

Science 30	Unit D: Energy and the Environment
Lesson 1 - Energy Efficiency	84 mins

Perspectives (bias)

Scientific - bases decisions on observation of natural phenomena, development of experiments to determine relationships, and theories

Technological - advocates development of practical uses for scientific discoveries

Ecological - bases decisions on concerns for environment and balance between biotic and abiotic factors within

Economic - relates decisions to trade, industry, or money

Political - bases decisions around actions of government or organizations involved with government that attempt to influence way a country is governed

Legal - bases decisions on existing laws or their interpretation

Ethical - bases decisions around accepted beliefs of group that acts to control its behaviour

Societal - focuses on ways in which society functions and the way people interact and carry out their live

Energy Use

- Energy has increased through the ages

From 9 EJ/billion people in 1850

To over 70 EJ/billion people in 2000

Factors Affecting Energy Use

- Climate
- Activity
- Population
- Energy Intensity
- Energy Efficiency
 - Increased by reducing friction (moving parts), or using better technology

Extreme temperatures increase energy use

- Too Hot needs AC (California and Arizona)
- Too Cold needs Heat (Canada, Russia)

How much work is being done

- Smaller GDP (gross domestic product less energy needed) Canada vs USA

More population means more energy needed to meet average lifestyle

Countries that rely on industries that require more energy to complete will use more energy than other countries.(Canada and natural resources, vs South Korea and software development)

Using more efficient technologies will reduce energy use.

- LED bulb vs Incandescent
- Electric Cars vs Internal Combustion

$$\text{Energy Efficiency} = \frac{\text{useful output energy}}{\text{total input energy}} \times 100\%$$

Alberta's Energy-Based Economy

- Energy industry is vital to alberta's economy
- Alberta uses the most energy per person of any other province.

- Fossil fuels - half the provinces exports
- Royalties from energy companies account for about $\frac{1}{3}$ of the total revenue for the province

Science 30 - Lesson 37 - Unit D - Energy

Name: _____

Electric Hand Dryer Versus Paper Towel

Criteria	Electric Hand Dryer		Paper Towel	
	Advantage	Disadvantage	Advantage	Disadvantage
Ease of Use				
Compliance				
Hygiene				
Waste Produced				
Environmental Impact				
Total				

Analysis

Description	Energy per Use (kJ)	Cost per 1000 uses
Non-recycled paper towel	743	\$23
Recycled paper towel	460	\$23
Standard electric dryer	222	\$1.47
Low-temperature, high-wind dryer	76	\$0.50

- 1) Identify which hand-drying method is preferred based on the table you complete.
- 2) Use the information in the table above to evaluate each method for drying hands based on cost. Based on this information, which method is preferred?
- 3) Was the preferred method identified in question 1 different from the one identified in question 2? If so, consider all factors and state the preferred method for drying hands.
- 4) Explain why paper towels use so much more energy than electric hand dryers.
- 5) Use the list of perspectives on the board to identify the perspectives represented by each aspect listed in the Criteria column of the table above.

- 6) In this situation, the environmental and economic perspectives are in agreement. The more environmentally friendly choice is also more economical. Give an example of an issue where the environmental and economic perspectives clash.
- 7) What is the useful energy of each device? What kind of energy is produced by is wasted?
- Light bulb?
 - Oven?
 - Television?
- 8) State an example of how a change in consumer preference led to an increase in the quantity of energy used by Canadians for transporting both people and products.
- 9) The United States is Canada's largest trading partner and shares many similarities in terms of lifestyle and culture.
- Compare the total energy consumption of Canada to that of the United States.
 - Compare the per capita energy use of Canada to that of the United States.
 - Provide reasons for the differences between the per capita energy use of these two countries.
- 10) Calculate the energy efficiency of a water heater that uses 200 J of energy to increase the thermal energy of water 55 J.
- 11) If an automobile engine is 20% efficient, calculate the useful output energy from 1 kg of gasoline containing 44.5 MJ of chemical potential energy.