

Ontario

ecological
LITERACY

RESOURCE

REVISED
2011-12



UNDERSTANDING CLIMATE CHANGE

IN GRADE 11 AND 12 GEOGRAPHY (UNIVERSITY/COLLEGE PREP, OPEN)



ONTARIO

ecoschools

ontarioecoschools.org

ACKNOWLEDGEMENTS

The Government of Canada's Climate Change Action Fund provided major funding for Ontario EcoSchools. Please see inside back cover for information on all of the partners involved in the development of the program.

Ontario EcoSchools: Understanding Climate Change in Grade 11 and 12 Geography (University/College Prep, Open)

DEVELOPER: Leesa Blake, Toronto District School Board

ADDITIONAL MATERIAL: Marlene Hume, Halton DSB; Kim Wallace, Halton DSB

REVIEWERS: Linda Barrett, Niagara DSB; Jon McGoey, London Catholic DSB; Lewis Molot, Faculty of Environmental Studies, York University Curriculum revisions (2005); Tina McPhee, Toronto DSB

EDITOR: Eleanor Dudar, Toronto DSB

REVISION 2012: Elanor Waslander, Kaitlin Doherty, Nataniel Lessnick

©2004 York University (Revised 2008)

Ontario schools, school boards, post-secondary institutions and government agencies may reproduce and adapt this publication in whole or in part for educational purposes without special permission from the copyright holder, as long as acknowledgement of the source is provided. If adaptation occurs, a clear distinction must be made between the original material and that which is added as part of the adaptation.

For more information about adapting this guide, go to www.ontarioecoschools.org.

Every reasonable precaution has been taken to trace the owners of copyrighted material and to make due acknowledgement. Any omission will gladly be rectified in future printings.

DESIGNER: Comet art + design

TABLE OF CONTENTS

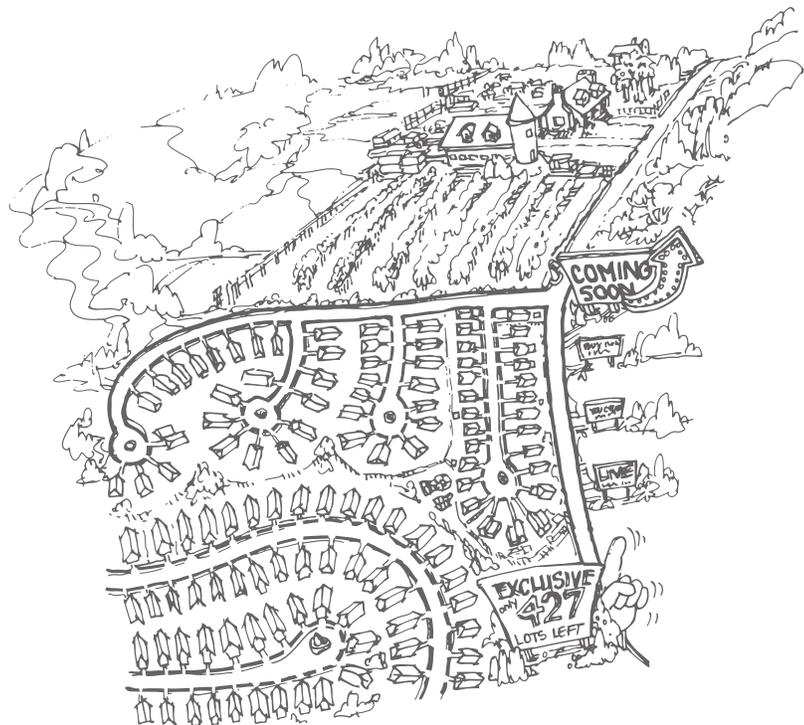
Understanding Climate Change in Grade 11 and 12 Geography (University/College Prep, Open)

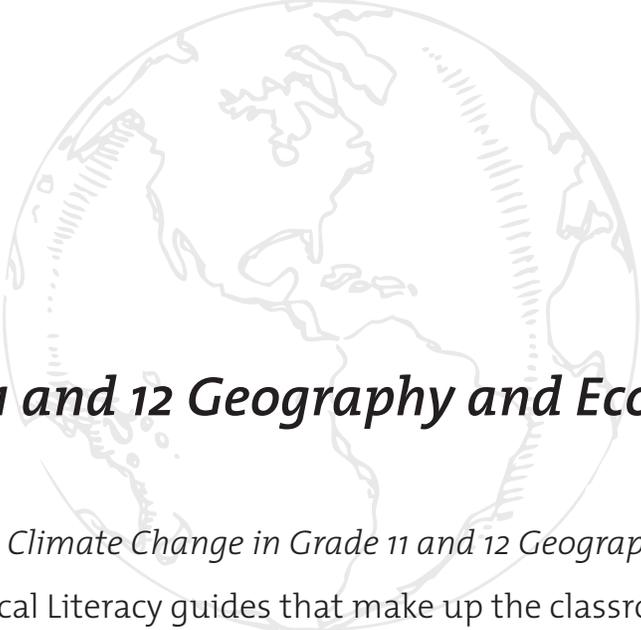
SECTION ONE

- 2** *Understanding Climate Change in Grade 11 and 12 Geography*
- 3** *Pathways to Developing Ecological Literacy*
- 5** *Understanding Climate Change: Fundamental Concepts*
- 6** *Climate Change 101*
- 7** *Teaching with Guiding Questions*
- 8** *Resource Overview*

SECTION TWO

- 12 CGD3M The Americas: Geographic Patterns and Issues, Grade 11 (College/University Prep)
 - 18 CGF3M Physical Geography: Patterns, Processes, and Interactions, Grade 11 (University/College Prep)
 - 24 CGG3O Travel and Tourism: A Regional Geographic Perspective, Grade 11 (Open)
 - 29 CGW4U Canadian and World Issues: A Geographic Analysis, Grade 12 (University Prep)
 - 36 CGR4M The Environment and Resource Management, Grade 12 (University/College Prep)
- 44 Appendix 1 Summary of the Kyoto Protocol and beyond





Grade 11 and 12 Geography and EcoSchools

Understanding *Climate Change in Grade 11 and 12 Geography* is one in the series of Ecological Literacy guides that make up the classroom component of EcoSchools. These resources offer teachers a new lens for seeing the environmental learning possibilities in the Ontario curriculum.

This resource is supported by *The Impacts of Climate Change*, a multimedia presentation that examines the impacts of climate change on the natural and human worlds

The EcoSchools Program resources support student learning and action that address climate change. Geography, with its highly integrated human and natural systems approach, is well positioned to foster understanding about climate change, its impacts and the possibilities for solutions.

PATHWAYS TO DEVELOPING ECOLOGICAL LITERACY

Improve Student Achievement through Ecological Literacy

Learning In, About, and For the Environment

Evidence is growing which supports the connection between environment-based education and increased student achievement.¹ Improving student achievement through ecological literacy can be developed in many ways. The Ontario Ministry of Education’s policy framework, *Acting today, Shaping tomorrow*, links ecological literacy to environmental education and defines it as “education about the environment, for the environment, and in the environment.” Teaching and learning *in, about, and for* the environment are powerful means to develop ecological literacy both in and outside of the classroom. (See diagram on page 4 for additional strategies.)

Inquiry-based Learning

Part of developing ecological literacy is using inquiry-based learning to reveal our dependence on the healthy functioning of the Earth’s living systems, which give us clean air, water, soil, food, and all the other resources we depend on. As our understanding of the inter-relatedness and complexity of life deepens, we can find ways to live on Earth that take into consideration the well-being of all life on the planet. Ecological literacy allows us to understand this dependence and interrelatedness, as well as the urgency of developing protective, sustainable, and restorative relationships with the natural systems that are affected by our daily activities.

Systems Thinking

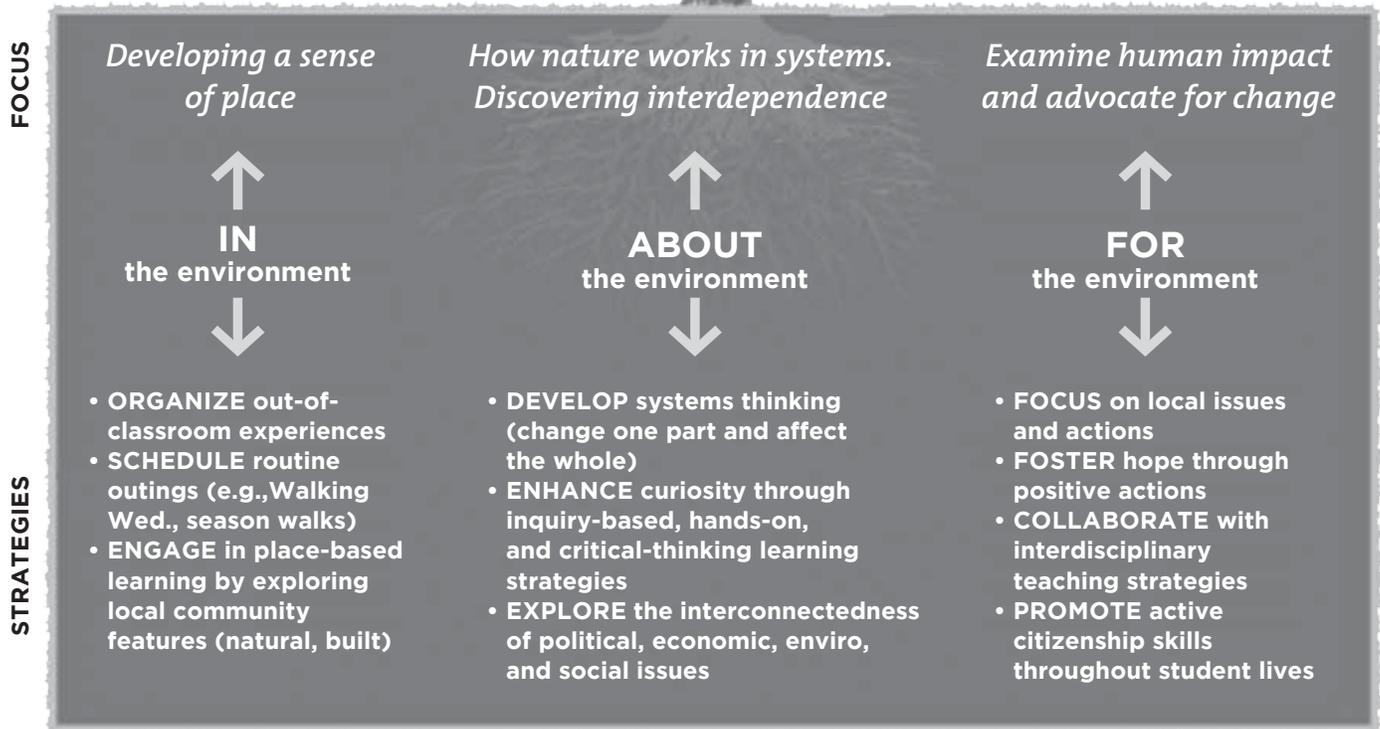
Systems thinking is an approach to learning that encourages students to think in terms of systems, and to recognize the world as an integrated whole with networks that define the way the parts function. One way students can use systems thinking is by *connecting the dots* in their learning, identifying interactions between the human and the natural world. Analyzing these interactions helps students understand some of the *causes and consequences* of human impact on the environment and vice versa. Through this process, students may discover that the *whole is greater than the sum of its parts*, thereby understanding how complex human and natural system interactions are.

Tools that support systems thinking include:

- Concept mapping: Visual representation of ideas that makes relationships explicit through arrows and linking words.
- Consequence mapping: Visual tool for illustrating the many kinds of future effects related to a real or imaginary event, issue, problem, or trend.
- Scenario mapping: Visual tool to help students show how an activity depends on resources from the Earth and sun.

¹Glenn, 2000. National Environmental Education and Training Foundation report; Lieberman & Hoody, 1998

STRATEGIES FOR DEVELOPING ECOLOGICAL LITERACY



Through teaching and learning *in, about, and for* the environment and using a systems thinking, we can deepen students’ ecological literacy and empower them to become active, engaged citizens of the Earth.

“When students are engaged in their learning and social environment, they are better able to develop the skills and knowledge and grasp the opportunities that can help them reach their full potential, pursue lifelong learning, and contribute to a prosperous, cohesive society.”

Ontario Ministry of Education, *Reach Every Student: Energizing Ontario Education* (2008), p. 12

UNDERSTANDING CLIMATE CHANGE: Fundamental Concepts



Some key concepts recur throughout this resource. These are addressed in the Ontario Grade 9 Geography course, but may need to be reviewed before students undertake inquiry relating to climate change. In particular, a grasp of systems thinking and the concept of the Ecological Footprint is essential to understanding climate change and our connection to it.

A Systems Thinking Approach

- The Guiding Questions and Common Understandings invite a systems approach — put at its simplest, this is the notion that a change in one component results in a change in the system. Describing the world in this

way allows us to understand the impact of *human activity as a system* or set of systems on natural systems, as well as the impact of natural systems on human systems.

Ecological Footprint

- This image powerfully represents the idea that humans have an impact on the Earth's ecology. The Ecological Footprint offers a calculation that converts people's consumption (human systems) into an

equivalent of how much of the Earth's land systems are required to sustain that consumption. The choices we make in our daily lives make a difference to the size of our footprint.

Greenhouse Gases

- Carbon dioxide (CO₂) is the major greenhouse gas (GHG) contributing to climate change (see Climate Change 101 for more details). Many human systems use fossil fuels that, when burned, emit CO₂. Each person

can calculate his/her own carbon dioxide emissions. Statistics are available to compare carbon emission sources and amounts by country.

www.climatehotmap.org/index.html

Choice

- Understanding the impacts of our actions is key to making choices that mitigate or slow

climate change. We CAN do something: locally, nationally, globally.

www.davidsuzuki.org

www.climatechange.gc.ca

Background: Climate Change 101

Source: *Canada's Action on Climate Change*
(www.climatechange.gc.ca)

Climate change is a long-term shift in overall weather conditions over time. It is measured by changes in temperature, precipitation, wind, snow cover, and other indicators. When we speak of climate change on a global scale, we are referring to changes in the climate of the Earth as a whole.

While the Earth's climate is naturally variable, its average state is regulated by factors such as the Earth's orbit around the sun and the natural greenhouse gas effect. In fact, the Earth would not be warm enough to sustain life without the natural greenhouse gas effect. The atmosphere is like a blanket, or greenhouse, trapping heat escaping from the Earth's surface. The principal natural greenhouse gases are water vapour and carbon dioxide. By burning fossil fuels such as coal, oil, and natural gas, we release more carbon dioxide into this blanket. Changing land use, such as deforestation and the conversion of land to agricultural use, has also contributed carbon dioxide to this blanket.

Causes of climate change can be divided into two categories – those related to natural causes and those created by humans.

Natural Causes

The climate can be affected by natural factors that are external to the climate system, such as changes in volcanic activity, solar output, and the Earth's orbit around the sun. It can also be affected by natural internal changes, such as variations in ocean currents, which can influence the climate for periods of decades.

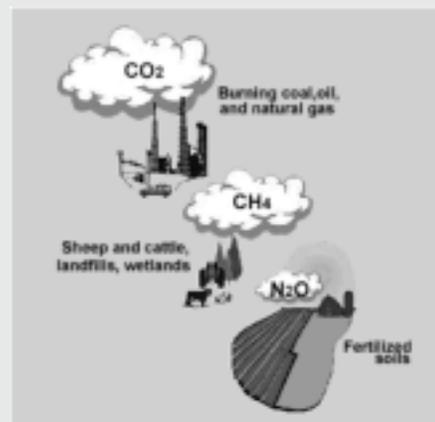
Human Causes

Climate change can also be caused by human activities, such as the burning of fossil fuels and the conversion of land for forestry and agriculture. Since the Industrial Revolution began about 250 years ago, climate change due to human influences has increased significantly because of the combustion of fossil fuels (such as oil, natural gas, and coal) and,

to a lesser extent, because of changes in land-use practices. As a result, the amount of heat-trapping gas in the atmosphere has increased, enhancing the warming capability of the natural greenhouse effect.

It is this human-induced enhancement of the greenhouse effect that causes the most environmental concern, because it has the potential to warm the planet at a rate that has never been experienced in human history, causing glaciers to retreat, sea levels to rise, and climatic zones to shift. Depending upon emissions during the twenty-first century, most experts agree that average global temperatures could rise by one to six-and-a-half degrees Celsius over this century. In Canada, this could mean an increase in annual mean temperatures in some regions of more than double the increase in the global average.

But climate change is more than just a warming trend. Increasing temperatures will lead to changes in many aspects of weather, such as wind patterns, the amount and type of precipitation, and the types and frequency of severe weather events that may be expected to occur. Such climate change could have far-reaching and/or unpredictable environmental, social and economic consequences.



Adapted from *A matter of degrees: a primer on global warming*, from the Environmental Citizenship Series. Environment Canada, Ottawa, 1993.

 **BROKEN LINK?** Google search Climate change Canada → Canada's Action on Climate Change → Climate Change 101

GUIDING QUESTIONS

This resource supplies Guiding Questions (and answers) as a tool for teachers to help students understand the many facets of climate change from a geographic perspective. Tips on how to use the Guiding Questions as both teaching and learning strategies follow:

Teaching with Guiding Questions

Student-led Inquiry

- **Brainstorming:** Teachers can use the Guiding Questions as a start point for class brainstorming activities.
- **Individual research projects:** Guiding Questions can be unpacked by students engaging in a research project. You can follow up with a presentation or report.
- **Group investigations:** Splitting up the class into working groups, teachers can use the Guiding Questions as focal points for discussions that everyone contributes to.

Assessment

- **Open-ended questions:** Teacher can generate open-ended questions for formal assessment.
- **Review material:** The answers generated during a unit can be compiled into review material for summative tests or presentations.

Re-framing Course Content

- **Ecological sustainability lens:** By connecting the course expectations to climate change and ecological sustainability, teachers can enhance the meaning of the expectations and support real-world context while developing students' critical-thinking skills.
- **Real-world context:** By exploring the current real-world context of climate change, students develop skills and an understanding of the complexity of a real-world issue.

RESOURCE OVERVIEW

Climate change is a complex subject requiring a multi-faceted analysis. Geography examines both the natural and human environments and how they interact as systems. This approach has helped geographers and other scientists understand causes and impacts of climate change and where to focus efforts in designing solutions.

The purpose of this document is to identify places where teachers can address key ideas about climate change in a sampling of senior Geography courses. To guide inquiry, a set of guiding questions is attached to a cluster of overall and specific expectations in five Geography courses in *The Ontario Curriculum Grades 11 and 12: Canadian and World Studies (2005)*. A number of central ideas are repeated from course to course. Approach the depth and detail of the material as suitable to the needs of the students and the intent of the course.

Along with guiding questions, specific examples or case studies are provided as a starting place for developing appropriate topics, accompanied by teaching suggestions. For each course, a number of resources are listed that include ideas for student activities. Others offer suggestions that can be incorporated into existing activities, assignments and tasks that are already being used within the course. Each course section concludes with common understandings in a climate change context that students are expected to develop and a list of resources.

The chart on the next two pages outlines some connections between the study of geography and climate change issues in five senior Geography courses.

COURSE GUIDING QUESTION**TEACHING SUGGESTIONS/
STUDENT ACTIVITIES****INFORMATION/DATA
(charts, graphs, maps)**

required for climate change related student inquiry

CGD3M**THE AMERICAS: GEOGRAPHIC PATTERNS AND ISSUES**

How does climate change have impacts on the natural and human systems within the environments of the Americas?

- Assign groups of students to countries in the Americas. Students research impacts and actions of climate change and suggest additional actions that country could take in order to reduce greenhouse emissions
- CO₂ emissions by country
- Severe weather trends (e.g., hurricanes)
- Economic statistics by country (e.g., tourism)
- Ocean currents (El Niño, La Niña)
- Energy technologies by country
- Kyoto Protocol

CGF3M**PHYSICAL GEOGRAPHY: PATTERNS, PROCESSES AND INTERACTIONS**

What are historic climate patterns and trends and how do they compare to current trends and impacts on the physical environment?

- Graph a variety of climate data to analyse trends in climate and make future predictions
- Assign students to expert groups representing different regions of the world to analyse the potential impact of the predicted climate change
- Temperature change of the Earth over time (glaciation)
- Ocean currents
- Atmospheric and hydrologic content
- Global vegetation patterns

CGG3O**TRAVEL AND TOURISM: A REGIONAL PERSPECTIVE**

What is the true ecological cost of travel?

- Use a case study to model the exploration of environmental issues related to tourism for a specific destination and to examine how the issue is addressed
- Have students apply the inquiry to a destination of her/his choice
- Use comparison charts examining CO₂ generation caused by different forms of travel, and by countries
- Ecological Footprint (calculator and comparison data by country)
- Carbon emission by mode of transportation
- Case studies on impact of tourism

COURSE GUIDING QUESTION

TEACHING SUGGESTIONS/ STUDENT ACTIVITIES

INFORMATION/DATA (charts, graphs, maps)
required for climate change related student inquiry

CGW4U CANADIAN AND WORLD ISSUES

What are the geopolitical implications of climate change?

What will it take for nations of the world to participate in responding to the challenge of climate change?

- *Issues-based:* The topic of climate change could be addressed either through a food disparity issue (prediction based on trends) or through the issue of energy sources and availability
- *Integration:* Within a culminating task — depending upon the format (issues by country or by theme) — encourage students to include the connection to climate change as part of the overall assignment and make predictions about its impact, as part of the inquiry

- Carbon dioxide emission by country
- Cost of mitigating climate change
- NGOs that take action on climate change
- Multinational companies: who is where
- Type of government
- GNP by country
- Green technologies

CGR4M ENVIRONMENT AND RESOURCE MANAGEMENT

How do the consumer choices we make as individuals, or as a nation, have an impact on the environment?

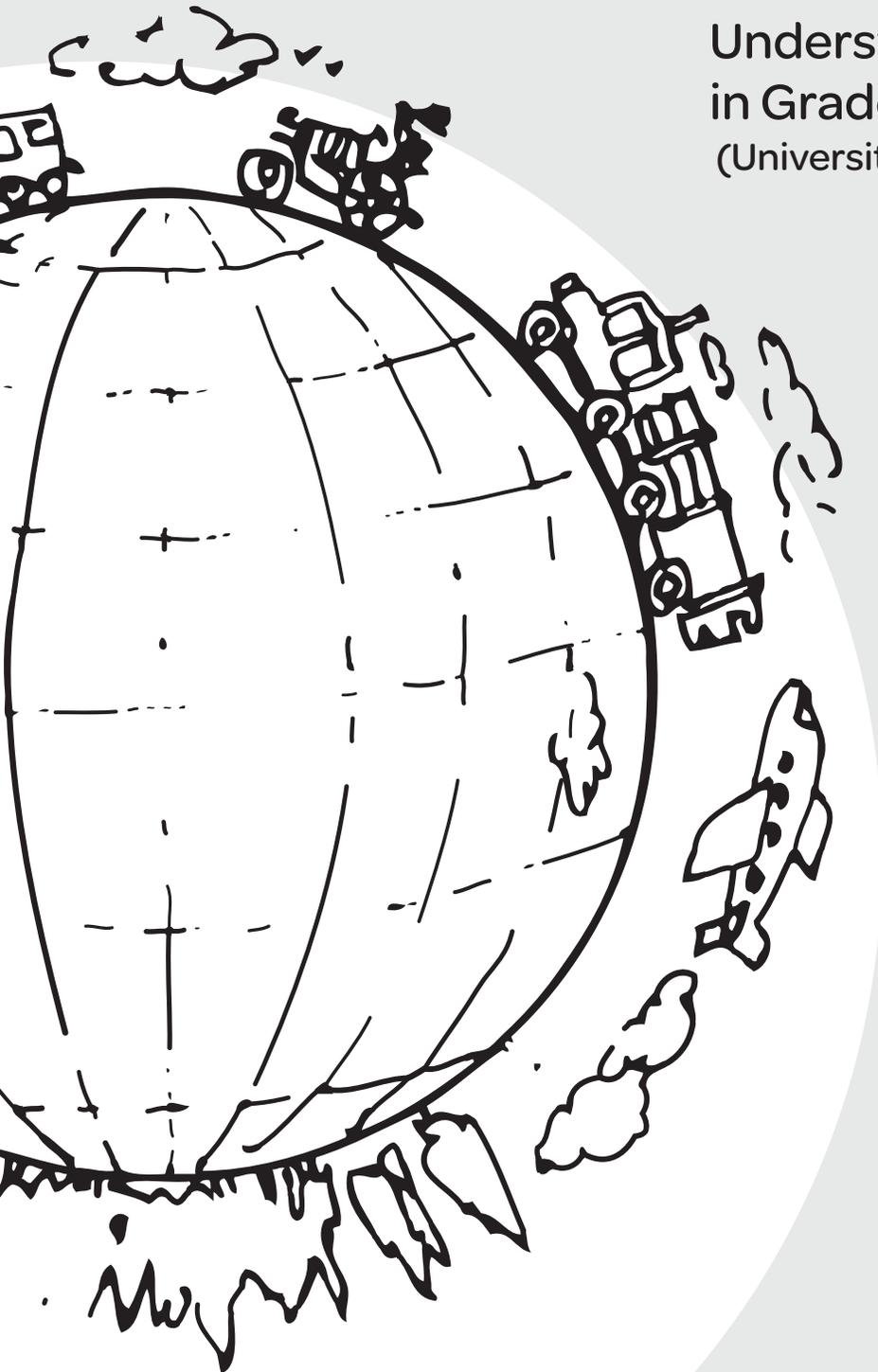
- Students produce an environmental impact assessment of their current consumer choices (a school waste audit may also be undertaken)
- Extend the impact assessment to a cost-benefit analysis of larger scale activities such as forestry, farming practices, energy supply etc. (one could use a case study as an example)
- Develop action plans identifying how to make a difference (the cost-benefit analysis and action plan could be worked through by individual students or in groups)

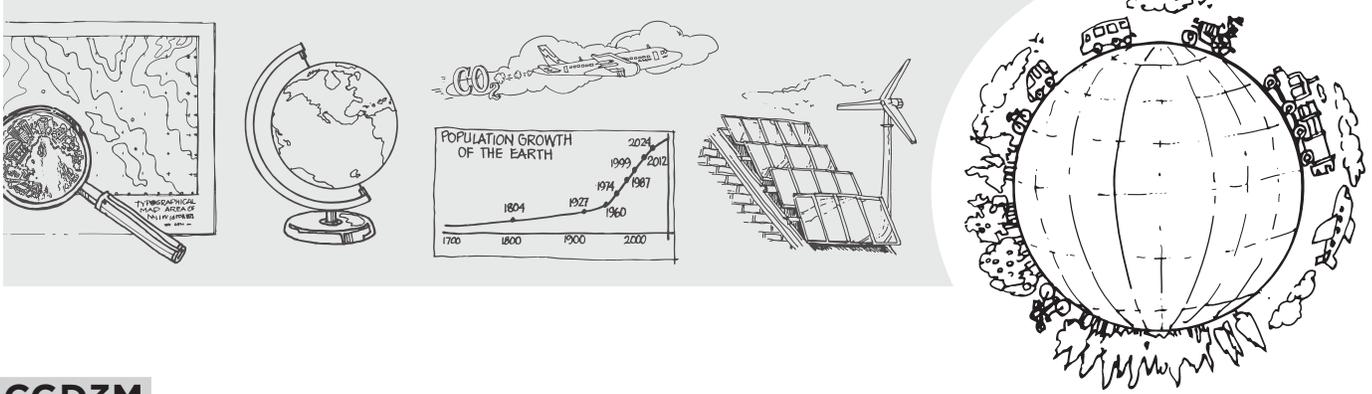
- Kyoto Protocol
- NGOs that take action on climate change
- Green technology
- Carbon dioxide calculator
- Ecological Footprint calculator

It is critical to remember that inquiry skills are inherent within the discipline; students should gather and analyse their own data. The resources listed within each course supply students with readily current information to practice these skills. Atlases and video sources will also be important resources. Although each course has a specific set of resources listed, some of them may also be useful for other courses.

SECTION 2

Understanding Climate Change
in Grade 11 and 12 Geography
(University/College Prep, Open)





CGD3M

THE AMERICAS: GEOGRAPHIC PATTERNS AND ISSUES, GRADE 11, UNIVERSITY/COLLEGE PREPARATION

Overview

Students analyse the impact of climate change on various countries within the Americas from physical, economic and cultural perspectives. Comparisons of sources and quantities of greenhouse gas emissions by country lead to suggestions for future actions to address climate change.



SYSTEMS THINKING

The world is a network of natural and human systems in constant interaction.

How does climate change have an impact on the natural and human systems within the environments of the Americas?

Curriculum Expectations

Please see page 15 for a list of the course curriculum expectations that can be linked to the Guiding Questions below.

GUIDING QUESTIONS

QUESTIONS	LEARNING CONCEPTS
<p><i>How do different nations and regions contribute to CO₂ production?</i></p>	<p>Economic forces (trade of resources or cash crops) can affect state decisions that have global consequences. Deforestation for harvesting timber or to produce more arable land for cash crops means that carbon sequestered in the forest is released into the atmosphere.</p> <p>Using marginal land for agriculture requires massive use of fertilizers and pesticides produced through industrial processes that also contribute to GHG emissions. Such unsustainable practices reduce the long-term yield and can lead to desertification and problems with sources of potable water.</p> <p>Use data to rank nations in terms of CO₂ production, national wealth and consumption of resources (e.g., wood, oil, coffee). This data can then be compared to economic and environmental disparity that contributes to demographic changes including increasing urbanization and the erosion of indigenous cultures (and perhaps sustainable practices).</p>

QUESTIONS	LEARNING CONCEPTS
<i>How are these nations and regions differently affected by the impact of climate change?</i>	The consequences of climate change affect all people, but the poorer nations are often the most vulnerable to devastating climatic variations. This is seen when considering the impact of severe weather events, such as hurricanes, which can wipe out an annual crop and kill many people.
<i>Who is responsible for making decisions about the reduction of GHGs? What are the kinds of decisions that can be made by specific nations or regions?</i>	Individuals, multinational corporations and governments can participate in international efforts to manage economic and environmental concerns. The Kyoto Protocol is such an effort. Different strategies are used to find energy sources that do not contribute further to climate change. Sharing energy-efficient technologies can help developing nations as they adapt to the constraints of agreements such as Kyoto. Different countries will have different solutions: some technologies will be more appropriate for one country than another (e.g. wind vs. solar energy).

CASE STUDY

HAITI AND A CHANGING CLIMATE

Ongoing human interaction with the environment may lead to significant environmental changes that then affect our ability to sustain the population. This can lead to human adaptation, new interactions and further unforeseen environmental changes. For example, the deforestation of Haiti has resulted in desertification, soil loss, diminished food production and the loss of potential tourist activity. Haiti has little ability to sustain its population or withstand the destructive force of hurricanes. On a larger scale, such environmental changes contribute to global climate change that has an impact on us all, limiting our ability to aid others.

The role of CO₂ gas is central in understanding climate change. An increase in CO₂ and other heat-trapping gases changes the composition of the atmosphere and affects the flow of energy out of the planet into space: more energy is retained and transferred into wind and water

movement that affects wind and ocean current patterns. Identifying CO₂ sources and the global nature of this issue helps people to understand the need for international approaches that limit production and may help slow the rate of climate change on the planet.

Severe weather has always existed, but there are now more severe weather events which can affect countries like Haiti. Severe weather patterns will affect different areas of the Earth in different ways. These changes in frequency and severity may be linked to increased energy and changing levels of CO₂ in the atmosphere. With improved satellite technology, temperature data can be collected (e.g. atmospheric and oceanic data) and trends can be tracked allowing for forewarning of conditions such as El Niño, La Niña or hurricane formation. The relationship between severe weather events and climate change is a complex one: see Appendix 1 on page 42 for more information.

Teaching Suggestions

- **Using Guiding Questions:** The Guiding questions (listed on p. 7) can be used in a number of ways. One suggestion is to use them to model and develop inquiry skills. As a class examine the guiding questions and gather information on Canada. Illustrate the use of various representation forms (charts, graphs, maps) to present different kinds of data, including temperature, CO₂ sources, forested areas and population levels. See the resource section for this course for a list of supporting resources and atlases.
- **Apply learning to other countries:** once a basic understanding is established, students can then apply the approach on other countries within the Americas.
- **Expert Focus Groups:** First, examine the questions from your local perspective to model for the class the critical thinking needed to respond to the guiding questions.

Follow up by organizing students into small groups (3 to 5 students) responsible for ongoing research for a nation or region of nations. These expert focus groups can then revisit the same geographic place from many different perspectives, including physical geography, historical development, demographic patterns, climate, agricultural output and changing use of resources. Have students include CO₂ in their survey of the nation or region, both its sources and the areas that sequester and store carbon, as well as sites of severe weather events and environmental degradation. This environmental perspective can provide students with an opportunity to consider climate change issues within the larger context of natural geographic systems and interacting social systems.

RESOURCES

LOCAL AND REGIONAL CONSEQUENCES OF GLOBAL WARMING

Global Warming: Early Warning Signs – annotated world map. 4 Activities:

- *Climate Change in my City*
- *Oral History*
- *Climate Change and Disease*
- *Climate Change and Ecosystems*

www.climatehotmap.org

DIOXIDE EMISSIONS

Climate and atmosphere – includes data identifying carbon emissions by source for individual countries

<http://earthtrends.wri.org>

CLIMATE CHANGE ISSUES AND POTENTIAL SOLUTIONS

An overview of climate change issues and solutions, with fact sheets on alternatives to fossil fuels.

www.panda.org/about_wwf/what_we_do/climate_change/index.cfm

EL NIÑO AND LA NIÑA

Temperature changes in the Pacific Ocean related to El Niño and La Niña events

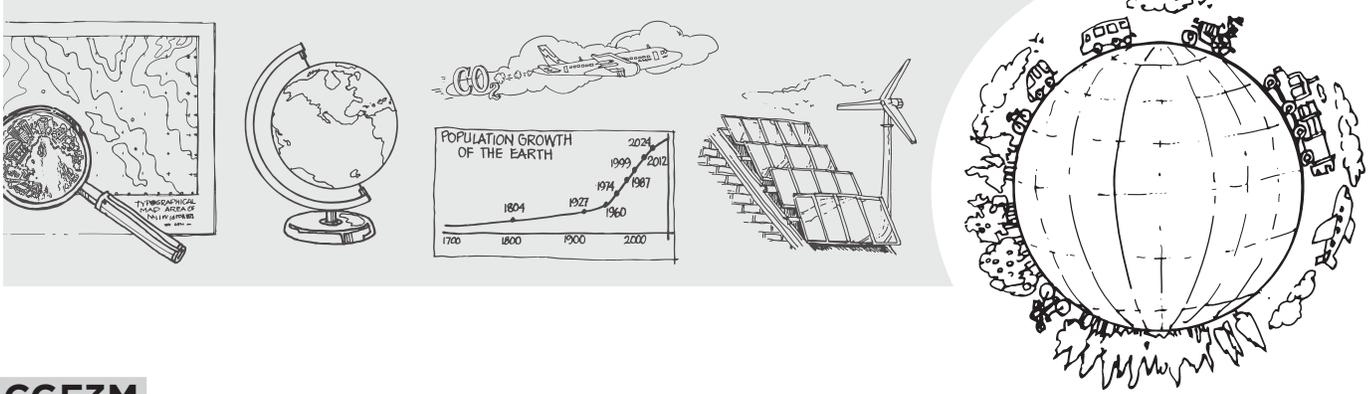
www.jpl.nasa.gov/earth/ocean_motion/el_nino_index.cfm

CURRICULUM EXPECTATIONS

STRAND/OVERALL EXPECTATIONS	SPECIFIC EXPECTATIONS
<p>Geographic Foundations: Space and Systems</p> <ul style="list-style-type: none"> • compare the diverse human systems and cultural realms of the Americas • analyse the political, economic, and social factors that contribute to disparities in economic development within the Americas 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • describe the patterns of natural characteristics in the Americas • describe the cultural realms and other major human patterns of the Americas • explain the relationships among patterns of settlement, resource distribution, development, and migration in selected regions of the Americas • describe trade patterns within and between selected economic regions of the Americas and analyse the factors that have shaped them <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • analyse the factors affecting the economic development of different regions in the Americas • compare the standards of living of various groups selected countries or regions of the Americas <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • analyse economic and quality-of-life data to identify patterns of socio-economic inequality within the Americas • analyse development patterns in selected regions of the Americas and identify the benefits and disadvantages of development for each region chosen
<p>Human-Environment Interactions</p> <ul style="list-style-type: none"> • analyse the causes and effects of human-environment interactions in various ecological zones of the Americas • evaluate the environmental and economic consequences for the Americas of natural hazards and climatic variations • analyse the linkages between population shifts and changes in physical and human environments in the Americas 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • describe the causes and effects of environmental degradation in specific areas of the Americas • analyse the regional distribution of different types of natural disasters and climatic variations that affect the Americas and describe their consequences • analyse the effects of rural-to-urban population shifts on mega-cities of the Americas <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • analyse the short-term and long-term social, environmental, and economic effects of natural hazards on selected regions in the Americas • compare the ways in which selected groups of indigenous peoples in the Americas have responded to the challenges and opportunities of their environments • analyse how human migrations have affected selected natural and human environments in the Americas • predict the direction of future economic development in the Americas and its impact on the environment <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • conduct a geographic inquiry that demonstrates how various regions in the Americas are affected by and deal with water scarcity • describe the long-term local and global effects of the destruction of major forest regions in the Americas • analyse how the production and transportation to market of selected resources affect natural ecosystems and human societies in the Americas

STRAND/OVERALL EXPECTATIONS	SPECIFIC EXPECTATIONS
<p>Global Connections</p> <ul style="list-style-type: none"> • evaluate the impact of the global economy on the environment and peoples of the Americas • analyse how the nations of the Americas interact to promote or defend their political, economic, environmental, and social interests 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • describe how disparities between rich and poor nations in the Americas affect interactions between them • describe various ways in which individuals, multinational corporations, and governments participate in the international relations of the countries of the Americas • describe Canada’s responsibilities to the rest of the countries of the Americas • explain how their geographic advantages and disadvantages affect the economic development of the nations of the Americas <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • evaluate the effects on Central and South America of world demand for the regions’ products and resources • explain the economic, social, and environmental impact of the global economy on the people and environments of selected countries in the Americas, including Canada • analyse economic data to determine the global ranking, as producers and users of resources, of the Americas as a group and of individual nations of the Americas <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • analyse selected examples of relationships that have developed between regions in the Americas because of environmental problems, resource needs, and border conflicts
<p>Understanding and Managing Change</p> <ul style="list-style-type: none"> • evaluate the effects of various political, economic, social, and technological changes on physical and human environments in the Americas • evaluate various aid programs in the Americas and their impact 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • describe how population distribution in the Americas has changed over the past one hundred years as a result of changes in population growth, the economy, and technology <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • compare the problems of living in a large city in North America to those of living in one in South America • analyse a development project in the Americas to determine its effect on local environments and economies, including those of indigenous peoples

STRAND/OVERALL EXPECTATIONS	SPECIFIC EXPECTATIONS
<p><i>Methods of Geographic Inquiry and Communication</i></p> <ul style="list-style-type: none"> • <i>use the methods and tools of geographic inquiry to locate, gather, evaluate, and organize information</i> • <i>analyse and interpret data gathered through research and investigation, using a variety of methods and geotechnologies</i> • <i>communicate the results of geographic inquiries, using appropriate terms and concepts and a variety of forms and techniques</i> 	<p><i>Research</i></p> <ul style="list-style-type: none"> • develop and use appropriate questions to focus a geographic inquiry • gather geographic information from primary sources and secondary sources to research a geographic topic or issue • gather geographic information, using a variety of geographic tools and technologies • evaluate the credibility of sources and the reliability and usefulness of information <p><i>Interpretation and Analysis</i></p> <ul style="list-style-type: none"> • distinguish among opinion, argument, and fact in research sources • use a variety of geotechnologies to interpret, analyse, and synthesize information in connection with a geographic inquiry • use graphic organizers to clarify and interpret geographic information • use different types of maps to identify and interpret geographic relationships • use appropriate statistical methods and categories of data in geographic analysis, observing accepted conventions • develop possible solutions to geographic problems or issues, using appropriate forecasting, decision-making, and/or problem solving strategies • explain the different points of view on a geographic issue that are, or might be, held by various stakeholders • produce a variety of maps, diagrams, and charts, following accepted conventions, to illustrate geographic patterns and relationships • provide appropriate and sufficient geographic evidence and well-reasoned arguments to support opinions and conclusions • complete an independent inquiry that deals with a topic or issue concerning the Americas and that reflects the required elements of a geographic inquiry <p><i>Communication</i></p> <ul style="list-style-type: none"> • communicate the results of geographic inquiries, for different audiences and purposes, using a variety of forms and including geographic visual supports, both conventional and geotechnological • use an accepted form of academic documentation to acknowledge all information sources, including electronic sources • use appropriate terminology when communicating results of geographic inquiries



CGF3M

PHYSICAL GEOGRAPHY: PATTERNS, PROCESSES, AND INTERACTIONS, GRADE 11, UNIVERSITY/COLLEGE PREPARATION

Overview

Using geological and atmospheric data, students will analyse historical and current patterns of climate and predict future climate trends and weather patterns. Physical, economic and social impacts of climate change in different regions of the world will be examined.



SYSTEMS THINKING

The world can be viewed as networks of relationships among natural systems (as well as between human systems and natural systems) that constantly feed back to alter these dynamic relationships.

How do past and current climate patterns have an impact on the physical environment of the Earth?

Curriculum Expectations

Please see page 21 for a list of the course curriculum expectations that can be linked to the Guiding Questions below.

GUIDING QUESTIONS

QUESTIONS	LEARNING CONCEPTS
<p><i>What physical factors contribute to global climate patterns? How is energy change in the atmosphere related to climate change? How has climate changed over time?</i></p>	<p>The physical nature of the Earth can be explained in terms of how energy interacts with natural systems (such as the atmosphere, the hydrosphere, the lithosphere and the biosphere) to produce global climate patterns.</p> <p>Understanding how energy change in the atmosphere relates to climate change demands a review of geologic time scales as compared to human time scales. The historical understanding of changing climate patterns encompasses longer periods of time than is evident in the timescale in which we measure the current imbalance in the carbon cycle and the hydrological cycle.</p>

QUESTIONS	LEARNING CONCEPTS
<p><i>How are the familiar climate patterns of today linked to a region's economic prosperity and productivity? How could changes to prevailing winds and ocean currents change the productivity and prosperity of different regions?</i></p>	<p>Social systems interact with natural systems and begin to affect local environmental conditions. These interactions can eventually have a greater impact, changing systems beyond the local environment where they began. These changes affect wind and ocean current patterns that will result in dramatic changes for both developed and developing nations.</p> <p>The economic feasibility of certain activities (forestry, agriculture, fishing) in present-day locations will decline, but predictions are not clear. An analysis of the impact of different activities (e.g., resource industries) and the impact of local behaviour on global change can provide case studies of how human activity can increase or decrease the magnitude and rate of climate change.</p>

INVESTIGATION

UNDERSTANDING CO₂ TRENDS TO IDENTIFY POSSIBLE FUTURE OUTCOMES

Both local weather and global climate patterns are largely the result of the interactions of the atmosphere and hydrosphere. Prevailing winds and ocean currents result in specific weather patterns (too hot, severe weather) that contribute to changing demographic patterns and economic development. These changing patterns affect the productivity of different regions, which in turn is linked to people's prosperity.

Understanding the interactions of the many factors that contribute to climate is difficult. Data that provides evidence of historical climate patterns and changes can help people today understand and predict the effect of changing the level of CO₂ in the atmosphere. Using data

that show trends of change, students can identify possible future outcomes.

Current use of monitoring technology allows people to track *sources* of CO₂ emissions and identify carbon sinks — areas where carbon is being sequestered. This type of technology is useful for refining and altering models of climate change over time. Such technology could also be used as part of a system to monitor the effectiveness of action and to ensure compliance with CO₂ production limits. (Having such technical capacity raises other questions: e.g., “Would society allow an ‘environmental police service’ to detect the source of emitted gases?”)

Teaching Suggestions

- **Visual Representation of Data:** There are many opportunities throughout this course where students could take data in different forms and create a visual representation. For example, students can take numbers from charts to form line graphs or bar charts, or to indicate variation on a map with several colours. Students may also be encouraged to gather their own data through field studies.
- **Prediction:** As different topics are approached within the course, students can predict how climate change will affect a specific region, then make larger global connections. An obvious opportunity comes in examining volcanic eruptions and linking them to different ice ages. Prediction can also be done at a very local level by examining micro-climates. For example, how does the construction/destruction of a hill make a difference to wind pattern, run-off, temperature, etc? How does the creation of a parking lot on a former agricultural field make a difference? (Joni Mitchell’s “Pave Paradise and Put Up a Parking Lot” may be used as an introduction. “Concrete Jungle” is another possibility.)
- **Specific Study of Climate Change:** Within this course, it would be very appropriate to incorporate the issue of climate change as a part of the climate systems unit. As the basics of climate systems are covered (ocean currents, wind patterns, temperature fluctuations, etc.) the different components and their relationship to climate change could be assigned to individuals or students working in small groups. Assign each group of students a particular region of the world: have them research the impact of climate on their region, and then predict the changes to that region if climate change (e.g., overall temperature increases) continues at its present pace. Results of the physical changes could then be linked to the consequent impact on the people (human systems) in the region. A comparison chart such as the following could be set up to synthesize the details found within the groups:

NATION/ ECOZONE	CURRENT CLIMATE (TEMP. RANGE)/ VEG/ WILDLIFE PATTERNS	CURRENT ENVIRONMENT- RELATED INDUSTRY AND SETTLEMENT PATTERN	PREDICTED PHYSICAL CHANGES IN THE ENVIRONMENT RELATED TO CLIMATE CHANGE	PREDICTED IMPACTS AND SETTLEMENT
Canada/prairie grasslands	Research according to the subheadings above; annotated maps would be appropriate here	Rich prairie soils have allowed the development of agriculture; people live in communities along rivers	Hot dry conditions eventually inhibit the soil’s ability to absorb rainfall and reduce grain yields; severe weather patterns include storms that produce heavy rainfall that is not absorbed by the soil, causing flooding.	Farmers change types of crops and soil mendments to accommodate the growing conditions; human communities will have to pay for municipal infrastructure that can accommodate the effects of severe weather. In extreme cases, the population may be forced to migrate if the land ceases to be productive.

RESOURCES

EL NIÑO AND LA NIÑA

Explanations of El Niño and La Niña and effects
www.pmel.noaa.gov/tao/elnino/nino-home.html

OCEAN CURRENTS AND CLIMATE CHANGE

Woods Hole Oceanographic Institute – oceans and climate change
www.whoi.edu

GLACIATION AND CLIMATE CHANGE

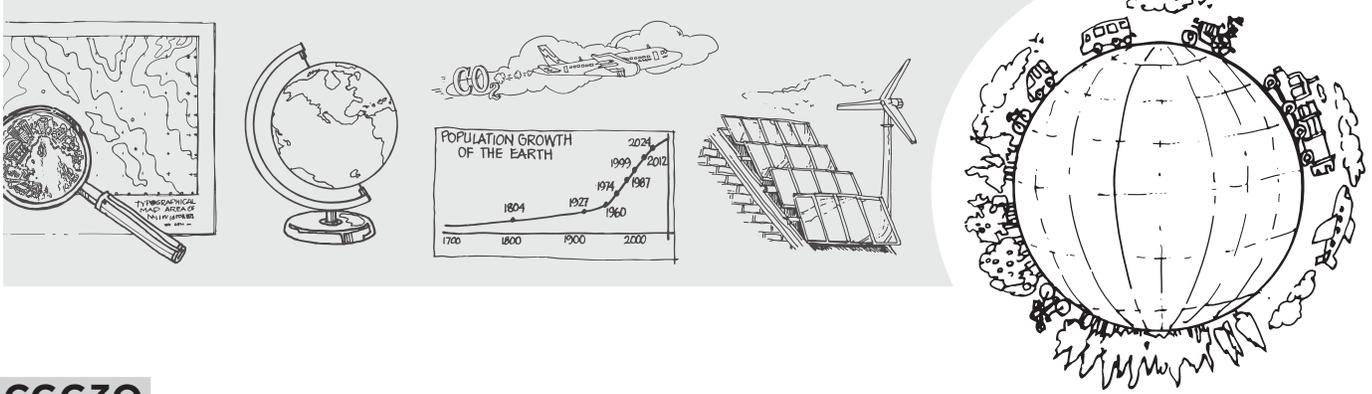
An assignment which addresses how climate change affects glaciation and vice versa (links for answers)
www.sln.org.uk/geography/enquiry/we35a.htm

CURRICULUM EXPECTATIONS

STRAND/OVERALL EXPECTATIONS	SPECIFIC EXPECTATIONS
<p>Geographic Foundations: Space and Systems</p> <ul style="list-style-type: none"> analyse the sources and nature of energy flows through the lithosphere, atmosphere, hydrosphere, and biosphere explain the physical processes that create landforms, climate, soils, and vegetation. 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> explain how the earth's orbit and tilt relate to the seasons and annual variations in climate identify the principal features of the lithosphere, atmosphere, hydrosphere, and biosphere identify the interconnections among natural systems within selected ecosystems describe the origins, distribution, and frequency of different kinds of storms <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> describe the flow of matter and energy through ecosystems and explain the relationship of these flows to landforms, climate, soils, and vegetation explain how climatic controls act upon the elements of the atmosphere to produce the climatic zones of the earth <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> explain the concepts of heat balance and air circulation, using local examples analyse the effects of natural variations in climate on the structure and composition of the soils and vegetation of selected regions
<p>Human-Environment Interactions</p> <ul style="list-style-type: none"> evaluate the impact of natural systems on people and their activities evaluate the impact of human life on the environment explain the importance of stewardship and sustainability as guiding principles for human use of the physical environment 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> describe the trade-offs for humans living in areas that are subject to natural disruptions describe the effects of human activities describe the importance of using sustainable practices in resource-based industries <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> analyse how natural hazards affect human activities analyse ways in which human activities may increase or decrease the risks from natural hazards evaluate the impact on a selected region of human-caused changes in atmospheric conditions <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> evaluate the impact of human activities on natural cycles analyse how selected human activities affect a local environment illustrate how the concept of sustainability is applied in a local environment

STRAND/OVERALL EXPECTATIONS	SPECIFIC EXPECTATIONS
<p>Global Connections</p> <ul style="list-style-type: none"> • explain the reasons for the global patterns of continents and oceans, landforms, climate, soils, and vegetation • explain the importance of water to global systems • analyse local, regional, and global issues related to physical geography 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • explain the role that oceans and ocean currents play in moderating climate <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • explain the relationships that link global patterns of landforms, climate, soils, and vegetation to each other • describe the distribution of significant ocean currents and prevailing winds and their relationships to world vegetation and soil patterns <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • compare global distribution patterns of climate, soils, and vegetation with patterns in a local bioregion • analyse the effects of human activities on water resources • summarize the geopolitical issues facing nations that share various physical regions • analyse the effects that human activities and/or natural events in a region or country can have on another part of the world
<p>Understanding and Managing Change</p> <ul style="list-style-type: none"> • analyse the causes and consequences of climate change • explain how human uses of the earth, especially uses involving technology, cause changes over time in natural systems 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • describe the potential effects of climate change on the sustainability of resource based industries • explain the relationship between natural variations in global climate and glacial movements • identify the mechanisms of change within the lithosphere, atmosphere, hydrosphere, and biosphere <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • distinguish natural short-term variability from long-term trends in historical climate data • explain the potential effects of long-term climate change on different parts of the world, including their local community • explain the correlation between changes in population density, changes in human activities, and changes in the “ecological footprint” of our species <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • describe the difficulties involved in predicting climate change • analyse changes in the physical geography and land use in their local area over time to determine how these changes have affected the population and the environment • evaluate the role of technology in changing relationships between humans and the environment

STRAND/OVERALL EXPECTATIONS	SPECIFIC EXPECTATIONS
<p><i>Methods of Geographic Inquiry and Communication</i></p> <ul style="list-style-type: none"> • <i>use the methods and tools of geographic investigation and inquiry to locate, gather, evaluate, and organize information</i> • <i>analyse and interpret data gathered through research and investigation, using a variety of methods and geotechnologies</i> • <i>communicate the results of geographic inquiries and investigations, using appropriate terms and concepts and a variety of forms and techniques</i> 	<p><i>Research and Investigation</i></p> <ul style="list-style-type: none"> • develop and use appropriate questions to focus a geographic inquiry or investigation • gather geographic information from primary sources and secondary sources to research a geographic topic or issue • use remote-sensing imagery, maps, the global positioning system, and geographic information systems to measure natural conditions <p><i>Interpretation and Analysis</i></p> <ul style="list-style-type: none"> • use a variety of geotechnologies to interpret, analyse, and synthesize information in connection with a geographic inquiry • use different types of maps to interpret geographic relationships • use appropriate statistical methods in geographic analysis, observing accepted conventions • develop possible solutions to geographic problems or issues, using appropriate forecasting, decision-making, and/or problem solving strategies • explain the limitations on our ability to make accurate predictions about physical phenomena • explain the different points of view on a geographic issue that are, or might be, held by various stakeholders (e.g., individuals, business organizations, governments, special interest groups) • produce a variety of maps, diagrams, and charts, following accepted conventions, to illustrate geographic patterns and relationships • provide appropriate and sufficient geographic evidence and well-reasoned arguments to support opinions and conclusions <p><i>Communication</i></p> <ul style="list-style-type: none"> • communicate the results of geographic inquiries and investigations, for different audiences and purposes, using a variety of forms and including geographic visual supports, both conventional and geotechnological • use an accepted form of academic documentation to acknowledge all information sources, including electronic sources • use appropriate terminology when communicating results of geographic inquiries and investigations.



CGG30

TRAVEL AND TOURISM: A REGIONAL GEOGRAPHIC PERSPECTIVE, GRADE 11, OPEN

Overview

Students will attempt to calculate the true ecological cost of travel through an examination of energy and carbon costs of different forms of transportation and an assessment of the impact of tourism on travel destinations. Impact predictions will help guide suggested future tourism patterns, policies and behaviours.



SYSTEMS THINKING

Examine the relationship between human actions and natural systems as they constantly affect each other. Some environments are more fragile than others, and technology may accelerate the impact that human actions have on natural systems.

What is the true ecological cost of travel?

Curriculum Expectations

Please see page 27 for a list of the course curriculum expectations that can be linked to the Guiding Questions below.

GUIDING QUESTIONS

QUESTIONS	LEARNING CONCEPTS
<i>What is the Ecological Footprint of different travel and destination choices?</i>	<p>We each create an Ecological Footprint that reflects our use of planetary resources. (This model of human interaction with the environment should be familiar to most students from previous courses.)</p> <p>As students explore regions and consider tourism opportunities, the choices that people make with respect to transportation need to be considered. We use energy to travel, and some travel choices produce more CO₂ than others.</p>
<i>What are the energy options for different regions?</i>	<p>Research the energy options available to sustain tourism in different regions. (For example, does one country have more access to a particular energy alternative than another does? What are the best choices given the physical and social resources of the country?) World maps that provide energy sources (wind potential or solar kilojoules along with hydro and oil and gas potential) will help here.</p>

QUESTIONS	LEARNING CONCEPTS
<p><i>What might help to change people's attitudes and expectations about comfort and convenience when they travel? What kind of policies could be put in place to address environmental degradation?</i></p>	<p>Convenience and attitudes about what we expect to find when we travel to a particular destination are related to energy choices which in turn are usually related to climate changing greenhouse gases. Consider what people expect as they make decisions and choose to travel to a particular place.</p> <p>The human use of resources and its consequences can lead to unforeseen damage, such as high levels of ground level ozone or acid rain from vehicular emissions, or damage to living reefs by cruise ship waste and traffic. Highlight the idea of changes at both local and global ecosystem levels being in constant interaction, producing ripple effects (butterfly/chaos theory).</p>
<p><i>How will climate change affect future possibilities for tourism for specific destinations?</i></p>	<p>As Earth's atmosphere captures more heat, the energy is distributed in the atmosphere and hydrosphere differently, creating climatic shifts. These climatic shifts will affect the environmental features of many regions, and so change the nature of tourism in these regions.</p> <p>Learning Activity: Have students consider the likely impact of climate change as they examine the physical features of a region and current settlement patterns along with the tourist attractions. For example, if a tourist site is known for its beaches, and the beaches are likely to flood, or if a site is known for a particular species of plant or animal and the environmental conditions change, it could mean not only the loss of the tourist site but the loss of a species as well. (This is an opportunity to revisit the idea of the importance of maintaining biodiversity: fraying the web of life makes many living organisms — including humans! — more vulnerable.)</p>

INVESTIGATION

UNDERSTANDING HOW TOURISM CAN CONTRIBUTE TO CLIMATE CHANGE

Energy and resource use are key components in understanding how human activity creates changes to the environment of a particular destination. Exploring issues surrounding transportation provides a way of understanding the impact of our actions. Seeing transportation and energy choices in terms of CO₂ production and infrastructure (e.g., roads or airports) can illustrate the impact on the local environment (e.g., pollution, habitat destruction), and help students understand how tourism can contribute to climate change.

The activity of one person may have limited impact on the local environment, but tourism can increase the population dramatically, creating significant impacts on the environment. Collective activity can degrade environmental conditions, leading to massive natural losses within a complex system. Such stress can increase the fragility of the region or country so that it is less able to withstand the forces of severe weather events. This fragility can lead to further environmental degradation, so that this destination is no longer attractive for tourism. The people who rely on this source of income often have limited options.

Teaching Suggestions

The topic of climate change in this course may be addressed through a case study approach and/or individual/group inquiry comparison. It is important for students to be able to relate what they are learning to their own Ecological Footprint.

- **Case Study:** Using a single case study throughout the course to address issues can provide students with a model of how to inquire about a different region or a question that they wish to pursue. The country of Nepal is suggested as a single case study with many rich complexities. If several case studies are used, the idea that some environments

are more fragile than others can be emphasized, e.g. the Galapagos, the Arctic or Antarctic environments compared to that of Kenya. (Link back to complexity of webs and chains.)

- **Comparisons:** Identifying contrasts can make some ideas very clear. Comparing the impact of tourist traffic in remote regions to densely traveled areas can provide students with opportunities to ask more questions for further research. How much CO₂ is generated per person? Are there efficiencies in heavily travelled destinations that are compromised in remote destinations?

RESOURCES

ECOLOGICAL FOOTPRINT

Calculate your own Ecological Footprint

www.myfootprint.org

CLIMATE CHANGE ACTIONS IN CANADA

Review Canada's current position on climate change and the actions it is undertaking to address greenhouse emission.

www.climatechange.gc.ca

WORLD HOTSPOTS FOR CLIMATE CHANGE AND CONSEQUENCES

Annotated world map

www.climatehotmap.org/index.html

CLIMATE CHANGE AND TOURISM

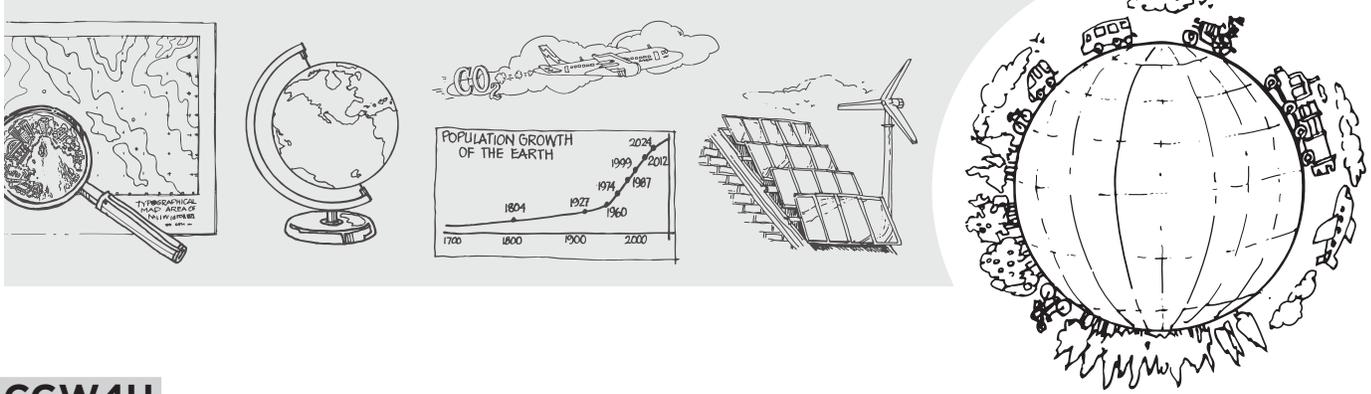
Climate Change and Tourism – recommendations on practices

<http://sdt.unwto.org/en/content/climate-change-tourism>

CURRICULUM EXPECTATIONS

STRAND/OVERALL EXPECTATIONS	SPECIFIC CURRICULUM EXPECTATIONS
<p>Geographic Foundations: Space and Systems</p> <ul style="list-style-type: none"> • evaluate the influence of human systems on patterns of travel and tourism and, conversely, the influence of travel and tourism on human systems • analyse how factors such as movements of people and regional characteristics influence travel and tourism patterns 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • explain how natural features and human criteria are used to define regions <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • determine the reasons for patterns of tourist travel within selected regions • analyse the effects of human systems on travel and tourism • explain how tourism-related development can have a significant effect on human systems <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • analyse the major natural, cultural, economic, and political characteristics of selected tourist regions • identify natural and human features that attract tourists to their local region
<p>Human-Environment Interactions</p> <ul style="list-style-type: none"> • explain how environmental factors affect patterns of travel and tourism • analyse the impact of different types of travel and tourism on the natural environment • evaluate the effectiveness of programs and initiatives designed to manage and protect the resources on which tourism is based 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • identify the natural resources on which tourism is based and justify the need for sustainable development <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • compare the positive and negative effects of tourism on people and the environment in selected sites or regions • analyse specific examples of how tourist activities can threaten fragile environments or species <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • produce a set of criteria or “code of behaviour” for tourists travelling in fragile environments • describe UNESCO’s role and the challenges it faces in protecting significant natural and cultural heritage sites • assess the need for sustainable development and protection of the resources on which tourism is based in selected sites or regions • predict and explain the likely impact of a natural or human-caused disaster on travel and tourism in a selected region
<p>Global Connections</p> <ul style="list-style-type: none"> • describe global patterns of travel and tourism and the factors that influence them • explain the social, environmental, cultural, economic, and political effects of travel and tourism on various destination regions • compare the characteristics of selected tourist regions of the world 	<p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • describe the social, environmental, cultural, economic, and political effects of travel and tourism associated with international events • analyse the causes and effects of economic disparities between selected world tourism regions <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • evaluate the natural and human attributes that contribute to the success of selected globally significant tourist attractions • explain the relationship between the development of travel and tourism in a developing country and the country’s level of economic growth

STRAND/OVERALL EXPECTATIONS	SPECIFIC CURRICULUM EXPECTATIONS
<p>Understanding and Managing Change</p> <ul style="list-style-type: none"> analyse the social, environmental, cultural, economic, and political effects of tourism-related development on a community or region evaluate the impact on travel and tourism of the plans, policies, and initiatives of governments, businesses, and other organizations 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> identify recent trends in travel and tourism and their effects on natural systems and the environment identify the economic, cultural, political, and environmental components of selected issues related to travel and tourism explain how various factors contribute to the growth or decline of tourism around the world explain issues that arise when planning for tourism development within a region <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> show how changes in technology or in its uses alter travel and tourism patterns analyse the effects of political, economic, cultural, and environmental motivators and barriers on travel and tourism patterns <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> analyse the effects of an increase in tourism on the natural and human systems of a selected region predict the future of tourism for a selected region or destination
<p>Methods of Geographic Inquiry and Communication</p> <ul style="list-style-type: none"> use the methods and tools of geographic inquiry to locate, gather, evaluate, and organize information analyse and interpret data gathered through research and investigation, using a variety of methods and geotechnologies communicate the results of geographic inquiries, using appropriate terms and concepts and a variety of forms and techniques 	<p><i>Research</i></p> <ul style="list-style-type: none"> develop and use appropriate questions to focus a geographic inquiry on a topic or issue in travel and tourism gather geographic information from primary sources and secondary sources to research a topic or issue related to travel, tourism, or regional geography gather geographic information, using a variety of geographic tools and technologies evaluate the credibility of sources and the reliability and usefulness of information identify the educational requirements, job descriptions, current opportunities, and future prospects for selected careers related to the travel and tourism industry <p><i>Interpretation and Analysis</i></p> <ul style="list-style-type: none"> distinguish among opinion, argument, and fact in research sources use a variety of geotechnologies to interpret, analyse, and synthesize information related to travel, tourism, and regional geography use different types of maps, graphs, organizers, and diagrams to clarify and interpret geographic information and relationships use appropriate statistical methods in the analysis of travel and tourism patterns, observing accepted conventions develop possible solutions to problems or issues related to travel, tourism, or regional geography, using appropriate forecasting, decision-making, and/or problem-solving strategies explain the different points of view on an issue related to travel and tourism that are, or might be, held by various stakeholders produce a variety of maps, graphs, diagrams, and charts, following accepted conventions, to illustrate patterns and relationships related to travel, tourism, and regional geography provide appropriate and sufficient evidence and well-reasoned arguments to support opinions and conclusions <p><i>Communication</i></p> <ul style="list-style-type: none"> communicate the results of geographic inquiries, for different audiences and purposes, using a variety of forms and including geographic visual supports, both conventional and geotechnological use an accepted form of academic documentation to acknowledge all information sources, including electronic sources use appropriate terminology when communicating results of geographic inquiries.



CGW4U

CANADIAN AND WORLD ISSUES: A GEOGRAPHIC ANALYSIS, GRADE 12, UNIVERSITY PREPARATION

Overview

Through a global issues approach using such topics as food or environment, students will examine the impact of climate change on nations in different stages of development from physical, economic, cultural and political perspectives. An analysis of various agreements (e.g., trade, protocols, multinational policies) will help students understand the complexities of climate change as they brainstorm possible future actions for reducing greenhouse gases.



SYSTEMS THINKING

Humans are dependent upon the natural world, but the natural world is not dependent upon humans for its existence. Human systems have impacts on the rates of energy flow, matter cycling, and the relationships in the web of life. These changes to natural systems feed back to create change in human systems.

What are the geopolitical implications of climate change?

Curriculum Expectations

Please see page 33 for a list of the course curriculum expectations that can be linked to the Guiding Questions below.

GUIDING QUESTIONS

QUESTIONS	LEARNING CONCEPTS
<i>How do global issues relate to climate change?</i>	<p>Many global issues can be connected to climate change. For example urbanization involves land use for transportation and housing and means loss of natural space; natural resource issues can be related to energy production or consumer products; food production is linked to agricultural practices which may include use of energy-intensive fertilizers.</p> <p>Breaking these large issues into more explicit questions such as the following will help reveal the climate change connections:</p> <ul style="list-style-type: none"> • How do different land use choices affect climate change? (biomes have different characteristics: some have a greater capacity to act as a sink for CO₂ than others; we should look at the need for increasing CO₂ sinks) • What are the climate change linked consequences that can result as farmland is swallowed up by sprawling cities?
<i>What are the connections between climate change and the main food choices of a country?</i>	<p>The cost of many of the foods we eat includes subsidized water use for California fruits and vegetables that are then transported by vehicles on subsidized roadways.</p> <p>Bali's experience with rice varieties provides a case study for examining how different people and groups of people have different perspectives (engineers different from farmers), the role of culture (engineered farming failed while rituals with the direction of priests maintained high productivity), how people see resources differently (maximize use of water for self, and ignore the impact on others), the importance of biodiversity (monoculture led to devastating pests), the impact of IMF policy, the interaction of social systems and natural systems. To support the wonder rice, people had to spend money on fertilizers and pesticides that are petroleum based: their production is connected to climate-changing CO₂ emissions. (See David Suzuki and Holly Dressel, <i>Good News for a Change</i>, Chapter 5.)</p>
<i>What resources do countries use as their source of energy production?</i>	<p>It is important to recognize that some countries may have coal or oil to burn readily at hand (e.g. China), while others are moving towards using other sources, (e.g., Hawaii and its Ocean Thermal Energy Conversion). Ideas touched upon toward the end of this section will question the power of some countries to encourage (force) other countries into using sources which may be more expensive, or not viable within the economic or political structure.</p>
<i>What is the impact of a particular policy of a transnational corporation?</i>	<p>Nike is a transnational corporation that has shown some leadership by eliminating PVCs from shoe construction and using organic cotton for its cotton needs. The issues of subcontracting and developing company policy that limits the exploitation by subcontractors can also be explored. (See David Suzuki and Holly Dressel, <i>Good New for a Change</i>, Chapter 1.)</p>

QUESTIONS	LEARNING CONCEPTS
<p><i>What role do non-governmental organizations (NGOs) play in developing or implementing policy?</i></p>	<p>Have students explore the ramifications of a particular NGO's policy decision: e.g., Partnership for Pesticide Bylaws focussed its efforts on the City of Toronto to ban the non-essential use of pesticides on lawns and gardens. In May 2003, Toronto adopted a bylaw to restrict the use of lawn pesticides. Reduced pesticide use can lead to greater insect biodiversity and reduce toxic chemical runoff.</p> <p>The decision to restrict pesticide use in Toronto means that people, their pets and other animals are less likely to be exposed to toxic chemicals when outdoors. It also affects the livelihood of people working in that industry. The link to climate change is less obvious, but significant: pesticide production is an energy-intensive process and shipping these chemicals also requires energy. Whenever manufacturing or shipping involves energy produced by fossil fuels, greenhouse gases are emitted which contribute to climate change.</p> <p>BC natives have established a protocol for forestry that includes non-native interests. The productivity of the forest increases with the maintenance of a natural forest rather than choosing a clear-cut monoculture alternative. Growth of new trees in the forests helps to sequester CO₂. Fishing is sustained and provides additional non-forest income. This case study shows social, economic, cultural and political components as they affect the sustainability of a resource-based activity. (David Suzuki and Holly Dressel, <i>Good News for a Change</i>, Chapter 6.)</p>

CASE STUDY

BALI RICE FARMER AND CLIMATE CHANGE

Climate change is a complex issue that has many layers of cause, impact and possible mitigation. Simple solutions are not always appropriate or effective. Robust natural systems are complex, such as a rain forest that is a polyculture with many species. The Bali rice farmers' initiative shows that when social systems simplify a natural system with a monoculture, there are dramatic results. More than a simple sum of various parts, the properties of a polyculture are surprising and difficult to analyse.

Policy that provides solutions sensitive to local contexts is more likely to be useful, successful

and lasting. The imposition of simplistic patterns generalized from one area to all areas can lead to greater degradation of the environment, political destabilization, cultural losses, reduced prosperity and lessened ability to sustain ongoing development of the population.

Solutions to climate change problems require action from many quarters, from the individual to small and large businesses to governments at all levels. This is a heartening message: it means that every person has the opportunity to make a contribution through personal action.

Teaching Suggestions

■ **Guiding Questions:** The Guiding Questions can be addressed in a number of ways throughout a world issues course. For example, they could be studied as the articulation of environmental issues in themselves. Another approach could be to revisit particular questions as different global issues are studied throughout the course. For example, what impact does climate change have as a factor when studying population patterns and urban development, resource/energy use or food disparities?

No matter how they are used, the nature of the questions necessitates basic background work through inquiry and the application of critical thinking skills to enable students to

understand the implications of what they are learning.

■ **Culminating Task:** Climate change could also be a part of a culminating task where students have been given sufficient opportunities to explore relevant issues and develop skills for independent research and analysis. Climate change can be assigned as an issue that requires students to actively integrate the many perspectives, problems and potential solutions available.

As part of the final 30% course task, students could choose a developing nation and write a proposal for aid support, factoring in the many likely impacts of climate change.

RESOURCES

LOCAL AND REGIONAL CONSEQUENCES OF GLOBAL WARMING

Global Warming: Early Warning Signs – annotated world map
www.climatehotmap.org/

NON-GOVERNMENTAL ORGANIZATIONS

Links to NGOs by topic
www.ngo.org/links/index.htm

BIOMES OF THE WORLD

Identifies biomes of the world – location and characteristics
www.ucmp.berkeley.edu/glossary/gloss5/biome/

CANADA: IMPACTS OF CLIMATE CHANGE AND FUTURE ACTIONS

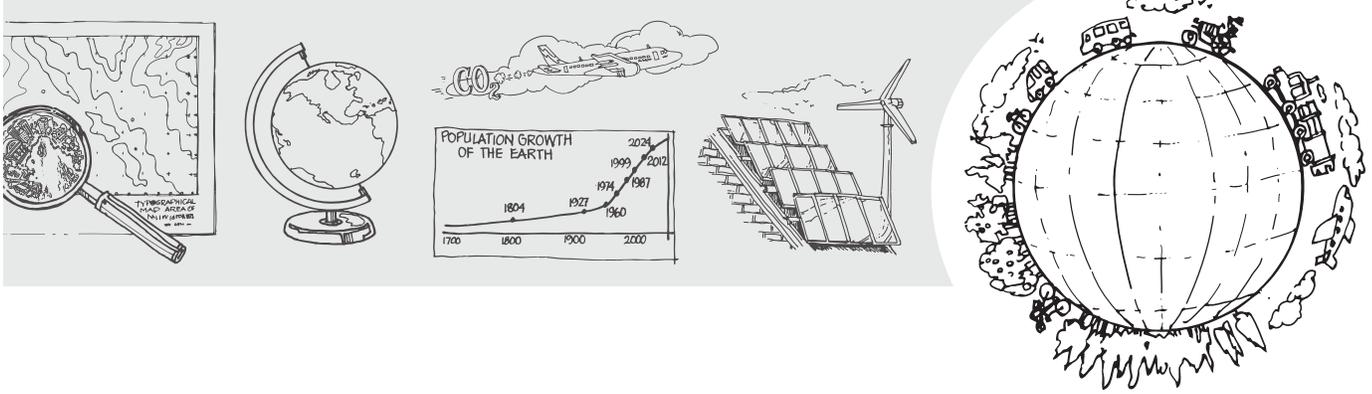
Identifies changes to Canada regarding climate change and actions that need to be taken from both government and individual perspectives
www.climatechange.gc.ca

CURRICULUM EXPECTATIONS

STRAND/OVERALL EXPECTATIONS	SPECIFIC CURRICULUM EXPECTATIONS
<p>Geographic Foundations: Space and Systems</p> <ul style="list-style-type: none"> • explain how the earth's natural and human systems are interconnected in multiple, complex ways • compare the cultural, economic, and political aspirations of selected groups and the effects of their actions on local, national, and global geographic issues 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • describe the interdependence of ecology and economics • explain how point of view influences an individual's perceptions of a place • identify ways in which countries and regions of the world are becoming increasingly interdependent • identify the social, economic, cultural, political, or ecological components of selected geographic issues <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • evaluate the significance of a variety of movements to protect resources and environments <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • describe the distribution of the world's major biomes and compare the productivity and diversity of selected ecosystems • analyse appropriate statistical indicators to assess the quality of life in a variety of developed and developing countries in different parts of the world • analyse the causes of economic disparity in the local or regional community
<p>Human-Environment Interactions</p> <ul style="list-style-type: none"> • analyse the impact of selected global trends on people and environments at the local, national, and global level • analyse geographic issues that arise from the impact of human activities on the environment in different regions of the world • evaluate approaches, policies, and principles relating to the protection and sustainability of the planet's life-support systems 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • explain how human-induced changes in natural systems can diminish their capacity for supporting human activity • explain why people perceive resource use and sustainable development differently at different times and in different places <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • analyse the impact on natural and human systems of selected human migrations • analyse the impact on natural and human systems of past and current trends in agriculture • analyse the impact on natural and human systems of some of the side-effects of urbanization and urban growth • evaluate the economic, social, and ecological impact of current practices used in harvesting or extracting a selected resource • evaluate the effectiveness of various policies and practices that are used to promote sustainable development in selected places and regions of the world • analyse the effects on the environment of various trade policies or agreements <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • evaluate the short-term and long-term economic, social, and environmental effects of efforts to increase the productivity of a selected natural environment • assess how selected municipal, provincial, and federal government policies contribute to sustainable resource development in Canada • produce a case study of a specific situation in which resource development has contributed to the disruption of an ecosystem

STRAND/OVERALL EXPECTATIONS	SPECIFIC CURRICULUM EXPECTATIONS
<p>Global Connections</p> <ul style="list-style-type: none"> analyse the influences that increase the interdependence of countries around the world analyse instances of international cooperation and conflict and explain the factors that contributed to each evaluate the social, economic, and environmental impact of the strategies for sustainable development implemented by a variety of individuals, organizations, and institutions 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> identify current global sustainability issues and environmental threats explain how inequities in the distribution of resources and boundary disputes contribute to uprisings and conflicts explain how economies and environments in some places can be affected by decisions made in other places describe the contributions of individuals who have been influential in addressing global issues and evaluate the impact of their work <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> analyse the economic and environmental effects of colonialism and neocolonialism on selected countries analyse geopolitical relationships between selected countries and regions analyse the evolving global geopolitical role of a selected region or country and evaluate how its actions contribute to international cooperation or conflict <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> evaluate the performance of a selected transnational corporation with respect to the promotion of environmental sustainability and human rights analyse problems of hunger and poverty in selected countries and explain how certain practices may aggravate the problems explain the relevance to their own lives of the work on poverty, disease, and the environment done by governmental and nongovernmental organizations
<p>Understanding and Managing Change</p> <ul style="list-style-type: none"> analyse trends and predict changes in the human use of the earth and its resources evaluate the cultural, economic, and environmental impact of changing technology evaluate the effectiveness of short-term and long-term solutions to geographic problems and issues at the local, national, and global level 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> explain how local participation in the development process can help build sustainable communities <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> predict future global demographic changes and their economic, environmental, and social implications analyse trends related to the consumption of selected resources to determine the sustainability of the resources evaluate the role played by non-governmental organizations and local community initiatives in different parts of the world in promoting sustainable development and responsible resource management <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> identify local awareness levels and viewpoints relating to a current geographic issue evaluate the perspectives and arguments of various stakeholders on a current issue assess the environmental and economic impact of a selected case of environmental deregulation in Canada evaluate the effectiveness of an international agreement (e.g., Kyoto Protocol, Convention on Biological Diversity, Montreal Protocol, Convention on the Law of the Sea) that has been designed to address global issues or protect the global commons (e.g., air, fresh water, oceans, biodiversity)

STRAND/OVERALL EXPECTATIONS	SPECIFIC CURRICULUM EXPECTATIONS
<p><i>Methods of Geographic Inquiry and Communication</i></p> <ul style="list-style-type: none"> • <i>use the methods and tools of geographic inquiry to locate, gather, evaluate and organize informations</i> • <i>analyse and interpret data gathered through research and investigation, using a variety of methods and geotechnologies</i> • <i>communicate the results of geographic inquiries, using appropriate terms and concepts and a variety of forms and techniques</i> 	<p><i>Research</i></p> <ul style="list-style-type: none"> • develop and use appropriate questions to focus a geographic inquiry • gather geographic information from primary sources and secondary sources to research a geographic topic or issue • gather geographic information, using a variety of geographic tools and technologies • evaluate the credibility of sources and the reliability and usefulness of information <p><i>Interpretation and Analysis</i></p> <ul style="list-style-type: none"> • distinguish among opinion, argument, and fact in research sources • use a variety of geotechnologies to interpret, analyse, and synthesize information in connection with a geographic inquiry • use different kinds of maps and images to identify, interpret, and analyse geographic relationships, including those that involve the consequences of human activities or environmental phenomena • use appropriate statistical analysis techniques in geographic analysis, observing accepted conventions • develop possible solutions to geographic problems or issues, using appropriate forecasting, decision-making, and/or problem solving strategies • explain why it is difficult to make accurate predictions relating to human use of the earth and its resources, and why some predictions are more (or less) accurate than others • explain the different points of view on a geographic issue that are, or might be, held by various stakeholders • produce a variety of maps, diagrams, and charts, following accepted conventions, to illustrate local or global patterns and relationships • draw conclusions or make judgments or predictions on the basis of reasoned analysis and supporting evidence • complete an independent inquiry into a selected local, national, or global issue that reflects the required elements of a geographic inquiry <p><i>Communication</i></p> <ul style="list-style-type: none"> • communicate the results of geographic inquiries, for different audiences and purposes, using a variety of forms and including geographic visual supports, both conventional and geotechnological • use an accepted form of academic documentation) to acknowledge all information sources, including electronic sources • use appropriate terminology when communicating results of geographic inquiries



CGR4M

THE ENVIRONMENT AND RESOURCE MANAGEMENT, GRADE 12, UNIVERSITY/COLLEGE PREPARATION

Overview

Students will analyse how consumer choices affect the sustainability of natural resources from both personal and global perspectives. Actions by individuals and special interest organizations as well as government policies will be assessed in terms of their effectiveness. An action plan to reduce greenhouse gases from a resource-based perspective will be developed.



SYSTEMS THINKING

Humans are dependent upon the natural world, but the natural world is not dependent upon humans for its existence. Human systems have impacts on the rates of energy flow, matter cycling and relationships in the web of life. These changes to natural systems feed back to create change in human systems.

How do the consumer choices we make, as individuals or as a nation, have an impact on the environment?

Curriculum Expectations

Please see page 41 for a list of the course curriculum expectations that can be linked to the Guiding Questions below.

GUIDING QUESTIONS

QUESTIONS	LEARNING CONCEPTS
<p><i>How do our roles as consumers of resources link us to climate change?</i></p>	<p>Like everyone else, students are consumers. Some may have little understanding of how the consumer choices we make are linked to many different interconnected systems on the planet. Some of these systems are natural systems (choosing organic cotton instead of cotton grown with pesticides), while others are social systems (manufacturing that involves labour standards and working conditions). Different driving forces lead us in different directions: reduced production costs may mean more emissions; reduction in emissions may mean fewer items produced or lower profits.</p> <p>By completing an Ecological Footprint analysis, students can start to make the connection to the idea that the choices they make have an impact on the Earth. A school waste audit may also be undertaken. Such an activity may help develop an understanding of the complexity of what is meant by “human impact.” While examining the many parts of human systems (e.g., transportation, shelter, food, etc.) students can see that they make many choices every day. They can begin to identify what as consumers they might do differently to mitigate or slow climate change. (This perspective is recommended as follow up with the remaining questions.)</p>
<p><i>How do consumer choices relate to the hydrologic, carbon/oxygen, and energy flow models?</i></p>	<p>By tracing the production of a consumer item (e.g., clothing or food), students can trace the impact on natural systems through the models. Examples may include a newspaper, CD, T-shirt, cup of coffee, banana, etc. Look for ways to help students make connections between extracting and processing the raw material (resource) to manufacturing and distributing the product (heat and greenhouse gas emissions) and how it alters the natural environment.</p> <p>Resource: John C. Ryan and Allan Thein Durning’s little book, <i>Stuff: The Secret Lives of Everyday Things</i>, is an excellent resource packed with facts about the cost of every stage of production of nine common household items. The idea of the impact of multiples is important: while one person’s choices may seem inconsequential, the accumulation of many millions of choices can have major consequences. Every individual’s action can make a difference, but it is also important to look at how to get a lot of people thinking in these terms — and then taking action.</p>
<p><i>What impact will climate change have on the economics of consumer products?</i></p>	<p>Ask students to make a connection to the impact on the resource used in a particular consumer product, the future availability of the resource and the general economic cost. (For example, bananas or wheat may not be able to grow in their current locations under the conditions resulting from climate change. This in turn may cause a decrease in availability and consequently an increase in cost. People relying on these products will have their livelihood threatened.) Tracing back to origins will lead to the notion that in a highly interconnected set of systems, one change results in a whole chain of consequences. (While it is not strictly true that “everything is connected,” this powerful idea is a healthy antidote to a fragmented world view.)</p>

QUESTIONS	LEARNING CONCEPTS
<p><i>What changes can be made to consumer products to make them more climate-friendly?</i></p>	<p>By retracing the processing of a product, steps may be identified where the product can be made not just more climate-friendly, but more environmentally friendly as a whole. Examine how the hydrological and carbon cycles and energy flow disruptions can be minimized:</p> <ul style="list-style-type: none"> a) through methods used for the extraction of the resource needed to make an item; b) through the process of production; c) in transporting of the item to the consumer. <p>Examples: In retracing the production of bananas in a plantation, examine how the actual growing process could be altered to increase the amount of forest left as a possible carbon sink while still allowing the grower to make a living; or whether pesticide sprays could be eliminated or reduced to promote healthier air and soil for people as well as plants.</p> <p>In tracing back to the origins of a T-shirt, examine the cultivation process of the cotton (agricultural practices) as well as all the stages of manufacturing, distributing and marketing the T-shirt. Is the cotton grown organically or with pesticides? Is it dyed? How is it packaged? How far is it shipped from its place of manufacture?</p> <p>Note: These examples have been simplified to suggest areas to explore. It is important to have a thorough understanding of the processing of a particular item to be able to make solid suggestions for minimizing greenhouse gas production and overall environmental impacts.</p> <p>Resource: <i>Stuff: The Secret Lives of Everyday Things</i> traces back to the origins the harvesting, extracting, manufacturing, shipping and distribution of nine “everyday” commodities to explore their environmental impacts. Data is mostly American, but in a global economy has relevance for Canadian readers. See Resources section.</p>

INVESTIGATION

CONSUMER CHOICE

Students should understand that exploring the issue of climate change is a way to study and understand the interactions of numerous components of natural and human systems. Climate change as an issue can provide both a context and an application for learning about the complexity of global systems. From an exploration of their individual behaviour as consumers to an examination of the global economy, students can see their own connections to/impacts on natural systems through the lens of climate change. Climate change also provides a vivid example of the unpredictable nature of change.

Encourage students to connect both economic and social change — changes in human systems — to the changes in the climate system. CO₂ and other GHG emissions are

linked to our patterns of consumption, land use patterns (urban landscapes), industrialization (include practices). These interconnections can help students to understand that these systems need to be changed — and begin to explore how they can be changed — as part of the action to slow the rate of climate change. Case studies that involve reducing CO₂ emissions, sequestering more carbon and reducing energy use provide models for sustainable choices.

By considering personal actions and the actions of people they know, students can extend these choices to posit global trends. As consumers, we can act to make 'greener' choices, and as citizens we can advocate for changes in policy that will help Canada meet current greenhouse gas emission targets and ensure a more sustainable future.

Teaching Suggestions

- **Environmental Impact Assessment:** Each person's own impact assessment can be completed through using the tools of the Ecological Footprint. Students can find examples of existing assessment forms. Or they may choose to develop their own questionnaire to assess the environmental impact of food, clothing, transportation and waste management choices within their immediate school or community. This may also include the different industrial or commercial sites located within their area.

If students develop their own questionnaires, it is important that they understand natural systems. Otherwise, they will miss important questions that need to be asked because they have not understood the intricacies of the interconnections among these systems and how they affect, and are affected by, human systems. Review types of questions to ask (open-ended, rating scales, yes/no, etc.) and how to solicit accurate and reliable answers.

Waste audits are another source of assessment for a particular site. Connect to the Ontario EcoSchools website for Waste Audit Instructions and Worksheets. www.ontarioecoschools.org.

If students undertake an impact assessment near the beginning of the course, it can serve as a reference point throughout the course of study, serving as a common thread tying the many components together. This approach may lead to an action plan for their particular choice of assignment as a part of the final course assessment.

- **Case Study:** Taking a particular product as a case study, students can analyse the specific impact that the product has on the environment through examining how it affects different parts of the natural system (hydrological and carbon cycles, energy flows).

Possible topics for case studies include:

- production of paper including different forms of forest management and harvesting of forest resources;
- home and transportation energy generation choices;
- producing/consuming food (including a local perspective where possible) and farming practices such as sun-grown vs. shade-grown coffee, mixed farming practices vs. factory farm production;
- car production.

- **Present a Plan of Action:** An action plan could be used as a learning strategy throughout the course, depending upon the units within it. For example, if the course is organized in terms of specific issues, an action plan may

be appropriate for each issue. If the course is organized in terms of governing bodies, e.g., personal, local, national, global, then developing an action plan for each level could synthesize learning effectively.

Working individually or in groups, students can present research findings and analysis for a particular company, industry, personal behaviour, etc. and develop a plan of action that reduces the use of resources, identifies needs over wants, and reduces emission of GHGs for that particular sector. Such a plan should include:

- identification of the sources of greenhouse gases and the inter-connection of systems (human and natural) related to the issue;
- analysis of the impact on natural systems;
- actions (from different levels of government) required to reduce the use of resources and/or emissions;
- an assessment of how the action will make a difference.

The action plan can include diagrams, maps, graphs, charts and reports. It allows for a broad range of coverage dependent upon many factors such as student ability, time allotment, placement in the course, etc. Refer to the Environmental Impact Assessment section above to see how an action plan could be used as part of the final 30% evaluation for the course.

RESOURCES

ATMOSPHERE AND CLIMATE CHANGE

Cycles of the Earth and atmosphere – middle school resources for teachers
www.ucar.edu/learn

WASTE AUDIT — ECOLOGICAL FOOTPRINT

This is a simplified version for students to calculate their use of the Earth's resources.
www.wrwcana.com/02wasteaudit.html

TRANSPORTATION COST BENEFIT ANALYSIS

A thorough report on transportation costs from greenhouse gas costs to health costs (US gov't based)
www.vtpi.org/tm/tm66.htm

CANADA: IMPACTS OF CLIMATE CHANGE AND FUTURE ACTIONS

Identifies changes to Canada regarding climate change and actions that need to be taken – government and the individual
www.climatechange.gc.ca

STUFF: THE SECRET LIVES OF EVERYDAY THINGS

Ordering information to purchase this book containing life cycle analysis of 9 common household items; free on-line teaching guide
www.sightline.org/research/books/stuff

CLIMATE CHANGE AND SUSTAINABILITY

David Suzuki Foundation – links to climate change, forestry, ocean & sustainability.
www.davidsuzuki.org

CURRICULUM EXPECTATIONS

STRAND/OVERALL EXPECTATIONS	SPECIFIC CURRICULUM EXPECTATIONS
<p>Geographic Foundations: Space and Systems</p> <ul style="list-style-type: none"> • analyse how the earth's major components – the lithosphere, atmosphere, hydrosphere, and biosphere – interact and are interdependent • analyse how the distribution of ecosystems has been and continues to be influenced by natural conditions 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • describe selected relationships among the earth's diverse natural systems • describe the variety, complexity, and evolutionary characteristics of selected ecosystems <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • analyse how matter and energy flow through the lithosphere, atmosphere, hydrosphere, and biosphere • analyse how various factors contribute to the fragility and/or resilience of selected ecosystems <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • demonstrate how the earth is a self-sustaining system

STRAND/OVERALL EXPECTATIONS	SPECIFIC CURRICULUM EXPECTATIONS
<p>Human-Environment Interactions</p> <ul style="list-style-type: none"> • explain significant short-term and long-term effects of human activity on the natural environment • analyse and evaluate interrelationships among the environment, the economy, and society • analyse patterns of resource availability and use 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • explain how human well-being and survival depend on complex linkages with other components of the biosphere • identify differences in the perceptions of nature and the views on environmental preservation of selected individuals and groups <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • analyse ways in which selected human activities alter the natural environment • explain the impact of selected land use practices on human and natural systems • evaluate the environmental, economic, and social implications of resource dependency for various individuals or groups • explain how various factors and processes determine the spatial distribution and short-term and long-term availability of a selected resource <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • illustrate how human systems and natural systems interact within the local ecosystem • evaluate the effects of fossil fuel use on urban and rural environments • illustrate ways in which environmental degradation is related to human health concerns • predict the social, economic, and environmental effects of the extraction and depletion of selected resources • estimate personal and class “ecological footprints”
<p>Global Connections</p> <ul style="list-style-type: none"> • analyse environmental and resource management issues and explain their global implications • explain how population growth affects the sustainability of global ecosystems • evaluate the effectiveness of the efforts of the international community to deal with environmental and resource management issues 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • explain how growth in population and economic activity around the world increases pressure on natural resources and natural systems • explain the need for international cooperation in achieving the sustainable use of global resources <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • analyse how global resource consumption is related to environmental degradation • evaluate the effectiveness of the efforts of individuals, groups, organizations, and agreements to implement solutions to global environmental concerns • evaluate the effectiveness of Canada’s participation in selected international organizations and agreements that deal with global environmental concerns • explain how human activity in one place may cause changes to the environment in another place • analyse and assess selected viewpoints regarding a sustainability or resource management issue

STRAND/OVERALL EXPECTATIONS	SPECIFIC CURRICULUM EXPECTATIONS
<p>Understanding and Managing Change</p> <ul style="list-style-type: none"> • evaluate the impact of economic, social, political, and technological change on natural and human systems • explain the purpose of environmental laws and regulations at the local, provincial, and national levels and evaluate their effectiveness over time • evaluate a variety of approaches to resolving environmental and resource management concerns on a local, regional, and national scale 	<p><i>Building Knowledge and Understanding</i></p> <ul style="list-style-type: none"> • explain how environmental policies can affect the economy • explain the purpose and nature of environmental-impact assessments • describe the rights and responsibilities of individuals with respect to protecting the environment for future generations • analyse the environmental-protection activities of non-governmental organizations <p><i>Developing and Practising Skills</i></p> <ul style="list-style-type: none"> • evaluate the environmental implications of developments in selected areas of technology • explain ways in which we can improve our protection of natural systems while continuing to meet human needs • explain how selected environmental protection principles and initiatives could contribute to economic and environmental sustainability • compare the economic and environmental implications of various waste management methods <p><i>Learning Through Application</i></p> <ul style="list-style-type: none"> • produce a plan to reduce personal and class “ecological footprints” • evaluate the impact on both human and natural systems of a selected environmental or resource management problem • analyse the environmental impact of a particular industry or human system and recommend practices to promote economic and environmental sustainability
<p>Methods of Geographic Inquiry and Communication</p> <ul style="list-style-type: none"> • use the methods and tools of geographic inquiry to locate, gather, evaluate, and organize information about environmental and resource management issues and concerns • analyse and interpret data gathered through research and investigation, using a variety of methods and geotechnologies • communicate the results of inquiries, using appropriate terms and concepts and a variety of forms and techniques 	<p><i>Research</i></p> <ul style="list-style-type: none"> • develop and use appropriate questions to focus a geographic inquiry on an environmental or resource management issue • gather geographic information from primary sources and secondary sources to research an environmental or resource management topic or issue • gather geographic information, using a variety of geographic tools and technologies • evaluate the credibility of sources and the reliability and usefulness of information <p><i>Interpretation and Analysis</i></p> <ul style="list-style-type: none"> • distinguish among opinion, argument, and fact in research sources • analyse a variety of media forms to identify biases with respect to environmental and resource management issues • use a variety of geographic tools and geotechnologies to interpret, analyse, and synthesize information related to environmental and resource management topics and issues • use appropriate statistical methods in geographic analysis, observing accepted conventions • develop possible solutions to problems or issues related to the environment or resource management, using appropriate forecasting, decision-making, and/or problem-solving strategies • explain the different points of view on an environmental or resource management issue that are, or might be, held by various stakeholders • produce a variety of maps, sketches, photographs, diagrams, and charts, following appropriate conventions, to illustrate the results of inquiries on environmental and resource management topics and issues • provide appropriate and sufficient geographic evidence and well-reasoned arguments to support opinions and conclusions • complete an independent inquiry on a local, regional, national, or global environmental or resource management topic or issue that reflects the required elements of a geographic inquiry <p><i>Communication</i></p> <ul style="list-style-type: none"> • communicate the results of geographic inquiries, for different audiences and purposes, using a variety of forms and including geographic visual supports, both conventional and geotechnological • use an accepted form of academic documentation to acknowledge all information sources, including electronic sources • use appropriate terminology when communicating results of inquiries related to the environment and resource management

Appendix 1

Summary of the Kyoto Protocol and Beyond

Countries around the world have recognized that climate change affects us all. The volume of greenhouse gases produced by human activity, added to the gases occurring naturally in the atmosphere, has led to extreme weather events, temperature changes, and the melting of the Arctic ice caps.

In December 1997, Canada and more than 160 other countries met in Kyoto, Japan, and agreed to targets to reduce greenhouse gas emissions. The agreement that set out those targets, and the options available to countries to achieve them, is known as the Kyoto Protocol. Canada's former target was to reduce its greenhouse gas (GHG) emissions to 6% below 1990 levels by the period between 2008 and 2012. The goal of Kyoto remains to reduce the total emissions of industrialized countries to 5.2% below 1990 levels even though Canada is no longer committed to these targets.

The Government of Canada and the provincial/territorial and municipal governments worked together to achieve reductions in greenhouse gases as outlined in the Kyoto Protocol. Investment in new technologies helped business operate in a more efficient way and Canadians have benefited by having a cleaner environment. The Kyoto Protocol allows the presence of carbon sinks to count toward a country's commitment to reduce greenhouse gases. A "sink" is any process that removes greenhouse gases from the atmosphere. For example, forests form a carbon "sink" through the process of photosynthesis – trees and other plants take up carbon dioxide (CO₂) and break it down. The oxygen (O₂) is released and the carbon (C) becomes part of the tree.

The Kyoto Protocol also allows countries to buy carbon credits from other countries. This means that countries that reduce their greenhouse gas emissions by more than is required under Kyoto can sell their unused carbon credits to countries that find it difficult or expensive to reduce emissions.¹ This is called emissions-reduction trading. In other words, countries that have "overperformed" (met and exceeded their target for reduction) may sell their "unused right to pollute" to countries that have failed to meet their emissions reduction target. Canada believes that a solution that uses the market has a part to play in achieving an overall reduction of greenhouse gases globally.

In 2012, Canada removed itself from the Kyoto Protocol, thereby releasing it from any commitments it had previously made. Canada is still active in addressing climate change, but this marked a clear change in how Canada takes action and is held accountable to making effective change to reduce greenhouse emissions. To see what Canada is currently doing to address climate change visit: www.climatechange.gc.ca

Based in part on information found at www.climatechange.gc.ca

For a glossary of terms, please see the Resources section at the end of this document.

¹ While it may appear strange that one country can buy the right to pollute from another country, remember that the total emissions of participating countries selling and buying carbon "credits" are to reach the agreed upon targets between 2008 and 2012. Some believe that allowing countries to pay others in order to keep polluting is wrong; others say that it is a way of encouraging those who can to make greater reductions while penalizing those who don't.

This resource is an adaptation of the EcoSchools *Climate Change in Grade 11 and 12 Geography* produced by the Toronto District School Board (TDSB). The TDSB has donated this resource to the Ontario EcoSchools Program as part of its in-kind contribution to the project.



CURRENT PROJECT PARTNERS



EVERGREEN



Ontario



Waterloo Region District School Board



www.ontarioecoschools.org