

S.S. 11: COUNTERPOINTS
CH. 17: ENVIRONMENT – NOTES

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INTRODUCTION

1. The Earth's resources, environment, and human populations are interconnected.
2. As the world's population has increased, the scale of human impact has grown. E.g. – in 1950, the harvest of fish from the world's oceans was 19 million tonnes, rising to nearly 90 million tonnes by the end of the 20th century.
3. The same impact can be shown with water, soil, forests, minerals, and energy resources.
4. We have caused harmful changes in the **biosphere** – the zone of earth, water, and air in which we live.

POPULATION AND RESOURCES

1. Nearly 85% of the world's resources are being consumed by 20% of the world's population, mainly in the industrialized Western countries.

Sustainable Development

1. **sustainability**- maintaining economic growth without damaging the environment so much that it compromises the future of life on the planet.
2. 1962 – Rachel Carson published ***Silent Spring***
1987 – UN Commission on the State of the Environment or Brundtland Commission produced a report, ***Our Common Future***, asking people in the developed world to reduce resource consumption and develop a sustainable lifestyle.
 - The developing world would need to reduce population growth to allow for development that would not overwhelm the environment.
 - The developed world would need to take care of renewable and non-renewable resources to ensure the needs of future generations and to reduce the impact on the environment.

3. 1992 – Earth Summit in Rio de Janeiro, Brazil – the largest gathering of heads of state in human history.
 - Looked at ways of harmonizing economic growth and a safe environment.
 - Produced a statement of action – **Agenda 21** – to encourage the development of a sustainable world economy.

WATER: THE INDISPENSABLE RESOURCE

1. Every person requires at least 5 litres of fresh water each day for good health.
2. Only 3% of the world's water is fresh water. Nearly 78% of that is in the form of ice caps and glaciers, and much of the remaining amount is underground as **groundwater**.
3. While there is enough water to supply the world's population into the future, the problem is its uneven distribution.
4. In Canada, we have a large share of the world's fresh water. The Great Lakes alone contain 18% of all the surface fresh water on Earth.

Abusing an Underground Resource

1. Increasing populations are the main threat to the world's freshwater supply. Falling groundwater tables and diversion of surface supplies are the main causes of shortages.
2. The Yellow River in China, the Ganges River in India, the Nile River in Africa, and the Colorado River in the U.S. are examples of rivers that run dry, or have little water left when they reach the sea. These shortages threaten world agricultural production.
3. 40% of the world's harvests comes from irrigated croplands. The U.S., China, and India are all facing reduced groundwater supplies. These countries produce $\frac{1}{2}$ the world's food.
4. In the latter $\frac{1}{2}$ of the 20th century, the amount of irrigated land more than doubled to over 250 million hectares.

- Using new technologies and techniques in well-drilling, farmers were able to tap the groundwater in **aquifers** beneath their land.
 - Unlike erratic river flows or rainwater, the supply of groundwater is constant and can be pumped whenever the farmer needs it, and is cheaper to access than surface water.
 - It does not need to be stored in costly reservoirs and is not subject to the high rates of evaporation found in hot, arid, or semi-arid lands.
 - The problem is that, unlike surface supplies, aquifers do not recharge rapidly. The water in the aquifer comes from water slowly seeping into the surface through porous (*permeable*) rocks such as sandstone or limestone.
 - Sometimes the water in the aquifer is trapped between layers of *impermeable* rock, which does not allow water to seep through.
 - The water table is the top of the saturated layer. There can be serious environmental and health consequences if the water table is allowed to fall too low.
5. In the North China Plain, where most of that country's food is produced, the water table is falling by 1.5 m per year.
 6. In India, tables are falling by 1 to 3 metres per year, and wells are running dry. Aquifer depletion could reduce India's harvest by ¼.

“Safe” Water and Sick People

1. In some areas of India, as wells are dug ever deeper in search of water, they tap into minerals such as arsenic and fluoride.
2. The crippling effects of fluorosis (bone damage caused by high concentrations of fluoride in water) have made it difficult for people with deformed limbs to work or get to school.
3. Estimates of the number of people leading a painful and crippling life from fluorosis are as high as 60 million, 6 million of them children. See Figure 17-6 p. 425.

The Ogallala Aquifer

1. One of the world's largest sources of underground water, underlies the Great Plains of the U.S. from just south of the Canadian border to Texas.

2. It provides water for more than 1/5 of the irrigated land in the U.S.
3. Filled over thousands of years by runoff from the Rocky Mts., it has taken a little more than ½ a century to reduce the aquifer by over ½ its volume.
4. The U.S. federal government adds to the problem by allowing farmers to claim the depletion of groundwater on their income tax, giving them little incentive to conserve the resource.

Abusing Surface Water

1. Surface water = lakes, rivers, and coastal waters
2. Tanker accidents and natural causes account for some of the pollution. But most pollution originates from municipal, agricultural, and industrial sources.
3. Municipal wastewater may contain human effluents, detergents, and solvents.
4. Farmers use agricultural chemicals in herbicides and pesticides.
5. Industries such as oil refineries, pulp mills, and chemical factories discharge wastes into rivers and oceans.
6. The effects of pollution in world oceans are confined mainly to coastal areas and enclosed waterways that do not have the circulation of open oceans and seas. See Figure 17-18 p. 434.
7. Many of the world's great rivers and lakes, such as the Thames River in England and Lake Baikal in Russia, were so badly polluted by industrial and chemical waste that they could no longer support life. Strict environmental controls have cleaned up the Thames, but the economic crisis since the fall of Communism in the former USSR has made cleanup of lakes and rivers a low priority.
8. On Canada's east and west coasts, Victoria and Halifax dump untreated wastes into surrounding waters.

9. Interior pulp mills provide 50% of the industrial discharge in the Fraser River; 90% of the municipal waste in the river originates in the Fraser Valley and Vancouver areas.
10. In Canadian lakes near populated areas, agricultural and industrial chemicals and wastes promote the growth of algae and weeds that deplete the lakes' oxygen supply for life forms and affect recreational use.
11. In B.C.'s Okanagan lakes, the spread of milfoil weed threatens a multi-million-dollar tourist industry.

Solutions

1. U.S. environmentalist Dr. Peter Gleick, in his book *The World's Water: Biennial Report on Freshwater Resources, 1998-1999*, is optimistic that sustainable water management can be done with present technology.
2. Large-scale projects can be replaced by micro-dams, hydro systems that run with a river's natural flow, shallow wells, and more efficient rainwater harvesting.
3. As technologies develop, he sees an increase in the use of reclaimed or recycled water and of desalinated (salt removed) seawater.
4. Low-energy sprinkler systems and drip irrigation, which directs water to plant roots, are used extensively in water-scarce Israel, and could be used in agriculture worldwide.
5. New toilet design has led to high efficiency and low flow, reducing by 70% the amount of water needed to flush millions of toilets.
6. Canada, the U.S., and India have no national policies to regulate the use of groundwater. Taxes or user rates could be introduced to encourage users to conserve water.

SHOULD CANADA TREAT WATER AS A RESOURCE TO BE TRADED?

Water Exports: Drinking Canada Dry

1. In 1995, the B.C. government banned the export of bulk water and was sued by a California company under the North American Free Trade Agreement (NAFTA) for compensation for lost opportunity.
2. The Ontario government was forced by public outcry to cancel permission to export Lake Superior water to Asia.
3. In Newfoundland, a plan to export lake water to the U.S. and the Middle East raised questions about Canada's water export policies.
4. Some Canadians argue that Canada's fresh water should be treated like other resources and be exported for gain; they argue that money and jobs could be created in areas of high unemployment, such as Newfoundland.
5. Nationalists claim that under the terms of NAFTA, if any bulk water is exported, all water will then be treated as any other trade good. Canada would lose control of its water.
6. Few Canadians pay attention to the export of bottled water. These exports have been growing steadily, particularly to the U.S.
7. Canadian per capita consumption of bottled water is $\frac{1}{4}$ that of the average U.S. consumption.
8. A study by the International Joint Commission, a Canada-U.S. body that oversees water resources shared by the two countries, found that Canada is the biggest supplier of bottled water to the U.S., where the market is growing at over 10% a year. The low cost of the Canadian dollar, close access to the market, and the perception of many Americans that Canada has an unspoiled environment, have all favoured Canadian exporters.
9. Canadian provinces have issued licenses to businesses to take 30 billion litres of water a year from Canada's springs, lakes, icebergs, and aquifers.

10. B.C. is the only province that charges a fee to use water, which brings only \$25 000 a year in revenue. Licenses are granted for life.

CHANGE IS IN THE AIR

The Hole in the Ozone Layer

1. **ozone layer** = a thin layer of ozone (O₃), a special kind of oxygen, in the atmosphere 15-50 km above the Earth's surface. See Figure 17-11 p. 430.
2. Ozone is the only gas in the atmosphere that can block the **ultraviolet (UV)** rays of the sun.
3. UV radiation can cause skin cancer in humans, and can damage other animal and plant species.
4. Plankton – microscopic organisms that are at the bottom of the marine food chain – are particularly vulnerable, as UV radiation can penetrate up to 20 m below the ocean surface.
5. 1980s – became apparent that the ozone layer was thinning. Ozone depletion is most evident at the northern and southern poles where holes open in the layer, especially in the spring. As much as 60% of the layer has disappeared over Antarctica.
6. Chemicals, particularly **chlorofluorocarbons (CFCs)**, which have done 80% of the damage, are destroying the ozone layer. CFCs have been widely used since the 1930s in coolants for refrigerators and air conditioners, in foams, solvents, and aerosol spray cans.
7. The **United Nations Environmental Program (UNEP)** has been working on phasing out the use of ozone-depleting chemicals.
8. 1987 – **Montreal Protocol** – all industrial nations agreed to cut their use of CFCs.
9. The **U.S. Environmental Protection Agency** claims that even if all ozone-depleting chemicals are phased out, it could take a century for conditions in the atmosphere to return to what they were in the 1980s.

Things are Warming Up

1. The gases in the atmosphere trap the heat energy from the sun like glass in a greenhouse. They make it possible for life on Earth to exist.
2. Since the Industrial Revolution and the massive burning of **fossil fuels** – coal, oil, and natural gas – scientists have detected much more carbon dioxide (CO₂) in the atmosphere. This could cause the temperature to rise by an additional 1 to 3 degrees C. by the year 2050.

Effects of Global Warming

1. Scientists agree that the increased number of heat waves and the rising incidence of violent storms are linked to global warming.
Above-average temperatures in polar regions are melting glaciers, and sea levels are rising.
2. Plant and animal ranges shift as species try to adapt to changing temperatures by moving to different habitats.
3. Coral reefs are losing their colours in over 30 countries as the microscopic algae that give them these colours fail to adapt to warmer water temperatures.

Threats to Canada

1. In Canada's Arctic regions, the sea ice is shrinking and the seasonal melt is occurring weeks earlier than in previous years.
2. Polar bears are slowly starving because they cannot use the ice to hunt seals. Since the 1980s, the bears' birth rate and average weight have fallen.
3. Arctic communities are facing sinking shorelines because of the melting of **permafrost**, the permanently frozen subsoil.
4. The survival rate of spawning salmon in B.C. is 1/3 of what it was in the early 1990s. Warmer ocean waters may have depleted the phytoplankton that salmon feed on, resulting in smaller fish that can't survive the swim upstream to spawn.

5. Winter recreation and skiing areas close to populated areas in central Canada could be devastated by warmer winters. Freak weather conditions, such as the ice storm that hit eastern Ontario and Quebec in January 1998, are more likely.
6. Warmer weather brings more droughts that make forest fires more likely or devastate prairie areas.
7. Some benefits:
 - The tree line could be extended farther north and higher up mountains.
 - Could also lengthen Canada's short growing season, helping farmers.

Doing something About It

1. 1997 – **Kyoto Protocol** – Canada was among the countries that promised to reduce greenhouse gas emissions by 6% of our 1990 level by 2012.
2. Canada is among the top global emitters of greenhouse gases. Despite modest reduction targets, greenhouse gases emitted in Canada have continued to increase.
3. The federal government signed the agreement, but provincial governments must regulate polluting industries.
4. Sustainable sources of energy that could be used to lessen dependence on fossil fuels: wind turbines, solar power panels, tidal power, ground-source energy or geothermal power, which uses heat from underground sources where available.
5. **Greenpeace**, an environmental group, claims that within 20 years, wind power could provide 10% of the world's electricity requirements.
6. Canadians consume over 40 times as much energy as people in developing countries, and our high standard of living means we consume resources at a much higher rate. Our small population can have as much impact on world energy and resources as a less developed country many times our size.

AGRICULTURE AND SOIL

Soils

1. Only about 11% of the land area of the Earth can be used for growing crops, yet soils are being lost and degraded around the world.
2. **desertification** = land turning to desert.
3. In the area south of the Sahara Desert in Africa, the area called the Sahel experienced years of drought in the 1970s. Cattle, the people's main livelihood, overgrazed the sparse grasses that held the soil. Gradually, the desert spread.
4. Most soils in tropical countries are nutrient poor. If the vegetation is removed, as in the Amazon rainforest, the nutrients quickly disappear and are not replaced. Soil on slopes is washed away. The land can become a desert. See Figure 17-18 p. 434.

A Rising Dependence on Chemicals

1. The increasing use, in developed and developing countries, of pesticides and herbicides to control insects that attack crops and to kill weeds leads to toxic soils and residues in foods.
2. Agricultural chemicals can be dangerous, as they eventually seep into groundwater and streams. They can also harm agricultural workers who are in contact with plants that have been sprayed.
3. The **World Wildlife Fund** has profiled insects that are needed in agriculture but are being poisoned by pesticides. These include ladybugs, a predator of aphids that destroy fruit trees; honeybees, needed for pollination of about 1/3 of human food; and dung beetles, which help decompose cattle dung on pastureland.
4. As of 2000, Canada restricted some pesticides which were completely phased out by 2004.
5. **Organic** fruits and vegetables are grown without the use of agricultural chemicals.

Genetically Modified Foods: Miracle or “Frankenfoods”?

1. Genetically modified (GM) plants are altered by splicing a gene from another organism into them. Some of these altered plants are more resistant to diseases or pests.
2. In Canada, the government has approved nearly 50 genetically modified foods since 1994, including corn, canola, soybeans, squash, potatoes, and cotton.
3. The **Canadian Food Inspection Agency (CFIA)** estimates that up to 75% of all processed foods are made with corn, soy, or canola products.
4. In Canada and the U.S., there are no labels on foods to show whether they contain genetically modified crops. The problem is GM crops can be mixed with regular crops, GM seeds can be spread by wind, pollination by insects, and accidental transport by farm machinery.

Clash of Opinions

1. In favour:
 - Claim GM crops are little different from regular crops and that people have been altering plants by breeding for generations.
 - Point to careful testing by companies and assessment by government agencies before genetically modified organisms are approved for use.
2. Opposed:
 - Concerned about the lack of long-term testing, and also about the possibility of GM crops cross-breeding with other crops.
 - Claim that in less developed countries, use of GM seeds will make farmers reliant on multinational seed companies and eventually add to their costs of production.

DECLINING FORESTS

1. Almost ½ of the forests that covered the Earth before humans began to farm have been cleared or reduced to a degraded state.
2. The remaining great blocks of naturally intact forests of the world are located in the Amazon Basin, Central Africa, islands of equatorial Asia, Russia, and Canada. See Figure 17-25 p. 439.

The Disappearing Tropical Forests

1. Tropical rainforests
 - are storehouses of **biodiversity** – the variety of life on Earth.
 - absorb carbon dioxide from the atmosphere and give off oxygen.
This is why deforestation is a cause of global warming.
2. Forest removal can affect wind patterns, precipitation levels, and temperatures far beyond the forests themselves. As well, some of these forests are still home to indigenous peoples, whose way of life is being threatened.
3. The largest clearing of tropical rainforest is taking place in Brazil, where poor people are being encouraged to move into forests and clear land to use for farming.
4. Previously remote highland areas of Ecuador, Colombia, and Peru have seen development by oil companies and forested lands have been opened up to settlement.
5. Indonesia has undertaken huge clearances to resettle people from the main island of Java.
6. Thailand's ban on the export of tropical hardwoods has been only partly successful because of illegal loggers, who make huge profits by sending timber across borders.
7. Most tropical soils are infertile; once the forest cover is removed, the few nutrients are used up, and wind and rains can erode the soil. What remains is an arid wasteland that is sometimes used for limited cattle grazing.
8. Damage is particularly severe on hillsides. Soil erosion leads to the silting of lakes and rivers, and clogs up hydro dams. Floods are common, as the forests are no longer there to absorb the rainfall and release it slowly.

Temperate Forests

1. The temperate and northern forests make up about 20% of Earth's land cover.
2. Canada has $\frac{1}{4}$ of the world's temperate coastal forest, $\frac{1}{3}$ of the world's **boreal** (northern) coniferous forest, and virtually all of the world's old-growth red and white pine. These forests are used mainly for logging and recreation.
3. Some First Nations in Canada have claimed the forest lands they traditionally held as part of Aboriginal title.
4. Canada's forests stretch from the Pacific coast to the Atlantic. They include one of the world's largest assortment of lakes and wetlands, and are home to over 100 000 species of plants and animals. They provide over \$70 billion worth of value to the economy.
5. In Alberta, only 9% of the forest has not been degraded; in Quebec and Manitoba, dams and diversions have damaged nearly $\frac{1}{5}$ of the forests.
6. Dr. David Schindler of the University of Alberta says that if we don't stop industrial development and relieve the pressure on the system from acid precipitation and climate change, there will be no boreal ecosystem in 50 years.
7. In northern Ontario in the last decade of the 20th century, the temperature increased by 1.6 C; as a result, water loss by evaporation was accelerated by 50%. Massive fires scorched the region and wiped out vast areas of boreal forest that show no sign of returning.
8. Wildlife extinction will be one of the consequences of the decline of the boreal forests.
 - Canada is home to $\frac{1}{3}$ of the world's wolf population and brown and black bears, and more than $\frac{1}{2}$ of the world's barren-ground caribou.
9. 1992 – all governments in Canada agreed with the **Tri-council Commitment on Protected Areas**, which planned to complete a network of protected areas representing all natural regions by the end of 2000.

10. By July 1999, the protected areas of Canada had been increased from 3.2% in 1989 to 6.4%, half-way to the goal set in 1994.

Coastal Rainforests

1. The Western Mountain region has 14% of Canada's forested land, but produces 40% of its marketable timber. The forest industry is the largest segment of B.C.'s economy.
2. 1993 – the provincial government launched the **Protected Areas Strategy (PAS)**, with a target of preserving 12% of provincial land for parks, recreation, and wilderness by 2000. However, only a portion of the rich, coastal old-growth watersheds was included in the PAS.
3. **Stewardship** = careful management of resources so that they are sustainable.
4. Environmental groups such as the **Sierra Club** and **Greenpeace** refer to B.C. as the "*Brazil of the North.*"

Saving the Forests

1. Global paper use has grown 600% since 1950.
2. 1/5 of all wood harvested in the world ends up in paper, and nearly 1/2 of that is used for packaging.
3. Paper makes up nearly 40% of solid waste in the industrialized world.
4. Canadians use over 300 kg of paper per person per year, compared to China's 27 kg and India's 4 kg.
5. The UN Environmental Program suggested usage of 30-40 kg per person per year, and expanded recycling of used paper in the developed world.

Ecotourism: Problem or Solution?

1. **Ecotourism** = communities in Canada suffering economic hardship use the fascination people have with the wonders of the natural world to promote tourism based on the environment.
E.g. – turning fishing boats into charter boats for tourists, kayaking and paddling in wilderness areas, hiking and forest tours.
2. One of the fastest-growing sector of the Aboriginal economy, employing nearly 10 000 people and generating more than \$250 million a year.
3. Tourists from developed nations tend to favour places with a high degree of biodiversity, such as the Amazon, Costa Rica, or the game parks in African countries. Advantages: transfer of wealth from developed countries; jobs are created.
4. **Problems:**
 - Many places once considered “off the beaten track” have become overpopulated with visitors, accelerating the pace of social and environmental damage.
 - In Nepal, site of the Himalayas and Mt. Everest, a trekking group uses 10 times as much firewood a day as a local Sherpa family. Urged by local members of the **World Wildlife Fund (WWF)**, the government introduced tourist entry permits that bring in \$500 000 (U.S.) a year for conservation of biodiversity and culture.
 - In the island societies of the Caribbean and South Pacific, the number of tourists can outnumber the local inhabitants. As hotels, restaurants, and other services are established, overcrowding and pollution can result.
5. **Sustainable Tourism Strategies**
 - Sustainability includes recognizing the rights of local communities to use and manage natural resources, and applying any profits from tourism towards the benefit of local people and the local environment.

ONE STEP FORWARD, ONE STEP BACK?

1. In Canada, forest practices have improved significantly; waste recycling has been adopted by many communities, and Canadians have become

innovative in turning sewage into fertilizer and developing more energy-efficient cars and buildings.

2. But we have been less successful in reducing the use of pesticides and herbicides, and in cutting down on packaging and paper consumption.
3. The rate of depletion of Canada's boreal forests, groundwater supplies, and other resources continues to be a concern if sustainability is to be achieved.
4. Greenhouse gas emissions in Canada have increased, despite our agreement to reduce them after signing the Kyoto Protocol.