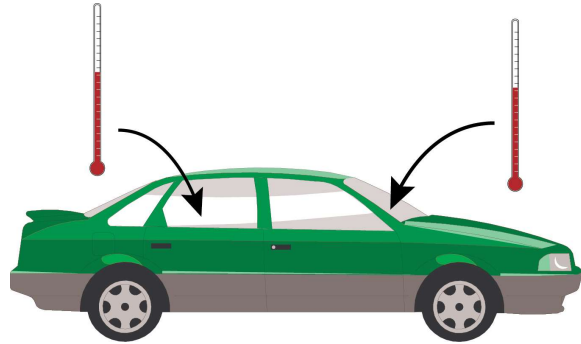
Option 1: Parked Cars

Each team of 2-4 Kids uses a thermometer and notebook to record the temperature inside a parked car with all windows open to start.

Each team decides how far to close the windows on its car or to completely close all the windows on at least one car. Encourage variety here. What do Kids think will happen?

Kids will need to record temperatures and how far the windows are open in each car at the start and finish of the activity.

- Option: Place two thermometers in a car, one near the front window and one in the back seat. Are the temperature changes the same? If not, how do Kids explain the difference?



Option 2: Outdoors

Each team of 2 Kids needs 2 thermometers, a pint-sized jar with lid, a notebook and pencil. Each team selects a spot outdoors in the sun for their setup and records where it is in their notebook.

Teams place their 2 thermometers side by side on their chosen spot. They record the temperature of each thermometer in their notebook.

The glass jar is carefully placed over one thermometer, enclosing it completely and sealing it from the air. Leave this setup in the sun.

The second thermometer is moved to a place out of the sun and left open to the air.



Indoor Option:

Setups could be placed one in a sunny window and another on a shelf in shadow.

Discussion:

What do Kids expect will happen?

Use background information to introduce the concept of different climates in different regions of Earth, relative to the heat from the sun and rainfall in a given area.

- Point out that some gases such as carbon dioxide and methane form layers in the atmosphere that trap warm air and contribute to global warming. How might Kids' observations in this activity relate to the large-scale greenhouse effect in our atmosphere?

Story: Read aloud from the book while the sun shines on the setups. Allow setups to remain in place for 10-15 minutes. Be sure to reserve time for Kids to check their setups. If the book is too long for time available, tell Kids we will read more of it next class.

Book: *The Magic School Bus and the Climate Challenge*, Joanna Cole and Bruce Degen, Scholastic, Inc., New York, NY 2010.

The information in this overview of global warming and its effect on our planet is full and factual. Told in a comic book style, the soaring bus gives Kids a bird's eye view of the effects of global warming.

As you read, encourage Kids to ask questions they may have about global warming and what they might be able to do to help counteract its effects. Briefly discuss their questions and suggestions, allowing time for follow up with their setups.

Activity Follow-up:

Kids return to their setups and record temperatures again, carefully noting differences between setups with more or less exposure to trapped air in the sun. Do they notice any other differences?

What do their notes tell them about global warming?

- What else do they want/need to know?

Principles in Practice:

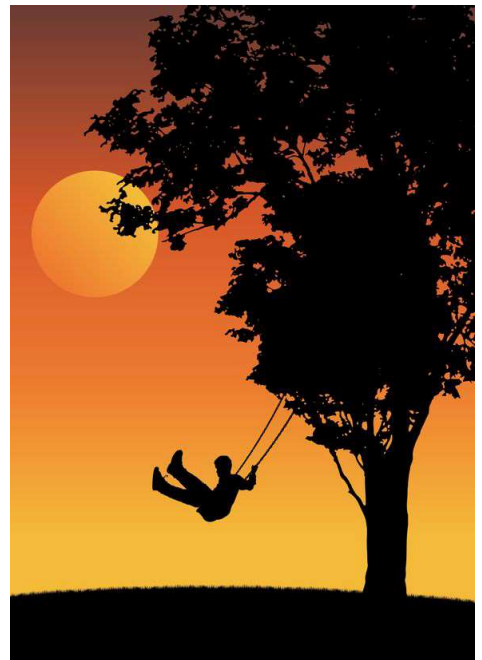
If there is time, challenge Kids to create a list of things people could do to reduce greenhouse gases. *The Magic School Bus* includes some creative ideas. Ask each Kid to commit to work on one or more of these ideas to help with the greenhouse gas problem. You as teacher can sign up as well.

Closing Words:

All present repeat these words together:

Just to be is a blessing!
Just to live is holy!

— Robbie Abraham Hershel, *Earth Prayer*





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Climate Change

LESSON 2: The Heat Is On!

OVERVIEW:

Concept:

We all contribute to rising heat in Earth's atmosphere in our daily lives. Even small changes in the atmosphere can have widespread effects on climate and plant life.

Background:

There are three sources of heat buildup in the atmosphere:

- Too much carbon dioxide and other greenhouse gases from burning fossil fuels
- Shrinking forests removing less carbon dioxide from the air
- Day-to-day human activities



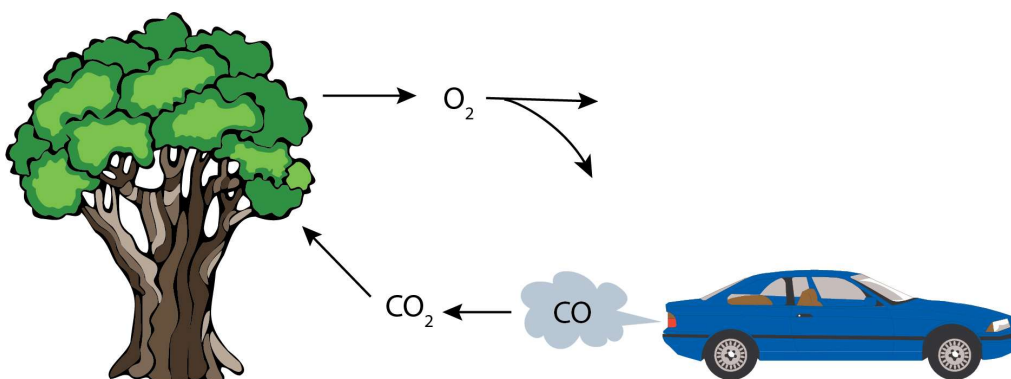
Air contains a mixture of gases and water molecules, which expand and take up more space when heated. Water becomes a gas. Heat from Earth's surfaces warms the air, causing it to rise. As the warm air moves away from Earth's surface, it cools. Water molecules move closer together and become liquid again. The result may be rain. When cold enough, the water forms crystals and we get snow. The moving air forms winds that bring about changing weather all over the planet.

When this cycle heats up, we get global warming and climate change. Warmer oceans, land surfaces and atmosphere lead to more extreme weather. Too much moisture in the atmosphere from warmer water bodies such as oceans and lakes leads to more severe storms and flooding. Too much heat over the land leads to drought.

Forests and other plants are important because they remove carbon dioxide from the air in the process of photosynthesis. As plants remove carbon dioxide from the air, they release oxygen, which we breathe. Along with all green plants, trees in the forest help to keep normal levels of oxygen and carbon dioxide in balance. World forests are shrinking, thus contributing to rising levels of greenhouse gases in the atmosphere.

Human activities also contribute to global warming. Just breathing, people along with animal life in general exhale carbon dioxide. Given that every transfer of energy releases waste heat

into the air, the activities of billions of people simply living their lives have a significant impact. Add to that the energy needs of our ever-expanding technologies and the human impact is evident.



In this lesson Kids observe how burning a fuel produces heat and ash and how heat and cold affect how air moves.

LESSON:

Action:

Kids observe burning candles producing light, heat, and air pollution. Then they investigate how heat affects the movement of air.

Materials:

For demonstration:

Three candles

Matches

Thermometer

- Small, low table

For activity:

- Hot plate
- Ice cubes
- Bubble blowing solution and wands, 4 to 6 sets

Book: *You Are The Earth* by David Suzuki and Kathy Vanderlinden

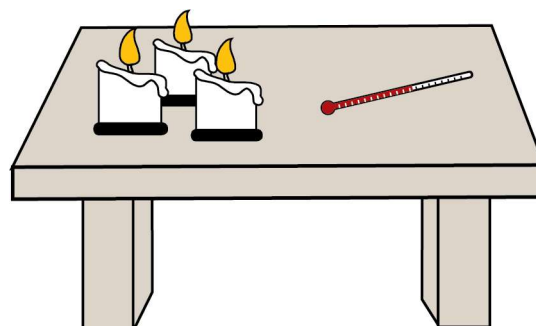
Preparation: Read through the lesson and decide how you want to use it.

For the demonstration:

Votive candles or other short fat candles are a good choice.

You may borrow a thermometer from a parent, or purchase if need be.

Place the table in the middle of the circle of chairs and put the candles and other demonstration materials on it, keeping the matches in your pocket or nearby.



For the activity: Set up an observation station.

- Depending on how many Kids in your class, you may want to set up two or more stations and ask volunteers to assist with the activity.
- You will need 2 sets of bubbles and wands for each bubble station
- Place the hot plate on one end of a table where Kids can get near it with their bubble solutions. Plug it in before the class session.
- Also before the class session, place a large container of ice cubes at the other end of the table.

LESSON PLAN:

Opening Circle:

Greet the Kids as they get seated in the circle of chairs. Note who is present. Introduce any volunteer assistants who are present.

To begin, tell the Kids that today we will be exploring heat and cold in the air. Do Kids have ideas about this topic? Encourage their sharing of ideas and questions, using background information to enrich a brief discussion.

Demonstration:

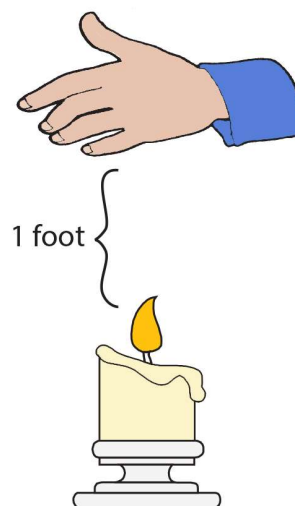
Place the candles close together on the low table and light one candle.

Ask the Kids what are we getting from burning the candle? (Light obviously! Perhaps someone will mention heat. Will anyone think of air pollution?)

You may have the Kids in turn pass a hand a foot or so above the flame to feel the heat. Then you light a second candle and have Kids feel the heat of two candles together. Does it feel any different?

Have them try it a third time with three candles lit. Can Kids feel the accumulation of heat going into the air the more fuel we burn?

- What do they observe rising from the candle when the flame is extinguished? How do they explain what they see? (An airstream of white ash briefly rises from the candlewick when the flame is extinguished.)



Discussion:

Use background information to help clarify Kids' understanding. Where does the carbon from burning fossil fuels go? (Into the air as carbon dioxide and ash.)

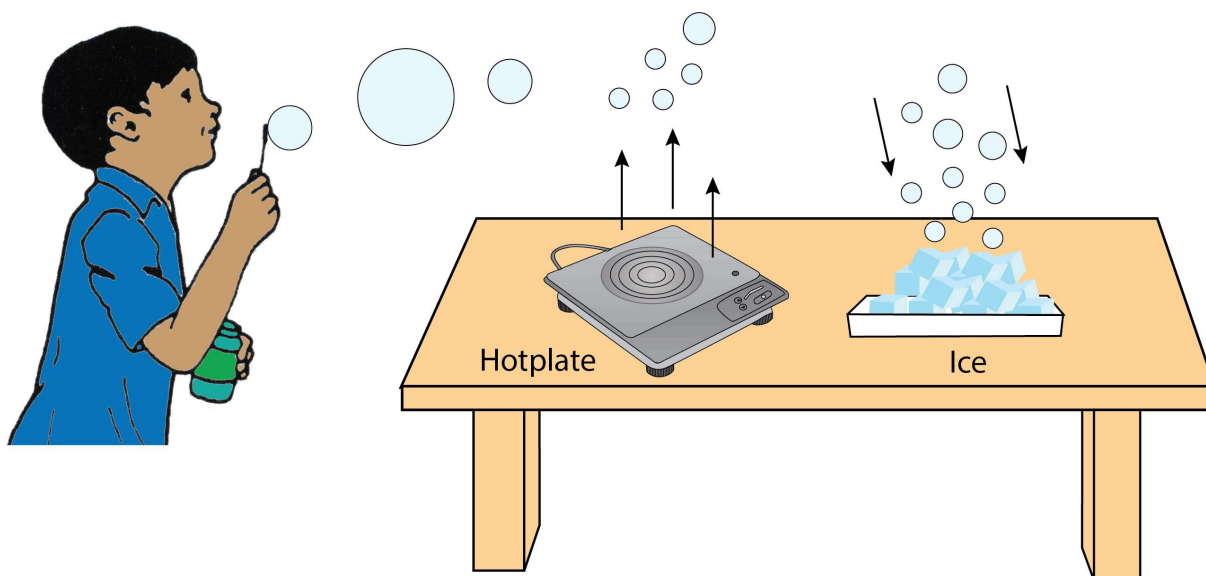
- How is this demonstration like burning fossil fuels? (The more candles or coal we burn the more heat goes into the air. We also get more air pollution from fossil fuels.)

Activity:

Tell the Kids that today they can use bubbles to watch how they float in hot and cold air. Do they predict any difference? If so, what?

Have the Kids line up to take turns releasing bubbles over the hot plate and over the ice cubes. Caution them to avoid touching the hotplate with their fingers. Do they notice a difference in how the bubbles move?

Allow 10 minutes or so for observations.

**Discussion:**

What did Kids notice about the movement of the bubbles?

How do they explain what they observed?

- How would this relate to weather and climate?

Use background information to help Kids understand how hot and cold air interacting cause winds that bring about weather.

Story:

Ahaiyuta and the Cloud Eater, p. 30, *You Are The Earth*, by David Suzuki, Greystone Books, Vancouver, British Columbia, Canada V5T 4S7, 2001

This story is told by the Zuni people who live in the hot deserts of New Mexico to explain why there is drought in their land and what one determined person did about it.

Principles in Practice:

For thousands of years people of diverse cultures all over the planet have tried to explain what they observe in their environments with myths such as this story. The business of science over the past few hundred years is to explain our world based on observations and data collected

through rigorous experiment and analysis. Many present day people disbelieve what science tells us about global warming and climate change. They discredit efforts to address the problems with legislative action. Some legislators even want to do away with existing laws and agencies such as the EPA.

After a discussion of the story and how it relates to current climate problems, perhaps the Kids can write a group letter to their state and national legislators about their concerns for the future of the planet where they will be spending their lives. See resources (p. 7) for names and addresses.)

Closing Words:

All present speak these words together:

We must protect the Earth for we are the Earth...
Part of the air, water, soil and energy of the world...
Beings with love in our hearts...
Life in our souls...
And a kingdom at our doorstep.
—*You Are The Earth*, David Suzuki





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LESSON 3: Megalopolis

OVERVIEW:

Concept: Each one of us makes a difference in the wellbeing of planet Earth by how we live our lives.

Background:

“Little drops of water, little grains of sand,
Make the mighty ocean and the pleasant land.”

—Julia Fletcher Carney, *Little Things*

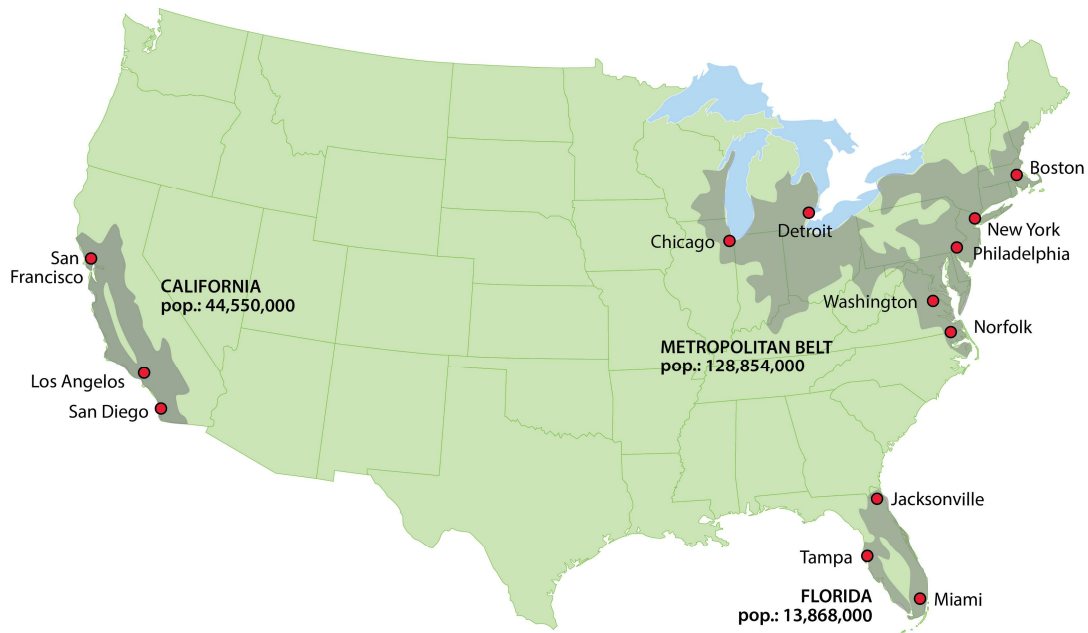
This quote, often wrongly attributed to Longfellow, embodies the essence of Megalopolis. A Megalopolis is a region where towns and cities run together making continuous population clusters over hundreds of miles. In the United States more than 80% of the people live in cities. In some regions such as the Northeast and the California coast, population density can reach 10,000 people per square mile, one person at a time, making a dense crowd.

We can see the effects of this concentration of people in many ways:

- Food sources removed from population areas
- Energy distribution, costs and limitations
- Concentrated air and water pollution
- Limits to water supply
- Waste disposal problems, both solid and liquid
- Traffic congestion
- Housing shortages
- Lack of natural open spaces

Cities in other parts of the world suffer from the same array of problems, for example, Beijing in China, Delhi in India, London in England. In some of these cities people wear oxygen masks outdoors in order to breathe.

Megalopolis Map



Keeping our cities livable requires vast amounts of energy to bring in resources such as food, water and electricity and to operate home equipment and appliances, fuel for transportation whether private cars or transit systems, as well as various other citywide systems and services. Most of the technology and systems that support a modern city depend on the one-time use of fossil fuels to generate electricity. Around 80% of people in the United States live in cities. The same technologies service rural populations in developed countries.

People living in the countryside have the same needs as city dwellers. Their food seldom comes from local sources and food grown locally often is shipped elsewhere. Driving to the supermarket is a regular happening, going much longer distances than in the city. Our industrialized food system requires many times more energy than it supplies to consumers.

Organic farming and growing food locally are increasing options with promise of healthier food with lower energy cost. In cities such as Boston roof gardens are flourishing and here and there backyard gardens are providing fresh food at the backdoor.

“It takes ninety calories of energy to deliver one calorie
of lettuce from California to Boston.”

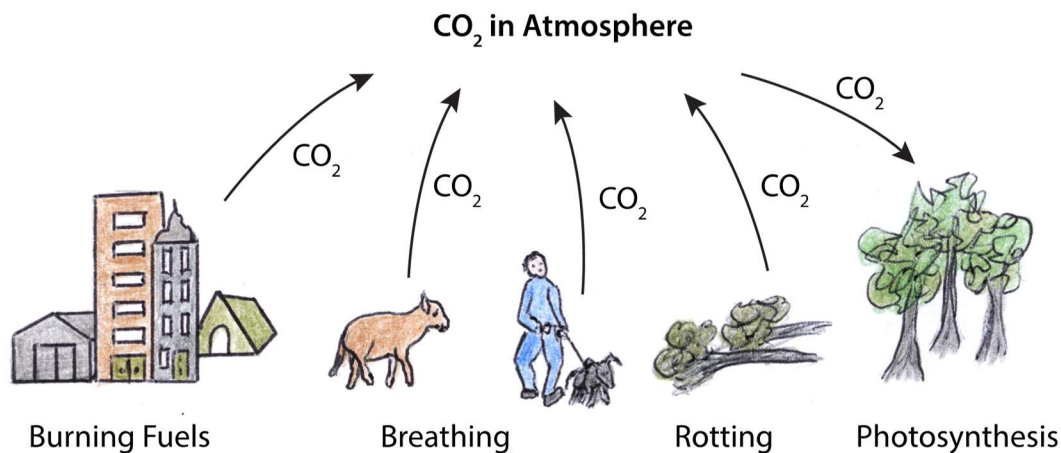
— Bill McKibbin, environmental activist and author

Electricity is the lifeblood of modern living, whether in urban areas or in the countryside. People may assume that using electricity instead of oil, coal, and gasoline as the source of heat and light is cleaner. But much of our electricity comes from burning fossil fuels to generate the heat that runs the generators that make the electricity. A *New York Times* article (May 7, 2016)

states that electricity production represents about 37% of all domestic carbon dioxide emissions.

Cities generally are as much as 15 degrees (Fahrenheit) warmer than the surrounding countryside, even at night. Concrete and asphalt absorb heat from the sun and release it into the air after dark. In the city carbon dioxide is an even bigger problem than heat. Not only does burning fossil fuels at the source release large quantities of carbon dioxide into the atmosphere. Use of fossil fuels in the city itself releases carbon dioxide directly into the air that people are breathing. As carbon dioxide levels increase, health problems result. Such use includes fuel for cars and other machines such as lawn mowers and snowplows. Think of the impact of energy use from one household at a time where so many are concentrated in limited areas! Conversely, think what the growing impact of organic gardening in suburban and urban backyards and of roof gardens in the cities can become!

We know that green plants such as trees, grasses, vegetables and flowers use carbon dioxide from the air to make carbohydrates. When the cycle of carbon dioxide production and its use by green plants is in balance, Earth's atmosphere has a more stable balance of oxygen and carbon dioxide and fresh air for breathing is a sustainable resource.



In the U.S., most people who live where population is less concentrated depend on the same energy sources and means of distribution to power their lives. Wherever they are, when people use energy, carbon dioxide and waste heat have gone into the air somewhere.

You may ask what about people in third world countries such as Borneo, where people may not even have electricity. The sad fact is that global warming and climate change affect them as well. They may not generate the problems that we see in large cities, but they are affected by the consequences of global warming such as drought leading to crop failure, ice melt and sea rise leading to flooding, and loss of homelands with an uncertain future. Issues of social justice and fair use of Earth's resources are implicit in this state of affairs.

Of course city living has many attractions and advantages:

- Jobs
- Concentration of resources and services

Health resources – hospitals, doctors, drug stores, etc.

Transportation systems

Utility systems and services

Education resources such as libraries, museums, schools, etc.

Recreation resources such as theater, music, sports arenas, cinemas, etc.

- Often, green spaces and parks

Given that living in a city is a choice that most urban dwellers make, why do they choose city life?

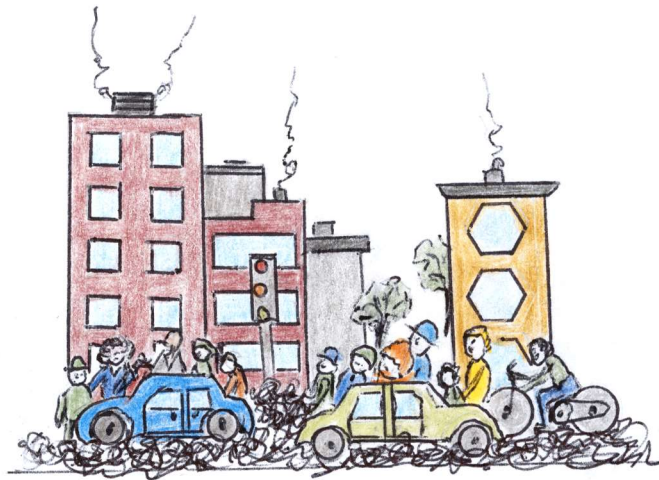
What are the benefits?

What are the problems?

What effect does a megalopolis have on weather and climate?

- What can a person do?

In this lesson Kids play a Megalopolis game and discuss global warming and climate change in the context of city living.



LESSON:

Action:

In this lesson Kids play a megalopolis game and compare the benefits and problems of city living and life in the countryside.

Materials:

Dried beans – 1 pound bag

Megalopolis map (p. 26)

Masking tape

- Kitchen timer

- Two small containers such as shoe boxes
- Two tables
- Red and blue sticky dots (3-4 sheets of each)
- Several folding chairs

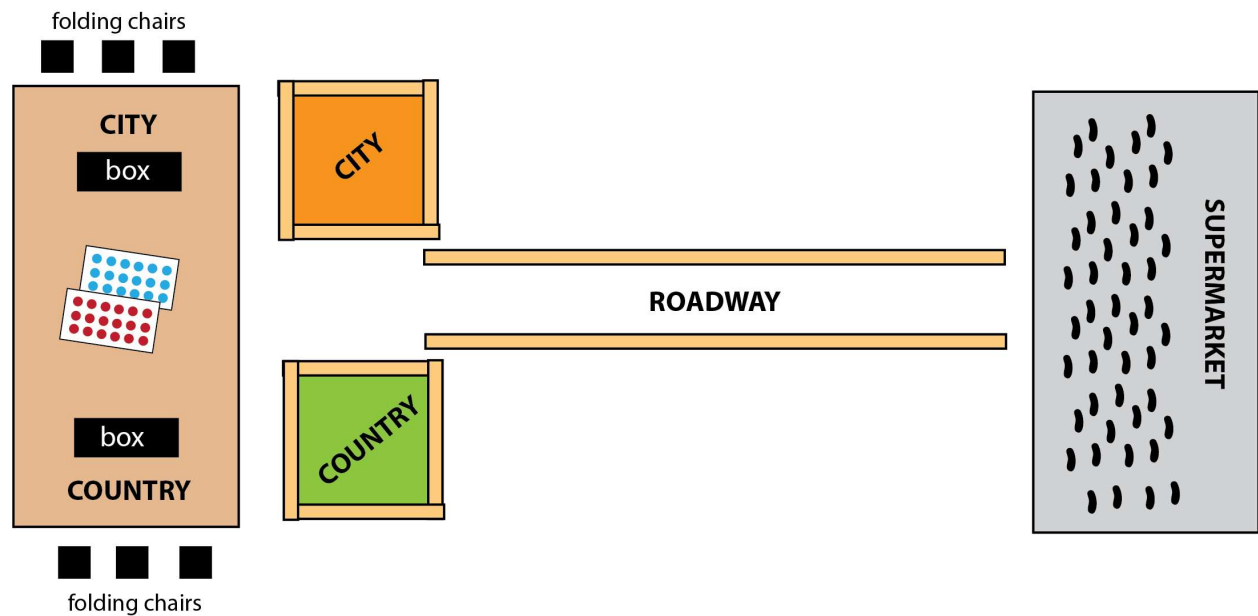
Book: *Earth, Fire, Water, Air*, by Mary Hoffman and Jane Ray

Preparation:

Set up the classroom the day of the activity.

- Place the table at one side of the room and label it “Supermarket.”
- Scatter beans on the tabletop to represent food, or do this at the time of the game.
- Place the other table at the opposite side of the room with several folding chairs at each end of the table.
- Label one end of the table “city” and the other end “country.”
- Use strips of tape to mark off equal spaces three or four feet square at each end of the table.
- Use long strips of masking tape along the floor to mark a “roadway” between the two tables.

The marked off spaces represent homes for families. Family members must stand inside the marked off spaces when not going for food. Chairs represent cars that travel the roads.



LESSON PLAN:

Opening Circle:

Greet Kids as they come in and note who is present.

Introduction:

Kids will be curious about the setup. Tell them that today they will be playing a megalopolis game. Do they know what the word “megalopolis” means? Use the megalopolis map (p. 26) and background information to illustrate and briefly discuss the concept.

Discussion:

Where Kids live, do they think there are too many cars, too much traffic in the area?

Too much waiting in line at the sub shop?

Is there enough outdoor space such as parks or woodlands?

What is good about where they live?

- What in their opinions could be improved?

Encourage Kids to ask questions and to suggest their own ideas. Use background information to enrich discussion and clarify Kids’ thinking. After a few minutes discussion, move on to the Megalopolis game.

Megalopolis Game:

Explain the setup to the class. Divide the class into one or more city families of two parents and one Kid and one or more rural family of four or five people. Tell the Kids that the game involves traveling to the market to get food. The game is played by family members using a car (chair) to go to the market for food. Provide one or two sheets of red dots to each rural family and one or two blue sheets to each urban family.

Rules of the Game:

1. One family member at a time uses a car (chair) to travel to the market, gather one bean per family member, and travel back.
2. Cars (chairs) are carried, not pushed, along the roadway.
3. A member of the rural family gathers two red dots per trip to represent fuel used.
4. A member of the city family gathers one blue dot per trip for fuel for the bus.
5. Family members alternate going to the market, one rural member and one city member at a time.
6. Each family has a small container to collect their beans and dots.
7. Each round of the game lasts two minutes.

Megalopolis Activity:

Set timer for two minutes for each round of the game.

- Between rounds each family counts its beans and red dots, and compares food gained with energy used to get it.

After first round of play, ask if family members have any problems getting food.

Scatter more beans if needed.

The class may play three or more rounds with discussion between rounds.

For a final round all family groups take a car (chair) to the supermarket to pick up food (bean) and return home at the same time.

With more cars on the road and more people in the market, are there more problems?

- After rounds are finished, both rural and city families count their beans and their red or blue dots.

Discussion:

After the final round:

How much fuel (red dots) per unit of food (beans) does each group (city and rural) use?

What other services besides food do families need? (heat, light, transportation, technology)

What kinds of fuel do these services require? (electricity, gasoline, coal, oil, natural gas)

Ask Kids to consider the energy costs for getting foods to the markets? (Use background information to inform their understanding as needed.)

- Do Kids have ideas to improve the system?

Ask Kids to compare this game with food shopping in their own families.

Do they participate in food shopping?

How often does someone go to the grocery store?

- What comments do Kids have?

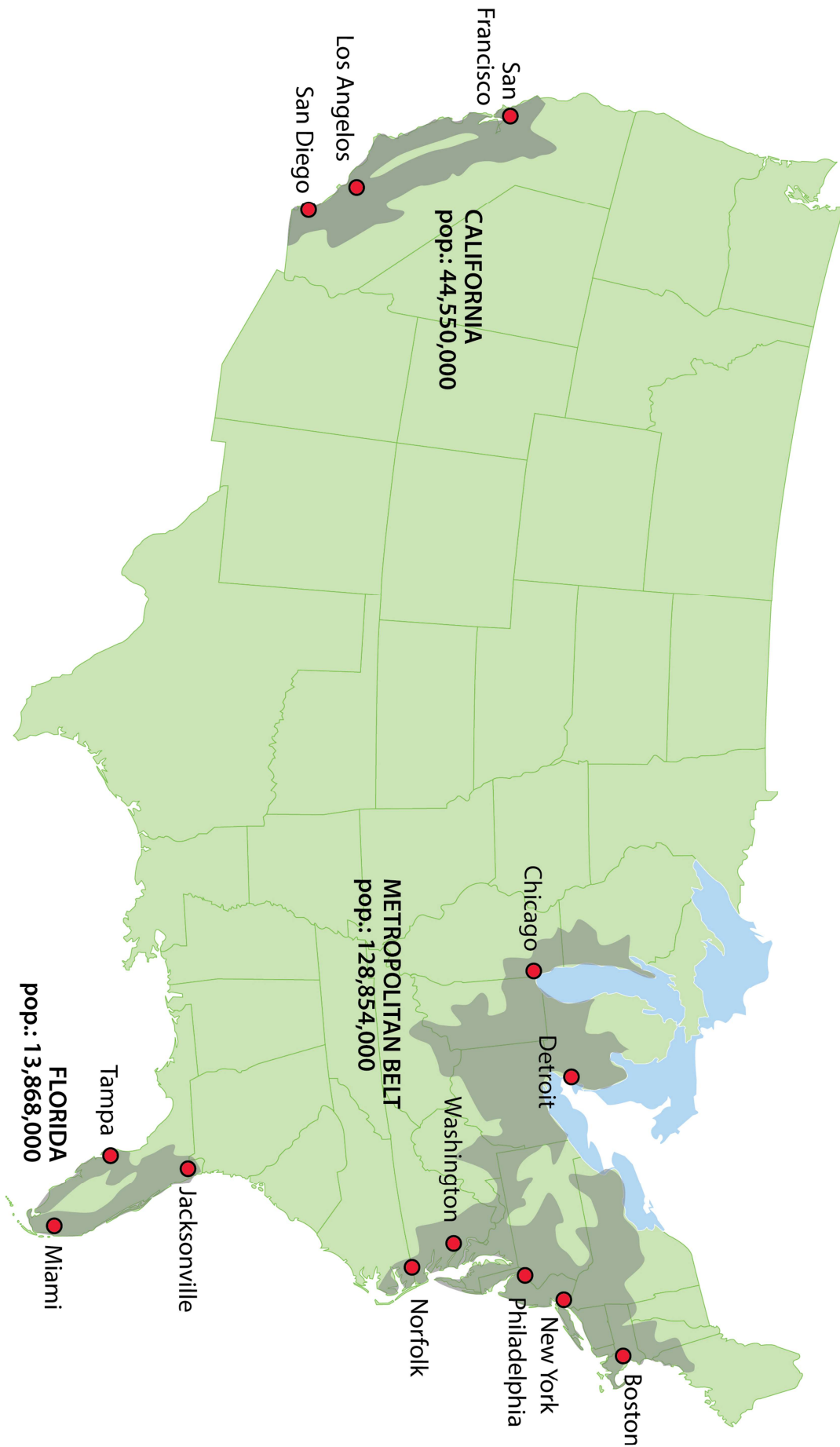
Show the megalopolis map again.

Is your town located in one of the grey areas?

What do Kids think the map is telling them?

- Where would Kids choose to live, city or country? Why?

Megalopolis Map



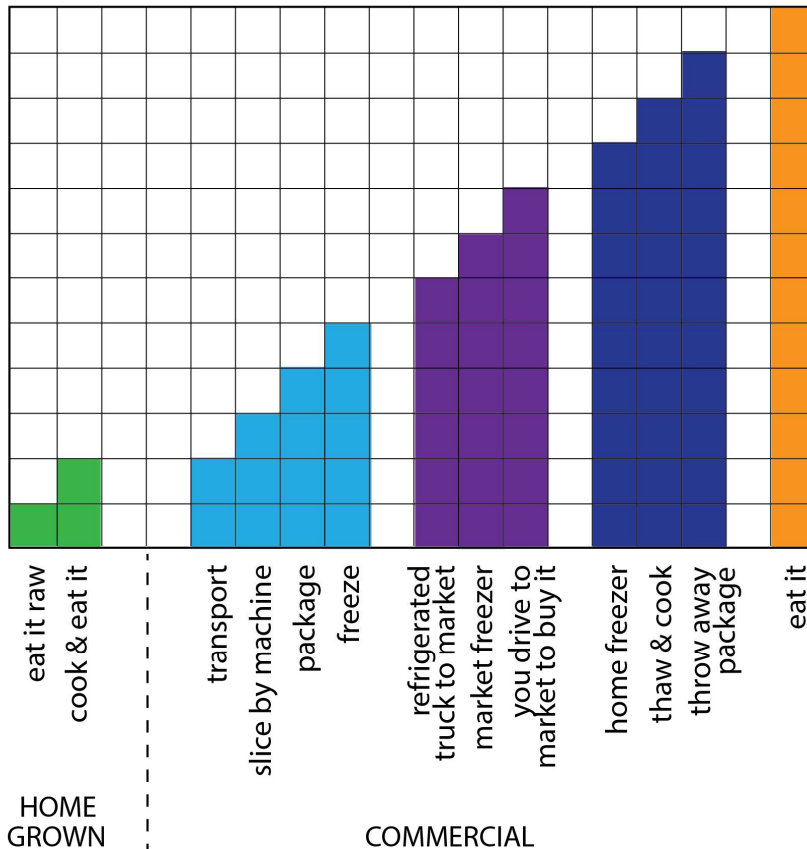
Option — Graphing Food Energy Costs:

- Ask the Kids what energy costs do they think are involved in bringing food to a city population.
- What do they know about production and transportation for different foods?

If there is time, you can refer to the carrot graph below as a model for Kids to construct a similar graph for a favorite food on the white board.

Someone grows a carrot.

Each step takes energy:



It takes 96 calories of energy to bring one calorie of lettuce from farms in California to people in Massachusetts.

— Bill McKibben

Story:

A Breath of Fresh Air (p.76) Earth, Fire, Water, Air by Mary Hoffman and Jane Ray
Dutton Children's Books, New York, NY 1995

This appealing essay encourages people to take small steps to help our Earth recover.

Principles in Practice:

What do Kids think about the way city life generates carbon dioxide and heat that add to global warming problems?

Is it fair to third world countries to suffer from heat-related problems generated in large part by first-world lifestyles?

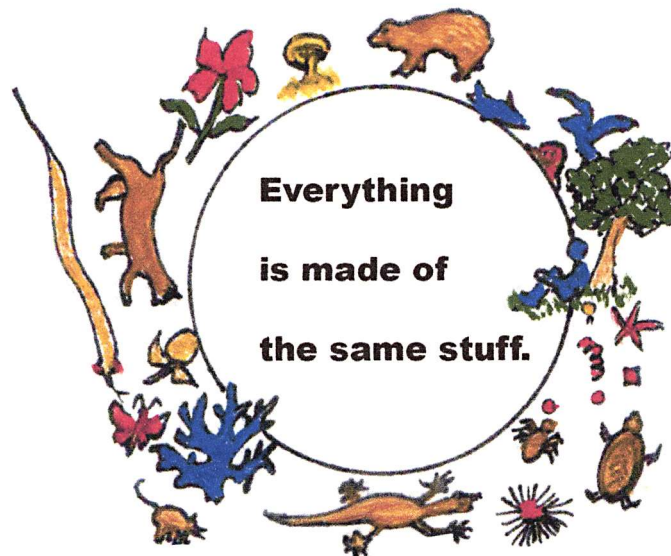
Do Kids think that city life can be modified to reduce or eliminate problems? If so, what do they suggest?

- What can Kids themselves do to help?

Closing Words:

All present repeat together:

All beings on Earth,
The trees, the animals,
The wind and the rivers
Give-away to one another
So all is in balance.





EarthCircles

Climate Change

LESSON 4: Guarding the Green

OVERVIEW:

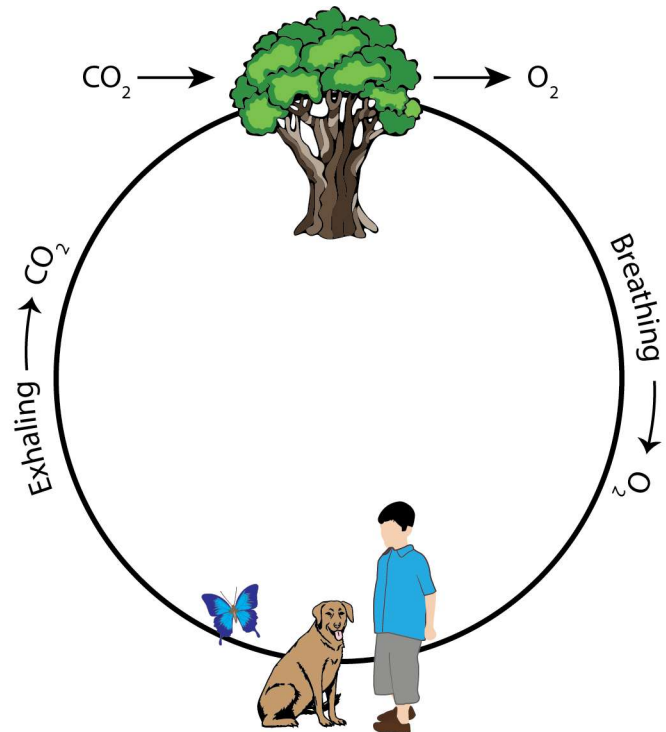
Concept: Forests and green plants in general are essential resources for maintaining critical balances in Earth's atmosphere.

Background:

Green plants including trees are important for their intake of carbon dioxide from the air and their release of oxygen into the air. Too much carbon dioxide in the air is a prime mover in global warming. Too little oxygen interferes with our ability to breathe. A forest is a major player in keeping this cycle in balance. The role of the forest in this dynamic is undervalued because of the high economic value of forest products.

A forest is an area where hundreds or thousands of trees are growing together, perhaps for many centuries. Different types of forest grow in different regions on Earth, depending on temperature and rainfall. For example, evergreen trees prosper in the colder temperate regions of North America and Europe. Deciduous trees such as maple and oaks thrive in milder temperate climates. Rainforests flourish in climates where it is wet and warm all year. Climate change has vital consequences for such areas

People in Europe were cutting down trees with handsaws and axes 500 years ago. This was hard work! It took all day to cut down one tree, some times longer with a big tree. The 1800s saw the invention of machinery to do this work. Now a big tree can be felled in less than an hour. By the end of the twentieth century most of the deciduous forests of North America, Australia and New Zealand were cleared. In the current century the tropical rain forests



in South America and Southeast Asia are rapidly being cut and burned. Over 90% of the forests in Asia are gone. In California only about 4% of the redwood forests are still standing.

This process of removing forests is called *deforestation*. It is happening at a rapidly increasing rate, especially in the tropical countries. Why?

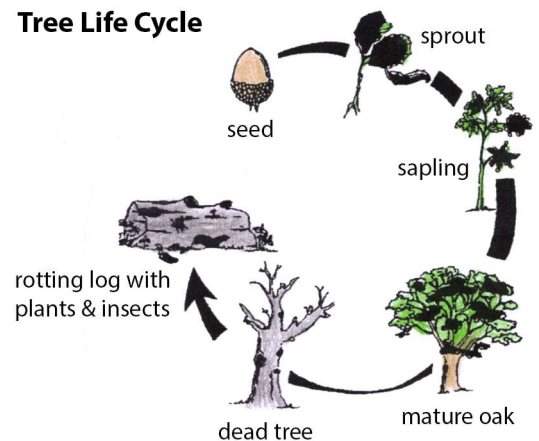
- Need for more agricultural land to feed a growing population
- Road building
- High profits from cattle ranching, timber, drug crops
- Need for wood for fuel in remote areas



What are some negative effects of deforestation?

- One serious effect is the threat to the balance of the oxygen-carbon dioxide cycle in our atmosphere.
- Carbon that was stored in the tissue of trees is released into the air as carbon dioxide when wood is burned or decomposes, contributing to global warming.
- Erosion and soil deterioration increase.
- Loss of watershed protection, decreased regulation of water flow.
- Biodiversity decline as plant and animal populations lose their habitats.
- In some cities oxygen recharge are available. People wear oxygen masks outdoors.

Tree Life Cycle



In addition, some people make forests their homes. Around 140 million primitive people live in the rain forests. Their homes are now threatened because of deforestation.

All green plants are players in this fundamental cycle. Trees are especially important because of their size and worldwide distribution. One bit of data states that on average it takes 65 trees to provide oxygen for one person's lifetime. At the same time that one person exhales about 22 tons of carbon dioxide into the air. Is there a tipping point for tolerable air quality as world population grows and forests are destroyed?

In this lesson Kids are asked to role play a ton's dispute over the future of local woodlands. Use the above information to enrich discussion as needed.

LESSON:

Action:

Kids role play a local dispute about the future of an adjacent woodland and discuss the value of forests worldwide.

Materials:

- | | |
|------------------------------|------------------------------|
| Paper and pencils | • Colored pencils or markers |
| Local map | • Pointers as needed |
| • Information summary sheets | |

Book: *The Barefoot Book of Earth Tales*, by Dawn Casey and Anne Wilson

Preparation:

- Make a copy of the information sheet for each Kid.
Gather paper, pencils, and markers and place them on a supply table.
- For pointers, Kids can use rulers or whatever rods are available.
One for each of three groups.

Make three copies of the local map, enlarged if possible.

LESSON PLAN:

Opening Circle: Greet the Kids as they settle in the circle of chairs and note who is present.

Discussion:

To begin, ask how many Kids have a wooded area near where they live.

- Do they like to go there?
What do they do in the woods?
Do they see other people there enjoying a short hike? Bird watching? Picnicking?
- How important is having woods nearby to a neighborhood?

Action:

Tell the Kids that today is Town Meeting day and the future of the Elm Street Woods is on the agenda for a vote about its future. You the teacher may take the role of moderator, or select a Kid who can fill this role. A Kid may need a little coaching while the three groups discuss their arguments. For example, the job of the moderator is to guide the discussion of all points of view so that all arguments are heard with equal fairness. The moderator does not express a personal point of view about the future of the woods but ensures that each group has equal time for a presentation and that due respect prevails during the proceedings.

Kids form three groups, each group to represent a different interest group:

1. The neighborhood near the woods
2. The town recreation department

3. A housing development business

Each Kid gets a copy of the information sheet (p.34). The task for each group is to read through the information about all of the three interest groups. Then each group develops a two or three minute argument to present to Town Meeting about why their own proposed plan for the woods is the best use of the property.

Allow ten to fifteen minutes for groups to read the information sheet and work on their plans and presentations.

Kids may choose to make charts or posters to emphasize points in their proposals.

Each group in turn makes a presentation and answers questions other groups or the moderator may have.

- After all groups have had their turn, have a five-minute general discussion followed by a vote of all present.



Discussion:

What are Kids' reactions to other groups' proposals?

What are the costs and benefits of each plan?

- What concerns Kids the most? Economic considerations, recreation facilities, natural spaces for informal enjoyment, need for more houses, cost to the Town, other.

Story:

Amitra's Tree, The Barefoot Book of Earth Tales, Dawn Casey and Anne Wilson, Barefoot Books, Cambridge, Mass., 2009

This folk tale from the village of Bishnoi in India is based on a true story of how women of the tribe saved the local trees from the woodmen's axes.

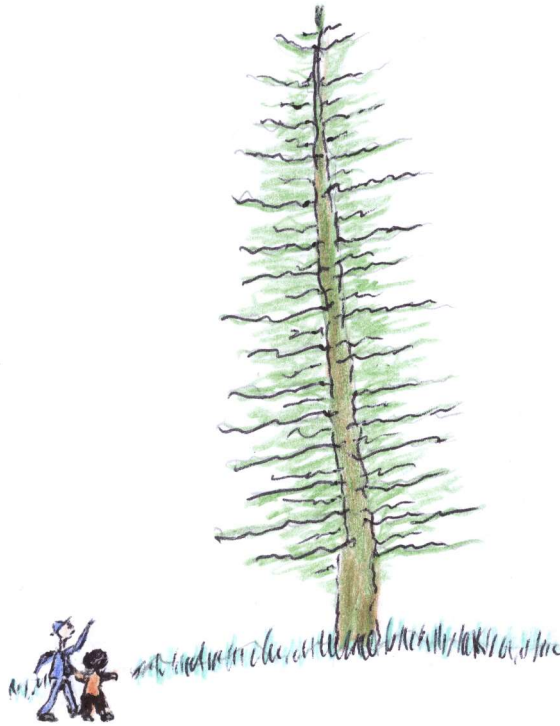
Principles in Practice:

Ask Kids to compare the issue around use of trees locally, the story of Amitra's tree, and the cutting down of trees across the world today. Use background information to inform and enrich discussion and expand Kids' thinking about the value of trees.

Would Kids take action to preserve a local tree or a woods from destruction?

Several national organizations have goals of forest protection. Kids may want to contact some of them and help them with petitions for action on threats to our forests and national parks.

National Wildlife Association
Sierra Club
Arbor Day Foundation
Massachusetts Audubon Society
National Audubon Society



Closing Words:

“The time has come to inquire seriously
What will happen when our forests are gone?”

— Theodore Roosevelt

TOWN MEETING INFORMATION SHEET — March 0000

Be it known:

Through the generosity of our beloved citizen Fred Foster, now deceased, our Town has been bequeathed the forty acres of the Elm Street woods. For generations the Foster family, historic owners of the woods, cared for the property in its natural state and generously allowed free use of the area for informal recreation by neighbors and townspeople. The woods are undeveloped, with a few walking trails, a brook and a small pond. The area around the woods is residential, with a school and a church nearby.

This inheritance is the subject of a question for this town meeting:

- What does the Town wish to do with the Elm Street Woods?

Three proposals are before us for a vote at this meeting.

1. **The Neighborhood: Keep the woods as they are.**

Natural areas are important for the health of the environment and for the wellbeing of people in the neighborhood.

The school in our neighborhood uses the area for class field trips.

The residents of the neighborhood treasure the woods for a place to walk, to picnic, to introduce their children to nature.

Maintenance, formerly handled by the Foster family, will be the Town's responsibility.

- Cost to taxpayers will be minimal; a few hours of staff time from the Department of Public Works.

2. **The Town Recreation Department: Develop a park for the Town to enjoy.**

The Town needs more outdoor recreation facilities such as playing fields for sports, for picnic areas, and for children's play grounds; possibly an outdoor swimming pool.

The Town has very little open space to develop such facilities.

Existing facilities are overcrowded and in need of renewal.

Cost of planning and development is estimated at \$1,200,000.

- Development, staffing and maintenance will be at taxpayers' expense.

3. **Housing Developer: Buy the property from the Town, install streets and public utilities, and build sixty new houses.**

There is a critical need for housing in this entire region.

The Town can help to address this critical need while making a tidy profit.

Market value for building lots is \$100,000 per acre. Thus the Elm Woods acreage is valued at \$4,000,000.

Our firm is known for the quality of its developments.

We are prepared to negotiate an advantageous deal for the Town.

- Our firm will install utilities and streets as part of development.

Once occupied, town services such as street maintenance will be at taxpayer's expense.



EarthCircles

Climate Change

LESSON 5: Climate Challenges

OVERVIEW:

Concept: People in many countries worldwide already are suffering the consequences of global warming and climate change.

Background:

“Nature can provide for every man’s need but not for every man’s greed.”

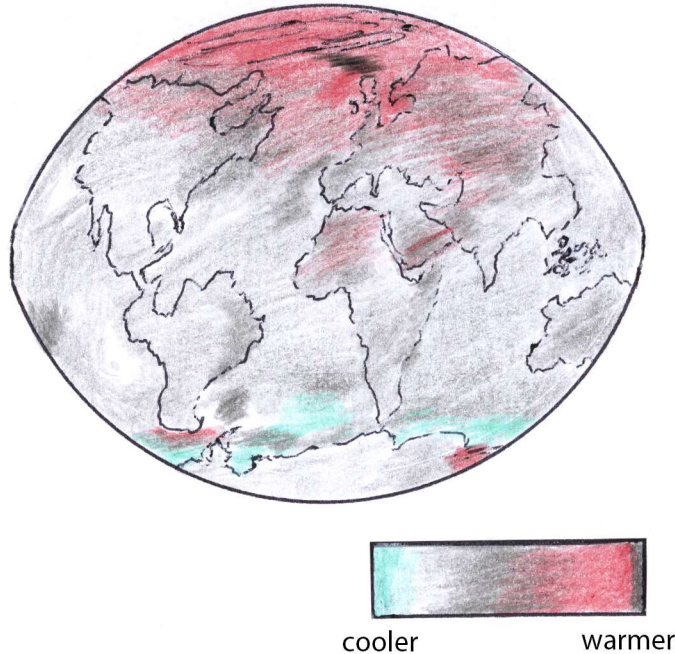
This quote from Mahatma Gandhi clearly applies to our culture’s conspicuous consumption of electricity to power our life styles. For over 200 years our economy has depended on fossil fuels for power to run factories, operate machines, appliances and now electronic devices. In developed countries we have created an energy greedy culture with little regard for the depletion of natural resources such as coal and oil, or for the environmental consequences. Some people do not see climate change as a result of economic interests taking precedence over environmental health and safety.

Most of planet Earth is getting warmer but not evenly. Antarctica actually seems to be getting colder while up north in the Arctic some areas are as much as 15 degrees warmer than a century ago or two. On average, Earth has warmed 1.5 degrees Fahrenheit since the late 1800s. The uneven warming can be explained by natural climate cycles, but the overall warming trend is a different matter. This trend coincides with the impact of the Industrial Revolution with its dependence on fossil fuels for energy to power factories and machines. Along with industry, which does provide jobs, power is needed for the marvelous appliances, transportation, communication and entertainment resources people in developed countries now enjoy. Our economy depends on this system of using natural resources to support a lifestyle “less advanced” countries can only imagine.

We tend to think of these countries as “poor,” while their lifestyles may be entirely satisfactory for the native people. They work hard, work together directly with their natural resources. Their communities are small by our standards, and people enjoy communal living. Sad to say, global warming is affecting their habitats already. Many of these people ask whether they will have to abandon their homes and migrate to life sustainable places. Where might they go?

(Stories in this lesson are adapted from National Geographic articles.)

Map of World Impact / Global Warming



LESSON:

Action:

Kids in small groups learn about lifestyles in different countries and how global warming is affecting them. Each group informs their classmates about their country. The class compares countries and the options there may be for survival there.

Materials:

- Brief reports of life in three countries: Greenland, Kiribati, and Mexico (pp. 40-42)
- One report about life in a first world country: Canada
- Craft materials for making posters
- Poster board or large newsprint
- Colored markers, pencils, crayons, Scotch tape
- Writing materials for creating songs or poems and/or musical instruments
- Timer

Book: *You Are The Earth*, by David Suzuki and Kathy Vanderlinden

Preparation:

Review the lesson plan and decide how to use it. You may want to enlist extra volunteer teachers to work with the Kid teams. Depending on the number of Kids in your class and time available, you may need to modify timeframes and possibly make this lesson into two lessons, one for learning and one for presentations. Plan for each group of 2-4 Kids to have one country to investigate. With a larger class, plan for two or more groups per country.

Make 2-4 copies of the Greenland, Kiribati, and Mexico reports, one per Kid overall.

Make a copy of the Canada report for each Kid for Principles in Practice.

Have assorted craft materials available for Kids to make posters.

Have paper and pencils available for Kids who choose to do rap songs or poems.

Place the materials on the supply table.

Make a copy of the Medicine Hat, Alberta, Canada report for each Kid.

Reserve the book and copies of National Geographic December 2015 *Cool It!* At your local library.

LESSON PLAN:

Opening Circle: Greet the kids as they come in and note who is present. If there are volunteers present, introduce them.

Discussion:

Begin with questions for the Kids.

Who has gone camping for vacation or spent a week in a cabin in the woods?

Without electricity, what did you do for power (heat and light)?

What did you miss most from your regular life?

What was most enjoyable?

Have you ever lost power during a storm? What did you and your family do?

- Would you want to live like this all the time?



Take five minutes or so for a brief discussion.

Activity:

Tell the Kids that today the class will find out about how people live in some different, remote countries. Working in small groups, each group has one country to learn about. Explain the procedures.

Each group will get a brief story about one of three countries for Kids to review and discuss.

After reading their country's story, the group decides how they will inform their classmates about this country: poster, poem, rap song, or some other way, with a two or three minute presentation.

- Next, with a show-and-tell presentation each group shares information about their country.

Setting Up:

Divide the class into three groups of two to four Kids. If your class is smaller than six or eight, you may want to leave a country out.

Provide each group with reports on a different country, one copy per Kid.

- Point out materials on the supply table for groups to use.

Action:

Allow about 15-20 minutes for groups to focus on their countries and develop presentations. We suggest mini-deadlines, using the timer to keep groups focused:

- 5 minutes – read and discuss article
- 3 minutes – decide on presentation, style and roles
- 10 minutes – work on their presentation materials
- 2 minutes – wrap-up warning
- 20 minutes – group presentations

For show-and-tell, one Kid may speak for the group or all Kids can share in describing their country's lifestyle and commenting on how they view it.

- Allow each group 3-5 minutes to present their information and thoughts about it.

Questions for discussion:

You may have a brief discussion or question and answer session after each presentation, have an overall discussion after all groups have reported, or if time permits, do both.

How dependent are people in each country on their own natural resources?

What do Kids find good or not so good about each country's lifestyle?

- Given the likely need for these people to adapt their way of life to climate changes, what options can Kids suggest for them?

Story:

Some Things Are the Sacred, (p.96), David Suzuki and Kathy Vanderlinden, Greystone Books, Vancouver, British Columbia, Canada V6K 4S2

This essay asks Kids to think about their possessions and values, their losses and nature's healing powers.

Principles in Practice:

Provide each Kid with a copy of the Medicine Hat, Alberta, Canada report. Allow three or four minutes for Kids to read it and think of questions about it.

Discussion:

How does Max's Lifestyle compare with the Kids' own lifestyles?

All things considered, which ways of life seem most/least Earth friendly?

Do Kids agree with the Kiribati's feeling that advanced countries are to blame for their (Kiribati's) troubles with the ocean because of overuse of energy sources?

What would the Kids be willing to change about their own lifestyles to help ease the problems?

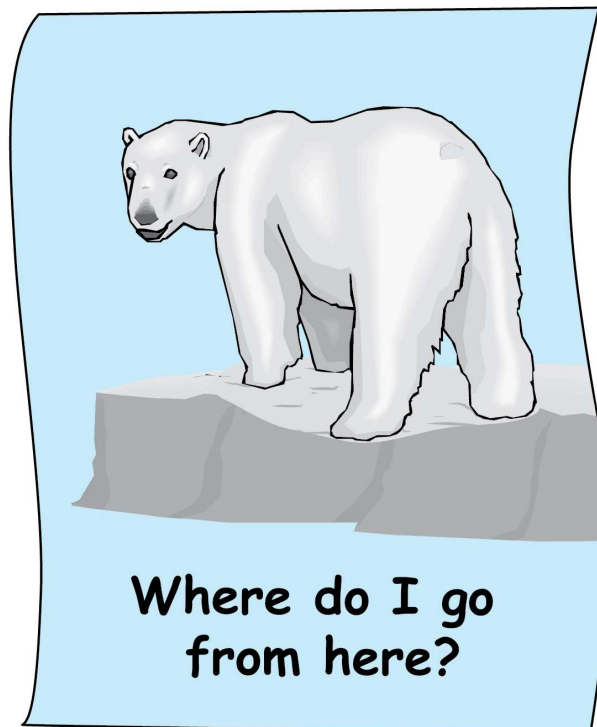
- What might each one of us do?

Closing Words:

Everyone present recites these words together:

My fears; the small ones that I thought so big
For all the vital things I had to get out and reach;
Yet there is only one great thing:
To live to see the great day that dawns
the light that fills the world.

— Inuit song, *Earth Prayers*



GREENLAND — Population 56,000 • Capital City: Nuuk, population 16,000

Hi! I am Nielsine and this is my friend Jensigne. We live in a small community in Greenland. No roads connect our villages. Dog sleds and snowmobiles are how we get around when ice is thick enough. Also, we have helicopters to get to the hospital in our capital city Nuuk, and to get to high school there when the ice is gone. There is an elementary school in each village.



Ice season used to last from December through June. Now it is February through April. Good ice shrank from seven months for hunting seal, reindeer, and polar bears to three months. This means less meat to eat and less furs for warm clothes.

Our culture is based on the seasonal advance and retreat of the sea ice. Men hunt, ice fish and butcher whatever they bring home. Raw liver from a fresh kill is a yummy treat for Kids. Women clean and dry hides and pound them until they are soft. Then they make fur clothing and boots for the people of their village.

Winter is a social time for visits as well as for hunts. Ice has to be firm to get to a neighboring village by dog sled or snowmobile. It is very unsafe to venture out on soft squishy ice.

Nowadays, we have computers and iPads that connect us to different places, different ways of life. We have gone from subsistence hunting to Facebook in one century. Many young people are leaving here for a “better” life elsewhere. But some are choosing to stay. They really like this way of life and the closeness of the people here. We don’t know what our future will be.

Questions:

- What reasons do these Kids have for leaving Greenland when they grow up?
- For staying there?
- Where can they go?
- Given the way their climate is changing, what can people who remain in Greenland do to survive?
- What would you do?

KIRIBATI — Capital City: Tarawa – population 50,000 and growing

33 coral atolls in the South Pacific Ocean form the islands of this nation.

Hi!! My name is Mannie Rikiauna and I have two young sons, Tebaroue and Henry.

Our island is one of thirty-three coral atolls in the South Pacific Ocean that make up the nation of Kiribati. About 50,000 people live in the capitol city of Tarawa on the largest island. Another 50,000 or so live on other smaller atolls, where sea changes are becoming dangerous. Our way of life is breaking down: when to plant crops, when and where to fish in warming ocean waters, whether traditional plants and kinds of fish will be available in the future.

We love our simple life on the island. We love always being in sight and sound of the sea. Not so long ago, when tides were high it was a happy time. We could play in the surf and swim. But lately the sea has become an unwelcome intruder. High tides are too high, eroding our shoreline, killing trees and the crops we plant for food, turning our fresh water salty. We build sandbag sea walls along the beaches but a strong tide washes them away or sometimes a strong surge of sea water comes right over them. We also have been planting groves of mangrove trees along the shore to protect the beaches. But it will take years for them to grow, and we have a problem now! People feel threatened and afraid of the rising sea.

Some people have moved to Tarawa to be safe, crowding the city. Many people talk of leaving Kiribati before problems with the sea get worse. Everybody has relatives in other countries such as Australia, New Zealand, or Fiji. Many people are angry at the world's rich countries because they feel that the climate troubles in Kiribati are not of their own making. The feelings of injustice are widespread on the atolls most at risk from rising seas. People say "It is a slow and insidious form of terrorism against us." Love of place is strong here. Whether to leave their island homes and go to safer places is a difficult decision! Who knows what the future will bring? I think about leaving. Part of me wants to go, but Kiribati is the best place for my boys to grow up.



Questions:

- Is it reasonable for people in Kiribati to be fearful for the future of their island homes?
- Is it reasonable to blame people in other countries for their problems with the seas? Why or why not?
- How do you think people will decide what to do?

SINOLA STATE, MEXICO

My name is Xavier and I am ten years old. My father is a migrant farm worker in California and my mother works in a factory here in Sinola. I have been working with my father picking tomatoes and peppers since I was seven. He and I go north to California's central valley every summer and fall, joining a crew of migrant workers in Bakersfield. For several months we work from sunrise to dusk. We get paid by the number of bushels we pick so we work hard! At noon I get to go to a migrant Kids school for three hours most days. It isn't a very good school but that doesn't matter. I get out of the hot sun in the middle of the day and I don't need much of an education for the work I'm doing. After school I go back to the fields and work until sundown.

We go home to Sinola in the winter to be with our family. We have big family gatherings and our village has fiestas. It is a happy life for three or four months. Then my Dad and I go back to work.

But we have a big concern, the drought in California. They say it has been too warm for much snow in the mountains. There was not enough snowmelt to fill the lakes and rivers. The irrigation systems did not get enough groundwater. All of that causes drought in the valleys where the crops grow. Without water the crops won't grow and we will have no work. Without the money my father and I make our family will be very poor. I don't know how our family will survive. When will the drought end?

Questions:

- Is this lifestyle a happy one for Xavier and his family?
- How might they survive if migrant farm work vanishes?
- How do you feel about Xavier's attitude towards school?
- What options are there for his future?



MEDICINE HAT, ALBERTA, CANADA

Hi! My name is Max and I am eleven years old. I live in a town called Medicine Hat in the province of Alberta in western Canada. It is a small town in farm country. Even so, we have a good life that depends on electricity to bring us energy for everything we do. My usual day goes like this:

When I wake up in the morning I turn on the radio and the lights in my room.
For breakfast my Mom makes hot cereal on the stove while I make toast in the electric toaster.

I ride the school bus to school and back home after school.

For lunch in the school cafeteria I have prepared food kept fresh in coolers or warmer ovens.

At school we all use iPads in rooms with overhead lights.

The school has air conditioning in hot weather and heat in the winter.

Our house is cooled and heated, too.

After school, I get a snack from the fridge at home.

I watch TV until dinner time and then do homework on my I-pad.

- I play a video game until time for bed.

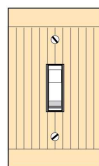
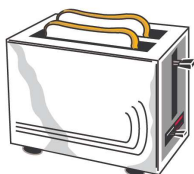
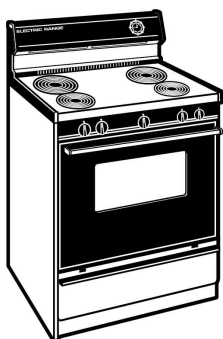
You can see that all this activity uses a lot of energy of the electric kind, not so much personal energy. Now we are told to limit our use of power to reduce global warming and ward off climate change. I am happy with my life the way it is. I really don't want to change anything! What would my life be like without electricity?

Questions:

Does Max seem to know or care about how people with less or no available electricity live their lives?

Does he mention a social life of any kind?

- What would you say to him about his future?





EarthCircles

Climate Change

LESSON 6: What Can We Do?

OVERVIEW:

Concept:

Individuals acting alone or in groups can bring about change that helps to heal Earth.

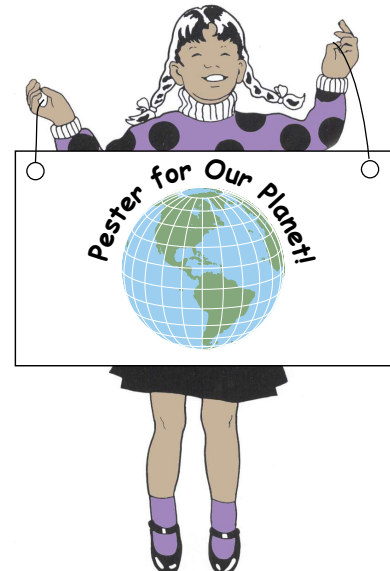
Background for Teachers:

Wherever we live on planet Earth, we are likely experiencing more extreme weather than our homeland had a century ago: more floods, more hurricanes and tornadoes, hotter summers, droughts, wild fires. Scientists tell us that these extremes are due to global warming from excess greenhouse gases and climate change is the result. The science is complex but people know when their homes, their livelihoods, their safety are threatened. Witness Greenland, Kiribati and Mexico in lesson 5.

In the United States 80% of the people now live in cities. The average temperature in cities is 4-11 degrees warmer than in the surrounding country, even at night. In big cities worldwide air pollution from excessive use of fossil fuels threatens the health of populations. But many people deny that global warming is actually happening and causing such problems. They do not believe that the scientists are right. What can Kids do?

The 1970s saw the growth of an environmental movement in the United States. Millions of people are ever more concerned about the future of Earth and the people living on it. But economic interests have challenged environmental regulation all along. Now Congress is proposing to abolish the EPA!

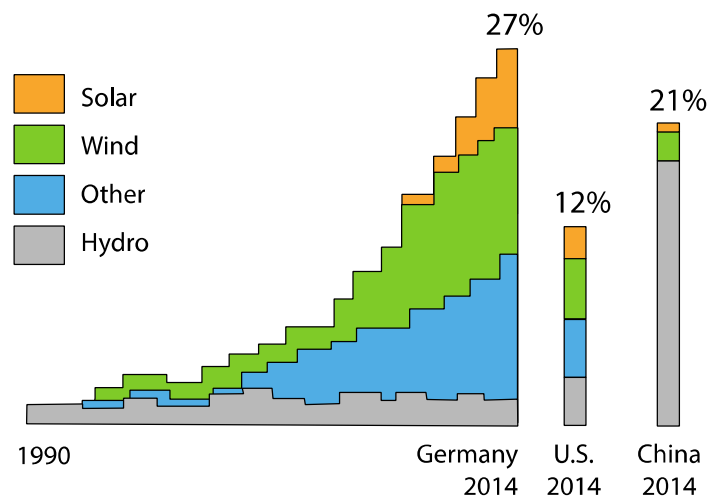
Germany, the world's fourth largest economy, is the world's leader in combatting global warming. In Germany citizen concern about global warming and the safety of nuclear power led to a decision to close all seventeen of their nuclear power plants, curtail use of fossil fuels such as coal, and focus on generating an Energiewende program. This program is rapidly reducing use of fossil fuels and generating alternative



energy sources. The goal is to cut planet-warming emissions by 40% by 2020, 80% by 2050. This resolution has come from grass roots citizen action despite opposition from the coal industry. Over 90% of the population supports Energiewende.

A leader in this movement, Hans Josef Fell, has a different approach to generating support for change. He does not push conservation efforts, which he believes people associate with a lower quality of life. Instead, he works for positive action. Using more renewable power sources and less coal is that action in Germany.

But what about Kids? What can they do? Is there action beyond recycling and turning off lights, important as these actions are? This lesson will involve Kids in thinking about such action and perhaps committing to an action project.



LESSON:

Action:

Kids meet with an environmental activist and generate ideas for action on behalf of planet Earth. They may commit to action as a group or as individuals.

Materials:

- Large easel and newsprint pad
- Black markers

Book: *You Are The Earth*, by David Suzuki and Kathy Vanderlinden

Preparation:

Well in advance, recruit one or two environmental activists to visit your class and share their work with the Kids. Look for one or two people who are focused on climate change, promoting renewable energy, working on legislation to constrain the fossil fuel industry or similar interests. A single recruit would be sufficient but another with a different focus would also be good.

- Meet with the activist(s) in advance of class to clarify goals and discussion points.
- Open the circle of chairs into an arc.
- Stand the large easel with the newsprint pad on it in the opening of the arc.
- Place black markers nearby.



LESSON PLAN

Opening Circle:

Greet the Kids as they come in and note who is present. Direct them to the arc of chairs.

Discussion:

Introduce the guest environmentalist(s) and tell the Kids why they are with us today: To talk with us about global warming and climate change and what needs to be done to combat them. Encourage Kids to ask questions and to share what they know about Greenland, Kiribati, and Mexican migrant workers (Lesson 5). Do they think such problems could happen here in the United States?

Action:

Here are some current affairs and actions for consideration if needed. The visiting environmentalists may have their own topics.

Current Affairs	Actions
Congress acting to abolish the EPA	Write letters to Congress.
Pipeline projects (W. Roxbury, N. Dakota)	Sit-ins; letters; send supplies
Deforestation	Plant trees locally. Write letters to Congress and to national park rangers.

- a) Kids can make informative and promotional posters to hang in the church or perhaps at school or the town hall.
- b) They can create songs, poems, and/or short plays about protecting our environment and perform at public meetings
- c) Perhaps older Kids could accompany adults on a protest march.

Here is a major option:

A group of Kids are actually suing the U.S. Federal Government. Here is why!

The Paris Accord is an international affiliation for countries to work together to reduce emissions that heat up Earth's atmosphere and contribute to weather extremes, leading to

climate change. Under President Obama the United States committed to this accord. President Trump has cancelled the U.S. commitment. A legal question is whether the president alone can do this.

Ann Aiken is the U.S. District Judge for the District of Oregon. She has filed suit on behalf of the world's children, who maintain they have a right to breathable air, clean drinking water, and livable climates in their lifetimes. She has recruited young people, ages 9 to 14, from diverse countries worldwide to testify. The Trump administration attempted to have the case dismissed but was overruled by the Federal courts. Trial is set for February 5, 2018 in Eugene, Oregon.

For More Information:

<http://news.nationalgeographic.com/2017/03/kids-sue-us-government-climate-change>

<http://www.cc.com/video-clips/k38ndq/the-daily-show-with-trevor-noah-xiuhtezcatl-martinez--taking-on-climate-change-with--we-rise->

Daily Show video of Xiuhtezcatl Martinez, one of the kids involved in the suit who also wrote a book about it, "We Rise." An interview is 15 minutes into the show.

As an option UU Kids could write a letter of interest in and support for this suit, which is for the benefit of all Kids worldwide. Send a letter to U.S. District Judge Ann Aiken, Eugene, Oregon.



Story:

The Call of the Mall, You Are The Earth (p.108), David Suzuki and Kathy Vanderlinden, Greystone Press, Vancouver, British Columbia, Canada, V5T 4S2, 2001.

The theme of this essay is addiction to shopping, whether it leads to happiness, and how it affects Earth's resources. It makes a clear connection between purchasing habits and use of Earth's resources.

Principles in Practice:

Whatever Kids decide to do, discuss with them how it relates to our UU principles.

Closing Words:

All present recite these words together:

“Never doubt that a small group of thoughtful
committed citizens can change the world.
Indeed it is the only thing that ever has...”

— Margaret Mead