

# Unit 5 : Toward a Sustainable Future

Content Area: **Science**  
Course(s): **Environmental & Earth Science**  
Time Period: **Fourth Marking Period**  
Length: **7 Week**  
Status: **Published**

## Unit Overview

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Unit five addresses solutions and policies that deal with threatening environmental issues such as climate change, and fossil fuel depletion. This unit is intended to help students understand the renewable energy technologies and the political and economic conditions necessary for their implementation. Students will also study waste management in urban and suburban areas and alternative methods that are replacing old techniques.

## STAGE 1- DESIRED RESULTS

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## Standards- 2020 New Jersey Student Learning Standards- Science

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### Science and Engineering Practices

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- Analyzing and Interpreting Data
- Asking Questions and Defining Problems
- Constructing Explanations and Designing Solutions
- Developing and Using Models
- Engaging in Argument from Evidence
- Obtaining, Evaluating, and Communicating Information
- Planning and Carrying Out Information
- Using Mathematics and Computational Thinking

### Cross Cutting Concepts

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- Cause and Effect
- Energy and Matter

- Influence of Engineering, Technology, and Science on Society and the Natural World
- Interdependence of Science, Engineering, and Technology
- Patterns
- Scale, Proportion, and Quantity
- Stability and Change
- Structure and Functions
- Systems and System Models

## **Disciplinary Core Ideas**

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### **Physical Sciences**

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- PS1A: Structure and Properties of Matter
- PS1B: Chemical Reactions
- PS1C: Nuclear Processes
- PS2A: Forces and Motion
- PS2B: Types of Interaction
- PS3A: Definitions of Energy
- PS3B: Conservation of Energy and Energy Transfer
- PS3C: Relationship Between Energy and Forces
- PS3D: Energy in Chemical Processes and Everyday Life
- PS4A: Wave Properties
- PS4B: Electromagnetic Radiation
- PS4C: Information Technologies and Instrumentation

### **Life Sciences**

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- LS1A: Structure and Functions
- LS1B: Growth and Development of Organisms
- LS1C: Organization for Matter and Energy Flow in Organisms
- LS1D: Information Processing
- LS2A: Interdependent Relationships in Ecosystems
- LS2B: Cycles of Matter and Energy Transfer in Ecosystems
- LS2C: Ecosystems Dynamics, Functioning, and Resilience
- LS2D: Social Interactions and Group Behavior
- LS3A: Inheritance of Traits

- LS3B: Variation of traits
- LS4A: Evidence of Common Ancestry and Diversity
- LS4B: Natural Selection
- LS4C: Adaptation
- LS4D: Biodiversity and Humans

## **Earth and Space Sciences**

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- ESS1A: The Universe and its Stars
- ESS1B: Earth and the Solar System
- ESS1C: The History of Planet Earth
- ESS2A: Earth Materials and Systems
- ESS2B: Plate Tectonics and Large-Scale Systems
- ESS2C: The Role of Water in Earth's Surface Processes
- ESS2D: Weather and Climate
- ESS2E: Biogeology
- ESS3A: Natural Resources
- ESS3B: Natural Hazards
- ESS3C: Human Impacts on Earth Systems
- ESS3D: Global Climate Change

## **Engineering. Technology. and Applications of Science**

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- ETS1A: Defining and Delimiting an Engineering Problem
- ETS1B: Developing Possible Solutions
- ETS1C: Optimizing the Design Solution

## **Essential Questions**

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- What are the causes and consequences of a warming Earth?
- What factors do determine Earth's climate?
- What are the effects of climate change?
- How can we respond to climate change?
- Can we depend on nonrenewable energy resources for our energy needs?
- What is energy and how is it used?
- How were fossil fuels formed, and how are they obtained and used?
- What are the problems associated with fossil fuel use?
- What are the advantages and disadvantages of nuclear energy?
- What are the potential uses and limitations of renewable energy sources?
- How can we use biomass energy and geothermal energy?

- How can water be used to address energy needs?
- How can we rely upon on the Sun and wind for power?
- How can we use hydrogen as a source of energy?
- How do our choices as consumers and waste producers affect our environment?
- How does our current waste disposal impact our environment?
- What is the best way to manage our solid waste?
- How can we best reduce the impact of hazardous waste?

### Enduring Understanding

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- Today's decisions define our future environment.
- Fossil fuel combustion generates 70% of the electricity used in the United States.
- The United States has only 4.5% of the world's population, but uses 21.1% of the world's energy.
- The United States imports two-thirds of its crude oil.
- Scientists estimate that nuclear power helps us avoid emitting 600 million metric tons of carbon each year worldwide.
- Currently, 19% of the world's electricity is made using hydropower.
- In one day, the Earth receives enough energy from the Sun to meet human energy needs for 25 years, if it could all be harnessed.
- Hydrogen is the most abundant element in the universe.
- U.S. households threw out about 304 million electronic devices in 2005—most were still in working order.

### Students will know...

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Standards	Students will know	Students will do	Suggested Activities/ Strategies
HS-ESS3-6	<ul style="list-style-type: none"> <li>• The heating of Earth's atmosphere by the Sun is influenced by the greenhouse effect, latitude, and sunspot cycles.</li> </ul>	<ul style="list-style-type: none"> <li>• Describe factors that affect how the Sun warms Earth.</li> </ul>	<ul style="list-style-type: none"> <li>• Lab: Does Latitude Affect the Sun's Rays? (<i>Pearson Environmental Science, Your World, Your Turn</i>, 2011, p. 486).</li> </ul>

HS-ESS3-6	<ul style="list-style-type: none"> <li>Winds distribute heat and moisture globally.</li> </ul>	<ul style="list-style-type: none"> <li>Discuss the role of wind patterns in determining climate.</li> </ul>	<ul style="list-style-type: none"> <li>Figure 3: Prevailing Winds Map, (<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p.487).</li> </ul>
HS-ESS3-6	<ul style="list-style-type: none"> <li>Oceans affect climate by transporting heat and absorbing carbon dioxide.</li> </ul>	<ul style="list-style-type: none"> <li>Explain how the oceans affect climate.</li> </ul>	<ul style="list-style-type: none"> <li>Search the role of ocean currents in regulating Earth's temperature.</li> </ul>
HS-ESS3-5	<ul style="list-style-type: none"> <li>Global climate may be affected by factors such as topography, volcanic eruptions, regional vegetation, and changes in Earth's orbit.</li> </ul>	<ul style="list-style-type: none"> <li>Describe how climate is affected by topography, volcanoes, regional vegetation and periodic changes in Earth's orbit.</li> </ul>	<ul style="list-style-type: none"> <li>Case Study: The Extinction of Dinosaurs.</li> </ul>
HS-ESS3-6	<ul style="list-style-type: none"> <li>Evidence of global climate change includes rising atmospheric temperature, precipitation trends, melting ice, and rising seas.</li> </ul>	<ul style="list-style-type: none"> <li>Identify evidence of global warming.</li> </ul>	<ul style="list-style-type: none"> <li>Real Data: Changing Temperature of the Atmosphere, (<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p.493).</li> </ul>
HS-ESS3-6	<ul style="list-style-type: none"> <li>Scientists study changes in climate by taking direct measurements, inferring past climate characteristics, and using models to predict the future.</li> </ul>	<ul style="list-style-type: none"> <li>Explain three methods used to study climate change.</li> </ul>	<ul style="list-style-type: none"> <li>Search supporting data for climate change.</li> </ul>

HS-ESS3-5	<ul style="list-style-type: none"> <li>Evidence indicates that global warming has been caused largely by the increase in greenhouse gases in the atmosphere.</li> </ul>	<ul style="list-style-type: none"> <li>State the probable cause of global climate change.</li> </ul>	<ul style="list-style-type: none"> <li>Figure 10: Greenhouse Gases, (<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p.496).</li> </ul>
HS-ESS3-6	<ul style="list-style-type: none"> <li>As the atmosphere warms, ecosystems on land and in the ocean are changing, affecting organisms in various ways.</li> </ul>	<ul style="list-style-type: none"> <li>State ways in which the warming atmosphere affects ecosystems and organisms.</li> </ul>	<ul style="list-style-type: none"> <li>Case Study: The Effect of Climate Change on Polar Bears.</li> </ul>
HS-ESS3-5	<ul style="list-style-type: none"> <li>Global climate change is affecting aspects of human life such as farming, forestry, the economy, and health.</li> </ul>	<ul style="list-style-type: none"> <li>Explain how climate change is affecting people now.</li> </ul>	<ul style="list-style-type: none"> <li>Figure 14: Weather Related Insurance Claims, (<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p. 500).</li> </ul>
HS-ESS3-5	<ul style="list-style-type: none"> <li>Computer modeling predicts that climate change will continue to affect people.</li> </ul>	<ul style="list-style-type: none"> <li>Predict future effects of climate change on people.</li> </ul>	<ul style="list-style-type: none"> <li>Case Study: Diablo Lake.</li> </ul>
HS-ESS3-5	<ul style="list-style-type: none"> <li>Ways of reducing the production of greenhouse gases include conserving electricity and finding new ways to produce electricity.</li> </ul>	<ul style="list-style-type: none"> <li>List ways to reduce greenhouse gases related to the use and generation of electricity.</li> </ul>	<ul style="list-style-type: none"> <li>Activity: Carbon Emission Reduction.</li> </ul>
HS-ESS3-6	<ul style="list-style-type: none"> <li>By choosing more efficient cars, driving less, and using public</li> </ul>	<ul style="list-style-type: none"> <li>Describe some of the ways of reducing</li> </ul>	<ul style="list-style-type: none"> <li>Activity: Green Technology in Transportation. Students to investigate advantages and</li> </ul>

	transportation, people can reduce greenhouse gas emissions.	greenhouse gases related to transportation.	disadvantages of using new green technology in all means of transportation.
HS-ESS3-6	<ul style="list-style-type: none"> <li>Greenhouse gas emissions can also be reduced through improved agriculture and forestry, cap-and-trade policies, carbon offsets, and carbon sequestration.</li> </ul>	<ul style="list-style-type: none"> <li>Describe other strategies for reducing greenhouse gases.</li> </ul>	<ul style="list-style-type: none"> <li>Activity: Students engage in a radiating heat activity and an activity that measures temperature in models with and without greenhouse gases. They draw conclusions about the effect of greenhouse gases on temperature and on human life.</li> </ul>
HS-ESS3-6	<ul style="list-style-type: none"> <li>The Kyoto Protocol is an agreement among many nations to reduce greenhouse gas emissions.</li> </ul>	<ul style="list-style-type: none"> <li>Explain how nations are working together to try to address climate change.</li> </ul>	<ul style="list-style-type: none"> <li>Case study: The Kyoto Protocol.</li> </ul>
HS-LS2-4	<ul style="list-style-type: none"> <li>Energy, which is the ability to do work, can be classified as either kinetic or potential.</li> </ul>	<ul style="list-style-type: none"> <li>Define energy and differentiate between kinetic and potential energy.</li> </ul>	<ul style="list-style-type: none"> <li>Marble Roll Activity: Students will observe and record the amount of work done by the three different marbles rolling down an inclined plane and hypothesize about the reasons for the differences.</li> </ul>
HS-LS2-4	<ul style="list-style-type: none"> <li>Forms of energy include mechanical energy, electrical energy, thermal energy, electromagnetic energy, chemical</li> </ul>	<ul style="list-style-type: none"> <li>Identify different forms of energy.</li> </ul>	<ul style="list-style-type: none"> <li>Combustion and Burning Activity: In this investigation, students are challenged to make careful observations about a burning candle to discover the chemical and physical changes that make it</li> </ul>

	energy, and nuclear energy.		work.
HS-ESS3-3	<ul style="list-style-type: none"> <li>Human society uses renewable and nonrenewable energy resources in industry, transportation, commerce, and residences.</li> </ul>	<ul style="list-style-type: none"> <li>Describe how human society uses energy resources.</li> </ul>	<ul style="list-style-type: none"> <li>Figure 5: How We Use Energy, (<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p. 521).</li> </ul>
HS-ESS3-2	<ul style="list-style-type: none"> <li>Fossil fuels formed from the remains of organisms that lived millions of years ago.</li> </ul>	<ul style="list-style-type: none"> <li>Explain how fossil fuels formed.</li> </ul>	<ul style="list-style-type: none"> <li>Video: Fossil Fuels.</li> </ul>
HS-ESS3-3	<ul style="list-style-type: none"> <li>Coal, which is used mainly to generate electricity, is obtained by mining.</li> </ul>	<ul style="list-style-type: none"> <li>Describe the uses of coal and how it is removed from the ground.</li> </ul>	<ul style="list-style-type: none"> <li>Activity: Supply and Demand of Coal. Students to present their unique coal use information in a visual display, pamphlet or brief presentation with props.</li> </ul>
HS-ESS3-3	<ul style="list-style-type: none"> <li>Petroleum, which is obtained by drilling, is a major source of energy and is used to make a variety of products.</li> </ul>	<ul style="list-style-type: none"> <li>Describe the uses of oil and how it is extracted.</li> </ul>	<ul style="list-style-type: none"> <li>Activity: Oil Refineries.</li> </ul>
HS-ESS3-3	<ul style="list-style-type: none"> <li>Natural gas yields a large amount of energy and is less polluting than other fossil fuels.</li> </ul>	<ul style="list-style-type: none"> <li>Explain the characteristics and uses of natural gas.</li> </ul>	<ul style="list-style-type: none"> <li>Students to debate advantages and disadvantages of using natural gas as a source of energy.</li> </ul>



HS-ESS3-2	<ul style="list-style-type: none"> <li>• The supply of fossil fuels is limited.</li> </ul>	<ul style="list-style-type: none"> <li>• Predict the future of fossil fuels.</li> </ul>	<ul style="list-style-type: none"> <li>• Figure 10: Consumption of Fossil Fuels, (<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p. 527).</li> </ul>
HS-ESS3-2	<ul style="list-style-type: none"> <li>• The burning of fossil fuels causes pollution that affects human health and the environment.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain how pollutants released by fossil fuels damage health and the environment.</li> </ul>	<ul style="list-style-type: none"> <li>• Real Data: Carbon Dioxide for Fossil Fuels, (<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p.530).</li> </ul>
HS-ESS3-2	<ul style="list-style-type: none"> <li>• Mining and drilling for fuels can endanger people and change ecosystems in harmful ways.</li> </ul>	<ul style="list-style-type: none"> <li>• Describe the environmental and health effects of mining and drilling.</li> </ul>	<ul style="list-style-type: none"> <li>• Case Study: Oil Technology in the Tundra.</li> </ul>
HS-ESS3-2	<ul style="list-style-type: none"> <li>• Since fossil fuels are unevenly distributed in the world, many nations need to depend on foreign sources.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the implications of dependence on foreign countries for fossil fuels.</li> </ul>	<ul style="list-style-type: none"> <li>• Map it: Oil Imports and Exports, (<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p. 534).</li> </ul>
HS-ESS3-2	<ul style="list-style-type: none"> <li>• To save fossil fuels and limit the damages they cause, we need to conserve energy.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain why energy conservation is important.</li> </ul>	<ul style="list-style-type: none"> <li>• Discuss local laws and regulation regarding energy conservation.</li> </ul>
HS-PS1-8	<ul style="list-style-type: none"> <li>• The process of nuclear fission releases energy.</li> </ul>	<ul style="list-style-type: none"> <li>• Relate nuclear fission to the production of energy.</li> </ul>	<ul style="list-style-type: none"> <li>• Figure 20: Nuclear Fission, (<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p.527).</li> <li>• WW2 Nuclear Weapons.</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>• In a nuclear power</li> </ul>	<ul style="list-style-type: none"> <li>• Describe how a</li> </ul>	<ul style="list-style-type: none"> <li>• Case Study: NY Indian Nuclear</li> </ul>

	plant, nuclear fission is used to generate electricity.	nuclear power plant generates electricity.	Energy Center.
HS-ESS3-4	<ul style="list-style-type: none"> <li>Nuclear power does not create air pollution, but its problems include the risk of accidents and disposal of wastes.</li> </ul>	<ul style="list-style-type: none"> <li>Identify the advantages and disadvantages of nuclear power.</li> </ul>	<ul style="list-style-type: none"> <li>Students to debate advantages and disadvantages of using nuclear fission for energy.</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>Nuclear fusion has advantages over fission, but the technology does not yet exist to use fusion to generate power.</li> </ul>	<ul style="list-style-type: none"> <li>Contrast nuclear fusion with nuclear fission, and explain the issues related to nuclear fusion.</li> </ul>	<ul style="list-style-type: none"> <li>Figure 24: Nuclear Fusion, (<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p.541).</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>Alternative energy resources are needed to replace fossil fuels, reduce air pollution, and reduce the emission of greenhouse gases.</li> </ul>	<ul style="list-style-type: none"> <li>Explain the benefits and current status of renewable energy resources.</li> </ul>	<ul style="list-style-type: none"> <li>Students to search renewable energy resources, and propose appropriate options for their local communities.</li> </ul>
HS-ESS3-4.	<ul style="list-style-type: none"> <li>Energy derived from biomass is used for cooking, heating, powering motor vehicles, and generating electricity.</li> </ul>	<ul style="list-style-type: none"> <li>Define biomass energy and explain how it is used.</li> </ul>	<ul style="list-style-type: none"> <li>Real Data: Biodiesel, (<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p. 552).</li> <li>Students to debate the effect of biofuels on the food market.</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>Steam and hot water produced by geothermal energy can be used for generating</li> </ul>	<ul style="list-style-type: none"> <li>Describe how geothermal energy is harnessed and</li> </ul>	<ul style="list-style-type: none"> <li>Case Study: Geothermal Energy in Iceland.</li> <li>Students to discuss pros and cons of using geothermal</li> </ul>

	electricity and for heating.	used.	energy.
HS-ESS3-4	<ul style="list-style-type: none"> <li>The movement of river water can be used to generate electricity.</li> </ul>	<ul style="list-style-type: none"> <li>Explain how river water can be used to generate electricity.</li> </ul>	<ul style="list-style-type: none"> <li>Students to debate pros and cons of using dams to generate electricity.</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>Hydropower is nonpolluting and relatively inexpensive, but dams can harm ecosystems and disrupt people's lives.</li> </ul>	<ul style="list-style-type: none"> <li>Identify benefits and costs of hydropower.</li> </ul>	<ul style="list-style-type: none"> <li>Case Study: The Three Gorges Dam.</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>The movement of tides and ocean thermal energy can be used to generate electricity.</li> </ul>	<ul style="list-style-type: none"> <li>Describe how energy from the ocean can generate electricity.</li> </ul>	<ul style="list-style-type: none"> <li>Students to illustrate limitations of using renewable energy resources from the oceans.</li> </ul>
HS-PS3-3	<ul style="list-style-type: none"> <li>The Sun's energy can be used to heat buildings and generate electricity.</li> </ul>	<ul style="list-style-type: none"> <li>Describe techniques for using solar energy to heat buildings and generate electricity.</li> </ul>	<ul style="list-style-type: none"> <li>Go Outside Activity: Does the temperature changes?</li> <li>Figure 13: Going Solar, (<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p.563.).</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>Solar power has many benefits, such as its limitless supply, but it depends on weather and is currently expensive.</li> </ul>	<ul style="list-style-type: none"> <li>Analyze the benefits and costs of solar energy.</li> </ul>	<ul style="list-style-type: none"> <li>Students to debate the costs and benefits of solar power.</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>Wind turbines convert</li> </ul>	<ul style="list-style-type: none"> <li>Explain how wind</li> </ul>	<ul style="list-style-type: none"> <li>Map it: Wind Patterns, (<i>Pearson</i></li> </ul>

	wind's kinetic energy into electrical energy.	energy can be used to produce electricity.	<i>Environmental Science: Your World, Your Turn</i> , 2011, p.568).
HS-PS3-3	<ul style="list-style-type: none"> <li>• Wind power is nonpolluting and efficient, but its supply is unpredictable and it may damage the landscape and wildlife.</li> </ul>	<ul style="list-style-type: none"> <li>• Analyze the benefits and costs of wind energy.</li> </ul>	<ul style="list-style-type: none"> <li>• Students to debate costs-benefit analysis of using wind power to generate energy.</li> </ul>
HS-ESS3-2	<ul style="list-style-type: none"> <li>• Hydrogen fuel can be produced from the breakdown of water or another hydrogen-containing compounds.</li> </ul>	<ul style="list-style-type: none"> <li>• Describe how hydrogen fuel can be produced.</li> </ul>	<ul style="list-style-type: none"> <li>• Explore different techniques to produce hydrogen fuel.</li> </ul>
HS-ESS3-2	<ul style="list-style-type: none"> <li>• Fuel cells are used to generate electricity.</li> </ul>	<ul style="list-style-type: none"> <li>• Explain the way fuel cells work and how they are used.</li> </ul>	<ul style="list-style-type: none"> <li>• Search current technology regarding fuel cell.</li> <li>• Figure 24: Inside a Fuel Cell,(<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p.572).</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>• The three main categories of waste include municipal solid waste, industrial waste, and hazardous waste.</li> </ul>	<ul style="list-style-type: none"> <li>• Identify the three categories of waste.</li> </ul>	<ul style="list-style-type: none"> <li>• Teacher to provide students with a list of items and ask them to classify each item as municipal, industrial or hazardous.</li> </ul>
HS-ESS3-2	<ul style="list-style-type: none"> <li>• Current solid waste disposal methods are based on ancient practices of dumping, burying, or burning waste.</li> </ul>	<ul style="list-style-type: none"> <li>• Describe conventional waste disposal methods.</li> </ul>	<ul style="list-style-type: none"> <li>• Students to compare and contrast the use of landfill and incinerators.</li> <li>• Case Study: NY Waste Management Plan After the Fresh kills Landfill.</li> </ul>

HS-ESS3-2	<ul style="list-style-type: none"> <li>One of the best ways to manage solid waste is to reduce the amount we generate.</li> </ul>	<ul style="list-style-type: none"> <li>Discuss the importance of reducing waste.</li> </ul>	<ul style="list-style-type: none"> <li>Lab: Reduce, Reuse, and Recycle (RRR).</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>* The amount of waste can also be reduced by composting and recycling.</li> </ul>	<ul style="list-style-type: none"> <li>Describe how composting and recycling help reduce the amount of waste.</li> </ul>	<ul style="list-style-type: none"> <li>Discuss the policy of recycling in your local community.</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>Waste that is ignitable, corrosive, chemically reactive or toxic is considered to be hazardous waste.</li> </ul>	<ul style="list-style-type: none"> <li>Define hazardous waste.</li> </ul>	<ul style="list-style-type: none"> <li>Lab: Hazardous Waste.</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>Both industry and the private sector produce hazardous wastes.</li> </ul>	<ul style="list-style-type: none"> <li>Describe some of the sources of hazardous wastes.</li> </ul>	<ul style="list-style-type: none"> <li>Students to search household hazardous material in accordance with EPA.</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>There are three main ways to dispose of hazardous waste: landfills, surface impoundments, and injection wells.</li> </ul>	<ul style="list-style-type: none"> <li>Describe current methods for hazardous waste disposal.</li> </ul>	<ul style="list-style-type: none"> <li>Compare and contrast the three major ways of disposing of hazardous wastes.</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>Radioactive waste is particularly dangerous to human health and is persistent in the environment.</li> </ul>	<ul style="list-style-type: none"> <li>Describe the danger of radioactive wastes.</li> </ul>	<ul style="list-style-type: none"> <li>Real Data: Radiation and Human Health, (<i>Pearson Environmental Science: Your World, Your Turn</i>, 2011, p. 601).</li> </ul>
HS-ESS3-4	<ul style="list-style-type: none"> <li>Hazardous waste is</li> </ul>	<ul style="list-style-type: none"> <li>Identify agencies</li> </ul>	<ul style="list-style-type: none"> <li>Search: Comprehensive</li> </ul>

	regulated and monitored, but illegal dumping is a problem.	that regulate hazardous waste.	Environmental Response Compensation and liability Act, (CERCLA), 1980.
<b>Modification</b>			
<ul style="list-style-type: none"> <li>• IEP guideline and modification for classified students.</li> <li>• Extended time for struggling students.</li> <li>• When available, assignments are to be sent electronically to online accounts and MacBook Air.</li> <li>• Special accommodations for students with physical or visual impairments.</li> <li>• Differentiated instruction.</li> </ul>			
<b>Predictable Misconceptions</b>			
<ul style="list-style-type: none"> <li>• The greenhouse effect is bad and will eventually cause all living things to die.</li> <li>• Humans burning fossil fuels caused the carbon cycle.</li> <li>• The 'Ice Ages' happened in the past and are now over.</li> <li>• ???? Even though most coal found in nature is the altered remains of prehistoric vegetation, mankind can make coal so we will never run out.</li> <li>• Earth's resources are not finite--there is an endless supply of water, petroleum, and mineral resources. All we have to do is to explore for them.</li> <li>• Energy is a fuel.</li> <li>• Natural disasters happen very rarely and these events are just the bad luck of the people that are affected.</li> <li>• Global warming is caused by the hole in the ozone because it lets in more radiation.</li> </ul>			

- Volcanic ash from a far away volcano cannot affect New Jersey.
- Earth and its systems are too big to be affected by humans.
- Nuclear power is more dangerous than coal power.
- Nuclear Waste cannot be taken care of and lasts thousands of years.

### **Suggested Case Studies**

- Dealing with Waste: Florida Waste management.
- Rising Seas may Flood the Maldives Islands.
- Oil or Wilderness on Alaska's North Slope?
- Germany's Big Bet on Renewable Energy.
- Transforming New York's Fresh Kills Landfills.

## **STAGE 2- EVIDENCE OF LEARNING**

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### **Formative Assessment**

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- Choral Response
- Debriefing
- Idea Spinner
- Misconception Check
- Observation
- Quiz
- Self-Assessment
- Student Conference

- Think-Pair-Share
- Web or Concept Map

### **Authentic Assessments**

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- \* Chapter 16 Assessment: (*Pearson Environmental Science: Your World, Your Turn*, 2011, p. 512-513)
- \* Chapter 17 Assessment: (*Pearson Environmental Science: Your World, Your Turn*, 2011, p. 545-546)
- \* Chapter 18 Assessment: (*Pearson Environmental Science: Your World, Your Turn*, 2011, p. 577-578)
- \* Chapter 19 Assessment: (*Pearson Environmental Science: Your World, Your Turn*, 2011, p. 607-608)
- \* E.Tex: Pearson Environmental Science: Chapter 16, 17, 18, and 19, Test (A, B).
- \* Unit 5: Students Self-test Assessment, Online Text:
- \* Teacher–Prepared Case Study Project Assessment.
- \* Students Workbook: Chapter 16, 17, 18, 14 (Pg.282: 363).

### **Benchmark Assessments**

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- Unit One: Final Test
- Unit One: Project Assessment
- Final Exam

## **STAGE 3- LEARNING PLAN**

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### **Instructional Map**

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Unit	Time Frame	Date	Marking Period
5	7 Weeks <ul style="list-style-type: none"> <li>• 5 Weeks Instruction</li> <li>• 2 Weeks Formative and</li> </ul>	April, May, and June	4 <sup>th</sup>



	<b>Summative Assessment</b>		
<b>Review &amp; Final</b>	<b>2 Weeks</b>	<b>June</b>	<b>4<sup>th</sup></b>

- Assess students' prior knowledge of the related topics in the unit, (Pre-Assessment).
- Unit Case Study:
  - Preview the case study.
  - Read the case study.
  - Assimilate the facts.
  - Gather additional information.
  - Map the contents.
  - Make local connection.
  - Create a project.
- Teacher to use formative assessment and feedback to improve students' learning.
- Students to use the textbook, or E-text, for reading and definitions.
- Teacher to use PowerPoint and multi-sensory media to introduce concepts and main points.
- Teacher to use the suggested activities, in the table above, for teaching each concept in the unit.
- Students to connect and relate unit topics to their local communities and environment, when possible.
- Students to use study guides, homework, and students' workbook for reference and feedback.
- Apply labs and outside activities as indicated in the table above.
- Teacher to guide students through authentic resources during their conduction of research and inquiries.
- Students to use graphs, charts, data table, and maps throughout the unit as indicated in the table above.
- At the end of the unit, students should present scientifically sound projects supported by evidence, data, charts, and maps.
- Unit summative assessment.

## **Modification Strategies**

### Differentiation Strategies for Special Education Students

- Remove unnecessary material, words, etc., that can distract from the content

- Use of off-grade level materials
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Time allowed
- Level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Varied homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Ability to work at their own pace
- Present ideas using auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment
- Differentiated checklists and rubrics, if available and appropriate

### Differentiation Strategies for Gifted and Talented Students

- Increase the level of complexity
- Decrease scaffolding
- Variety of finished products
- Allow for greater independence
- Learning stations, interest groups
- Varied texts and supplementary materials
- Use of technology
- Flexibility in assignments
- Varied questioning strategies
- Encourage research
- Strategy and flexible groups based on formative assessment or student choice
- Acceleration within a unit of study
- Exposure to more advanced or complex concepts, abstractions, and materials
- Encourage students to move through content areas at their own pace
- After mastery of a unit, provide students with more advanced learning activities, not more of the same activity
- Present information using a thematic, broad-based, and integrative content, rather than just single-

subject areas

### Differentiated Strategies for ELL Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials, including visuals
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge
- Define key vocabulary, multiple-meaning words, and figurative language.
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Allow students to work at their own pace
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Role play
- Provide graphic organizers, highlighted materials
- Strategy and flexible groups based on formative assessment

### Differentiation Strategies for At Risk Students

- Remove unnecessary materials, words, etc., that can distract from the content
- Provide appropriate scaffolding
- Limit the number of steps required for completion
- Gradually increase the level of independence required
- Tiered centers, assignments, lessons, or products
- Provide appropriate leveled reading materials
- Deliver the content in “chunks”
- Varied texts and supplementary materials
- Use technology, if available and appropriate
- Differentiate homework and products
- Varied questioning strategies
- Provide background knowledge

- Define key vocabulary, multiple-meaning words, and figurative language
- Use audio and visual supports, if available and appropriate
- Provide multiple learning opportunities to reinforce key concepts and vocabulary
- Meet with small groups to reteach idea/skill
- Provide cross-content application of concepts
- Presenting ideas through auditory, visual, kinesthetic, & tactile means
- Provide graphic organizers and/or highlighted materials
- Strategy and flexible groups based on formative assessment

## 504 Plans

Students can qualify for 504 plans if they have physical or mental impairments that affect or limit any of their abilities to:

- walk, breathe, eat, or sleep
- communicate, see, hear, or speak
- read, concentrate, think, or learn
- stand, bend, lift, or work

Examples of accommodations in 504 plans include:

- preferential seating
  - extended time on tests and assignments
  - reduced homework or classwork
  - verbal, visual, or technology aids
  - modified textbooks or audio-video materials
  - behavior management support
  - adjusted class schedules or grading
  - verbal testing
  - excused lateness, absence, or missed classwork
  - pre-approved nurse's office visits and accompaniment to visits
  - occupational or physical therapy
- 
- Cooperative Grouping
  - Extended Time
  - Frequent Breaks
  - Highlighted Text
  - Interactive Notebook
  - Modified Test

- Oral Directions
- Peer Tutoring
- Preferential Seating
- Re-direct
- Repeated Drill and Practice
- Shortened Assignment
- Teacher Notes
- Tutorials
- Use of Additional Reference Materials
- Use of Audio Resources

## **Horizontal Intergration- Interdisciplinary Connections**

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See Appendix

## **Vertical Integration- Discipline Mapping**

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- **Middle School**

- 6<sup>th</sup> Grade: Diversity of Life
- 7<sup>th</sup> Grade: Populations and Ecosystems
- 8<sup>th</sup> Grade: Earth History

- **High School**

- Biology
- Anatomy and Physiology
- Chemistry
- Physics
- Forensic Science
- Zoology

- Human Impact on the Environment

## Additional Materials

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- *Lab Manual and Equipment*
- *Safety Rules and Equipment*
- *Pearson: Environmental Science, Your World, Your Turn, 2011*
- *Textbook, Students' Workbook, and Lab Manual*
- *E-texts, Teacher Resources, and Students Resources*
- *Environmental Protection Agency* <http://www.epa.gov>
- *Food and Drug Administration*, <http://www.fda.gov>
- *National Oceanographic and Atmospheric Administration* (NOAA)
- *National Oceanographic and Atmospheric Administration* (NOAA)
- *National Environmental Satellite, Data and Information Service* (NESDIS)
- *National Marine Fisheries Service* (NMFS)
- *National Ocean Service* (NOS)
- *National Weather Service* (NWS)
- *Office of Oceanic and Atmospheric Research* (OAR)
- *Department of Health and Human Services* (HHS)
- *Agency for Toxic Substances and Disease Registry* (ATSDR)
- *Centers for Disease Control and Prevention* (CDCP)
- *National Institutes of Health* (NIH)
- *New Jersey Department of Environmental Protection*
- *New Jersey Division of Fish, Game and Wildlife*
- *US Fish and Wildlife Service Offices in New Jersey*
- *Nature*, <http://www.nature.com/nature/index.html>
- *Conservation Fund*, <http://www.conservationfund.org>
- *Conservation International*, <http://www.conservation.org>
- *Earth Justice*, <http://earthjustice.org>
- *Environmental Defense Fund*, <https://www.edf.org>
- *Natural Resources Defense Council*, <http://www.nrdc.org>
- *Oceana*, <http://oceana.org>
- *Rainforest Alliance*, <http://www.rainforest-alliance.org>
- *Sierra Club Foundation*, <http://www.sierraclubfoundation.org>
- *Union of Concerned Scientists*, <http://www.ucsusa.org>
- *World Resources Institute*, <http://www.wri.org>
- *Discovery*: <http://www.discovery.com>