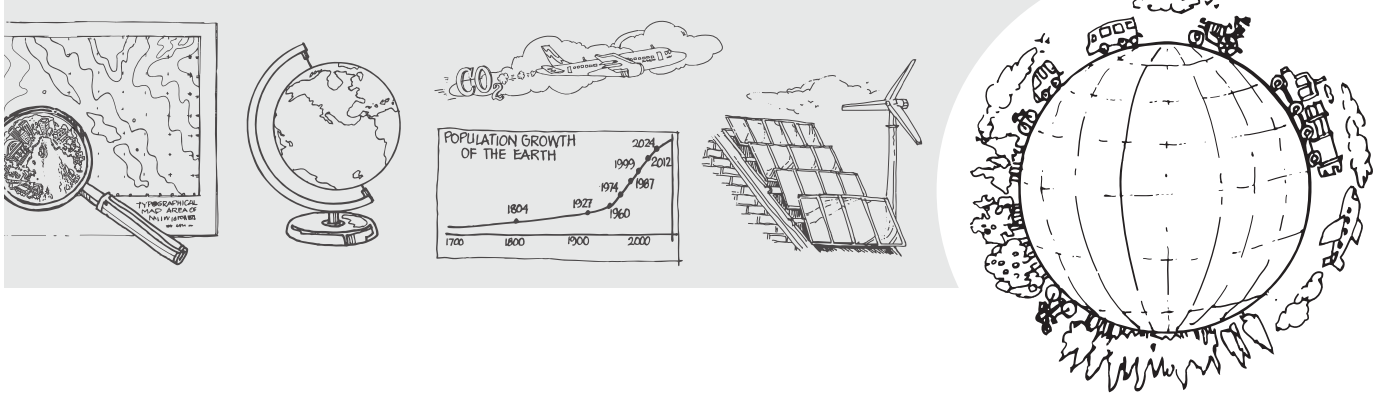

CGR4M

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
How do our roles as consumers of resources link us to climate change?	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. 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.)
How do consumer choices relate to the hydrologic, carbon/oxygen, and energy flow models?	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. Resource: John C. Ryan and Allan Thein Durning's little book, *Stuff: The Secret Lives of Everyday Things*, 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.
What impact will climate change have on the economics of consumer products?	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.)

QUESTIONS	LEARNING CONCEPTS
What changes can be made to consumer products to make them more climate-friendly?	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: 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. 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. 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? 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. Resource: *Stuff: The Secret Lives of Everyday Things* 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.

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. CO_2 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 CO_2 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.wrwcanada.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/tdm/tdm66.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
Geographic Foundations: Space and Systems • *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*	*Building Knowledge and Understanding* • describe selected relationships among the earth's diverse natural systems • describe the variety, complexity, and evolutionary characteristics of selected ecosystems *Developing and Practising Skills* • 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 *Learning Through Application* • demonstrate how the earth is a self-sustaining system

STRAND/OVERALL EXPECTATIONS	SPECIFIC CURRICULUM EXPECTATIONS
Human-Environment Interactions • *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*	*Building Knowledge and Understanding* • 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 *Developing and Practising Skills* • 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 *Learning Through Application* • 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"
Global Connections • *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*	*Building Knowledge and Understanding* • 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 *Developing and Practising Skills* • 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
Understanding and Managing Change • *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*	*Building Knowledge and Understanding* • 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 *Developing and Practising Skills* • 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 *Learning Through Application* • 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
Methods of Geographic Inquiry and Communication • *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*	*Research* • 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 *Interpretation and Analysis* • 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 *Communication* • 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

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