

Environmental Science Second Edition

The new edition of Environmental Science represents a major revision offering greater scope and depth of content coverage. New material covers carbon capture and storage, renewable energy sources, Gulf of Mexico oil spill, volcanism, ice sheet melting, globalization, and much more. A comprehensive exploration of the Earth's systems, from its geology and ecology, to the many ways in which humans interact with their natural environment.

Structured on the **APES program** and highly suitable to most environmental science curricula.

Suitability:

- Advanced Placement Environmental Science
- International Baccalaureate Environmental Systems and Societies
- Grades 9-12
- College prep
- Community College

ISBN: 978-1-877462-76-4 Pages: 234

Biozone's unique formula encourages self direction, while dovetailing with traditional resources.

Chapters

- The Earth's Systems
- Ecosystems
- Natural Ecosystem Change
- Populations
- Investigating Ecosystems
- Land and Water
- Energy
- Pollution
- Global Change

Features

- **Introduction to the topic:**
A concise introduction to the concepts in the activity.
- **Easy to understand diagrams:**
Highly visual, clearly annotated diagrams improve the accessibility of information.
- **Consolidation and branching out:**
Activities provide information to consolidate basic knowledge, while allowing scope for exploring. Differential instruction becomes easier and students at all levels are encouraged to be 'thinkers'.
- **Write-on format:**
Activities provide information to consolidate basic knowledge, while allowing scope for exploring.
- **Tear-out pages:**
Each page has a perforation to allow easy removal for marking, or placement in a ring binder.
- **Links:**
Reference to specific web sites (accessed via Biozone's web site) and links to activities with related content elsewhere in the workbook.
- **Activity Code:**
Each activity is coded to identify the skills required for its completion.

Ice Sheet Melting

The surface temperature of the Earth is not equalled by the amount of ice on the surface. When ice melts, a large amount of heat is required. However, the area and thickness of the ice sheet can be highly reflective. From 1982 to 2008 the Arctic ice extent was the minimum annual extent, decreasing by more than 2 million square kilometers.

Since summer minimum (1982) 2.8 million km²

Since summer minimum (2008) 10.5 million km²

1. Explain how low sea ice extent affects and/or alters the next year's sea ice cover.

2. Discuss the effects of decreasing summer sea ice on polar wildlife.

Oil Spills and Wildlife

The coastline of Louisiana, Mississippi and Florida contains the largest amount of oil and gas reserves in the world. The oil and gas industry provides habitat for a range of species including seabirds, marine mammals and many species of fish and shellfish.

They return to the ocean. The Gulf of Mexico is home to many important commercial fish species and 20% of the commercial catch of the United States. The oil and gas industry provides habitat for a range of species including seabirds, marine mammals and many species of fish and shellfish.

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The Nitrogen Cycle

Nitrogen is a vital element for plants and animals. It is a key part of the structure of proteins and nucleic acids. The cycle involves the movement of nitrogen through the atmosphere, soil, and living organisms.

1. Describe the processes in the nitrogen cycle where bacterial action is important. Include the names of each of the processes and the changes in the form of nitrogen involved.

Wind Power

Wind power has been used for many years to generate mechanical energy for sailing, water pumps or machinery. Today it is widely used to generate electricity. Wind power is becoming increasingly popular and cost-effective technology worldwide and continues to be able to operate in a range of conditions and wind speeds.

1. Explain why wind power works best when it makes up only a portion of national electricity requirements.

2. Discuss the advantages and disadvantages of wind power.

3. A typical wind turbine produces around 2.3 MW. The average house uses 300 kWh per day. Calculate the following:

- The minimum number of wind turbines required to power a town of 100,000 people.
- The total cost of the wind turbines to be shown at a rate of \$1,000 per kilowatt installed.
- The number of wind turbines required to replace a 1,000 MW coal fired power station.

Content Overview

THE EARTHS SYSTEMS

The Earth's History
 Fossil Formation
 The Earth and the Sun
 The Earth's Crust
 Plate Boundaries
 Lithosphere and Asthenosphere
 Volcanoes and Volcanism
 The Rock Cycle
 Soil Textures
 Soil and Soil Dynamics
 The Atmosphere and Climate
 Variation and Oscillation
 Ocean Circulation and Currents
 Global Water Resources
 Water and People
 Water and Industry
 Key Terms: Mix and Match

ECOSYSTEMS

Components of an Ecosystem
 Factors Affecting Biome Distribution
 World Distribution of Biomes
 The Effect of Temperature on Biomes
 Physical Factors and Gradients
 Habitats
 Ecological Niche
 Energy Inputs and Outputs
 Photosynthesis
 Cellular Respiration
 Food Chains
 Food Webs
 Energy Flow in an Ecosystem
 Ecological Pyramids
 Primary Productivity
 Key Terms: Mix and Match

NATURAL ECOSYSTEM CHANGE

The Carbon Cycle
 The Nitrogen Cycle
 Nitrogen Pollution
 The Hydrological Cycle
 The Phosphorus Cycle
 The Sulfur Cycle
 Primary Succession
 Secondary Succession
 Ecosystem Stability
 Ecological Change
 Key Terms: Mix and Match

POPULATIONS

Features of Populations
 Density and Distribution
 Population Regulation
 Population Growth
 Survivorship Curves
 Population Growth Curves
 r and K Selection
 Population Age Structure
 World Population Growth
 Human Demography
 Life Expectancy
 Human Sustainability
 Humans and Resources
 Species Interactions
 Interspecific Interactions
 Intraspecific Interactions
 Key Terms: Mix and Match

INVESTIGATING ECOSYSTEMS

Sampling Populations
 Quadrat Sampling
 Quadrat-Based Estimates
 Sampling a Leaf Litter Population
 Transect Sampling
 Mark and Recapture Sampling
 Sampling Animal Populations
 Indirect Sampling
 Monitoring Change in an Ecosystem
 Radio Tracking
 Classification Keys
 Keying Out Plant Species
 Key Terms: Mix and Match

LAND AND WATER

The Importance of Plants
 Global Human Nutrition
 The Green Revolution
 Cereal Crop Production
 Pest Control
 Pesticide Resistance
 Integrated Pest Management
 Soil Degradation
 Reducing Soil Erosion
 The Impact of Farming
 Agricultural Practises
 Forestry
 Managing Rangelands
 City Planning
 Transportation
 Environmental Remediation
 Mining and Minerals
 Globalization
 Ecological Impacts of Fishing
 Fisheries Management
 Key Terms: Mix and Match

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Content Overview continued

ENERGY

Using Energy Transformations
Non Renewable Energy
Oil
Coal
Nuclear Power
Renewable Energy
Wind Power
Hydroelectric Power
Solar Power
Geothermal Power
Ocean Power
Biofuels
Current and Future Energy Demands
Energy Conservation
Key Terms: Mix and Match

POLLUTION

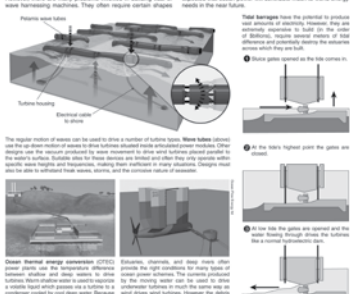
Types of Pollution
Water Pollution
Sewage Treatment
Waste Management
Reducing Waste
Noise Pollution
Atmospheric Pollution
Acid Rain
Toxins in the Home
Health Effects Of Pollution
The Economic Impact of Pollution
Exxon Valdez Oil Spill
Niger Delta Oil
Deepwater Drilling
Deepwater Horizon Oil Spill
Oil Spills and Wildlife
Cleaning Up Oil Spills
Chernobyl Accident
Bhopal Disaster
Key Terms: Mix and Match

GLOBAL CHANGE

Stratospheric Ozone Depletion
Global Warming
Effects of Global Warming
Ice Sheet Melting
Ocean Acidification
Carbon Trading
Carbon Capture and Storage
Loss of Biodiversity
Tropical Deforestation
Impact of Alien Species
Endangered Species
Extinction
In situ Conservation
Ex situ Conservation
Nature Reserves
Conservation of African Elephants
Conservation and Sustainability
Saving the Black Robin
Key Terms: Mix and Match

191 Ocean Power

An enormous amount of energy is stored in the world's oceans. Tides, waves, and currents provide a constant source of energy that can be harnessed to generate electricity. This energy is stored in the form of potential energy. When the water moves, this potential energy is converted into kinetic energy. This kinetic energy can be used to generate electricity.



1. Describe some of the technical problems associated with producing energy from the sea.

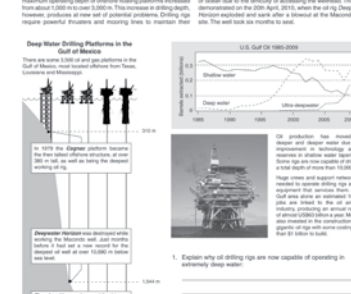
2. Explain why harnessing ocean power could be so useful.

3. Explain why ocean power is unlikely to ever produce much of the world's energy.

Related activities: Renewable Energy, Wildlife, Ocean Power
Phetlabs: Energy Flow
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192 Deepwater Drilling

As technology improves and the demand for oil increases, oil companies are now beginning to drill oil wells much further from shore than ever before. Drilling platforms are now able to operate in water thousands of metres deep. These platforms are built on steel jackets that are anchored to the seabed. The jackets are made of steel and are built to withstand the harsh conditions of the deep sea.



1. Explain why oil drilling rigs are now capable of operating in extremely deep water.

2. Explain why oil companies are exploring for oil in progressively deeper water.

3. Describe some of the issues associated with ultra-deepwater oil.

Related activities: Deepwater Drilling, Oil Spill
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193 Nature Reserves

Conservation on a national scale generally involves setting up reserves or protected areas to allow the best of biodiversity. Nature reserves may be designated by government institutions in some countries by private landowners. The different types of nature reserves, e.g. wildlife, scientific and scientific reserves, and National Parks, all have varying levels of protection, depending upon countries and local laws. National parks are usually located in areas which have been largely undisturbed and they often contain ancient, natural, or historical sites. They provide habitats for endangered species, high biodiversity, or unusual geological features. Canada's National Parks are a country-wide system of approximately 39 national parks of various sizes. They are protected by law for public understanding, appreciation, and enjoyment, while being managed by the Nature Conservators. National parks have existed in Canada for well over a century. Some 11% of public lands (200,000 km²) of the USA are in National Parks and Preserve, which contain natural resources, with almost 80% of the USA, with at least one or more parks. This provides habitat for endangered species, migratory birds, and big game.



1. Discuss the importance of national parks and reserves, including conservation, recreational and tourism uses.

Related activities: National Parks, Conservation, Endangered Species, Environmental Impact, History, and Biodiversity
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