

Human-Environment Interactions

Big Idea

The impact of human systems on natural systems can be expressed as our Ecological Footprint. In systems terms, the size of our Ecological Footprint is a measure of resource *inputs* from natural systems into human systems and waste *outputs* from human systems into natural systems. For example, a natural system input could be the amount of land set aside as a landfill for our garbage, which is a human system output.

As human systems interact with natural systems, the results are sometimes difficult to predict. New properties are continually created as a result of the interactions between and among systems, such as:

- ▶ depletion or loss of non-renewable resources (e.g., fossil fuels);
- ▶ loss of renewable resources (e.g., trees, fresh water);
- ▶ ecozones where the vegetation, soil, landforms, wildlife and human activity are changed over time as greenhouse gases are released into the atmosphere;
- ▶ new economies (e.g., carbon trading) and policies (e.g., the Kyoto Protocol);
- ▶ extreme changes in climate systems.

The waste *output* of greenhouse gases produced by human activity (such as, for example, driving cars) becomes an *input* to the climate system, thus changing the way the system works. Modifying human behaviour by relying less on fossil fuels can slow climate change and reduce its impact. Reducing the size of our footprint by driving less reduces that input into the global climate system.

New solutions are needed to make the human use of nature more sustainable over the long term.

Expectations addressed in this Big Idea

Human-Environment Interactions

- [SE] explain how human activities (e.g., agricultural and urban development, waste management, parks development, forest harvesting, land reclamation) affect, or are affected by, the environment; describe how natural systems (e.g., climate, soils, landforms, natural vegetation, wildlife) influence cultural and economic activities (e.g., recreation, transportation, employment opportunities)
- [SE] assess how the effects of urban growth (e.g., development on former farm lands, destruction of wildlife habitats, draining of marshes) alter the natural environment
- [SE] recommend ways in which individuals can contribute to the quality of life in their home, local ecozone, province, nation, and the world

Global Connections

- [SE] compare Canada's approaches to specific concerns (e.g., species loss, deforestation, pesticide use, cross-border pollution, movement of people, trade) with the approaches of other nations

<p><i>Understanding & Managing Change</i></p> <ul style="list-style-type: none"> • [OE] explain how natural and human systems change over time and from place to place • [SE] explain how selected factors cause change in human and natural systems (e.g., technological developments, corporate and government policies, zoning by-laws, natural hazards, global warming); identify and explain the factors influencing demographics and migration in Canada • [SE] predict the consequences of human activities (e.g., agriculture, recreation) on natural systems (e.g., soil depletion, climate change) 	
<p>Links to culminating task</p>	
<p><i>Human-Environment Interactions</i></p> <ul style="list-style-type: none"> • [OE] analyse the ways in which natural systems interact with human systems and make predictions about the outcomes of these interactions • [OE] evaluate various ways of ensuring resource sustainability in Canada 	
<p>Focus Questions and Answers For tips on using Focus Questions, please see page 2.</p>	
<p>1. What is an Ecological Footprint? (List the activities that are included in this concept.)</p>	<ul style="list-style-type: none"> ▶ <i>The Ecological Footprint is the amount of space (land and air) that is required to support a person's activities. It can be determined for individuals, countries, cities, or even the world.</i> ▶ <i>Components of the Ecological Footprint include housing, food, transportation, consumer goods (e.g., clothes, books, furniture, vehicles, recreation, etc.) and services (e.g. education, health care, entertainment, waste disposal, etc.).</i>
<p>2. What does the size of our Ecological Footprint tell us about the impact of human systems on natural systems?</p>	<ul style="list-style-type: none"> ▶ <i>The Ecological Footprint allows us to calculate how much human systems consume and converts that into an equivalent of how much of the Earth's land systems are required to sustain that consumption.</i> ▶ <i>However, the Ecological Footprint is based on the premise that all land is productive. It also assumes that all humans share equally in the Earth's resources (which is not the case). This concept is called "fair earthshare." This is worth mentioning so that students realize that the Ecological Footprint assumes this ideal situation.</i> ▶ <i>The Earth's carrying capacity refers to the number of people that can be safely and sustainably supported by productive land. Calculations show that the Earth's sustainable carrying capacity has already been exceeded. The existence of climate change is an indicator of this fact.</i>

<p>3. How have Canadians' Ecological Footprint and the physical environment changed over time?</p>	<ul style="list-style-type: none"> ▶ <i>In 2004, Canada's Ecological Footprint was calculated at 8.56 ha/person. (Vemetoulis, et. al, Ecological Footprint of Nations (2004), cited in www.progress.org).</i> ▶ <i>Since we require ever larger amounts of materials and energy to support the population's needs and wants, the size of our Ecological Footprint has increased greatly over time. Productive land is being developed and used at a rapid rate, changing the appearance of our landscape. For example, forests might become golf courses, clear cuts (which grow back after many years) and pavement. Or a hillside might become a ski run or a mining project.</i>
<p>4. What changes can people make in their daily lives to reduce the size of their Ecological Footprint?</p>	<ul style="list-style-type: none"> ▶ <i>We need to look carefully at the changes we can make to maintain or improve our quality of life while increasing our impact on the Earth as little as possible:</i> <ul style="list-style-type: none"> ▶ <i>Change the types of fuels that we use for transportation and industry or in our homes to renewable options wherever possible.</i> ▶ <i>Choose products that are made of recycled materials.</i> ▶ <i>Walk, bicycle or use public transit.</i> ▶ <i>Buy foods with less packaging.</i> ▶ <i>Create homes that are properly insulated and have energy efficient appliances.</i>
<p>5. How can alternative energy sources contribute to slowing climate change?</p>	<ul style="list-style-type: none"> ▶ <i>Wind and solar power are two alternative energy sources that do not rely on fossil fuels. When fossil fuels are burned, carbon is released into the air as carbon dioxide, which contributes to climate change.</i>
<p>6. How might human actions make a difference to climate change (either positive or negative)?</p>	<ul style="list-style-type: none"> ▶ <i>Being a responsible consumer involves paying attention to personal consumption and making choices that result in less fossil fuel being burned. Less burning means less CO₂ production, which will help to slow climate change. (Brainstorm ideas with the class.)</i> ▶ <i>A consumer who pays no attention to reduction of fossil fuel use as a criterion for making choices is missing a chance to help slow climate change. (Brainstorm ideas with the class.)</i>