

# Unit 6: Mineral & Energy Resources

Content Area: **Science**  
Course(s): **Environmental Science**  
Time Period: **4th Marking Period**  
Length: **2 Weeks**  
Status: **Published**

## Unit Overview

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Human populations use resources in the environment in order to maintain and improve their existence. Natural resources have been used to maintain human populations.

The Earth doesn't have infinite resources; increasing human consumption places severe stress on the natural processes that renew some resources, and it depletes those resources that cannot be renewed.

Humans use many natural systems as resources. Natural systems have the capacity to reuse waste, but the capacity is limited. Natural systems can change to an extent that exceeds the limits of organisms to adapt naturally humans to adapt technologically.

## Transfer

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Relate minerals that are mined to their economical value.

Become aware of the value of metals for their ability for conductivity, durability and corrosion resistance.

Identify local environmental problems as a result of mining.

Identify the nonrenewable resources used in their own daily lives.

Construct a logical argument for alternative sources of energy.

Compare and contrast the benefits and consequences of nuclear energy.

Identify renewable resources in the local area.

Logically research alternative energies to best benefit their local area.

Research their own waste, both biodegradable and non biodegradable.

Identify activities in their home that can create hazardous waste.

## **Meaning**

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## **Understandings**

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Most of the world's energy needs are met by fossil fuels, which are nonrenewable resources.

Coal is refined primarily to produce electricity.

Petroleum is used to make fuels and other products such as plastics.

The extraction of fossil fuels cause many environmental problems.

Nuclear energy is energy that exists within the nucleus of an atom.

Nuclear energy generally does not pollute but is radioactive which can be dangerous for centuries.

Renewable energy is energy from sources that are constantly being formed.

Solar, wind, geothermal and tidal energy are alternative energies that are either in development or are newly being used.

People in the US generate more than 10 billion metric tons of waste a year.

Biodegradable materials can be broken down by biological processes while non biodegradable cannot.

Recycling is a process of reusing materials or recovering valuable materials from waste or scrap.

Activities at home can create hazardous waste.

## **Essential Questions**

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How do ore minerals form?

What is the difference between surface and subsurface mining?

What are environmental consequences associated with mining?

How are fuels used to generate electricity?

How do fossil fuels form and how are they used?

How does a nuclear power plant work?

What is an alternative energy? Why is the development of them important?

How can you conserve energy in your daily life?

How do landfills work?

What makes a waste biodegradable?

What environmental problems are associated with landfills?

How can you reduce waste?

How is hazardous waste created? How is it treated?

## **Application of Knowledge and Skill**

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### **Students will know...**

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A mineral is a naturally occurring, usually inorganic solid that has a characteristic chemical composition, an orderly physical structure, and a characteristic set of physical properties.

Ore minerals may form from the cooling of magma, the circulation of hot water solutions through rocks, and the evaporation of water that contains salts.

Minerals are concentrated by wind and water into deposits called placer deposits.

Environmental consequences of mining may include air, noise and water pollution, displacement of wildlife, erosion, degradation of soil and underground mine fires.

Most of the world's energy needs are met by fossil fuels.

Calculations of fossil fuel reserves predict that oil production will peak and then decline in the early 21st century.

Nuclear energy is energy that exists within the nucleus of an atom.

Nuclear energy releases large amounts of energy but can become unstable producing radioactivity that remains dangerous for centuries.

Renewable energy is energy from sources that are constantly being formed.

Solar, wind, geothermal and tidal energy are all alternative energies either in production or in the stages of development.

Solid waste is classified as either biodegradable or not.

Biodegradable waste includes newspapers and cotton fibers and can be broken down by biodegradable processes.

Non biodegradable materials such as plastics cause major disposal problems.

Recycling is the process of reusing materials or recovering materials from waste or scrap.

### **Students will be skilled at...**

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Identifying minerals and how they are made.

Comparing and contrasting ores.

Developing a flow chart for mining and the associated consequences.

Create a graphic organizer for fossil fuel use.

Calculate their own carbon footprint.

Identify ways in which energy can be conserved daily.

Develop their own alternative energy producing machine.

Create a plan for composting and recycling.

Compare and contrast biodegradable and non biodegradable waste.

### **Academic Vocabulary**

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mineral

ore mineral

surface mining

placer deposit

smelting

subsidence

reclamation

fossil fuel

electric generator

petroleum

oil reserves

nuclear energy

nuclear fission

nuclear fusion

renewable energy

passive solar heating

active solar heating

biomass fuel

hydroelectric energy

geothermal energy

alternative energy

ocean thermal energy conversion (OTEC)

energy efficiency

energy conservation

solid waste

biodegradable

municipal solid waste

landfill

leachate

source reduction

recycling

compost

hazardous waste

deep-well injection

surface impoundment

## **Learning Goal 1**

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Discuss the economic importance of minerals, surface and subsurface mining techniques, the environmental ramifications of mining, and the laws regulating mining and mine reclamation.

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| SCI.HS-ESS3-5 | Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. |
| SCI.HS-ESS3-6 | Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.   |
| SCI.HS-ESS3-4 | Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.   |
| SCI.HS-ESS3-2 | Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.   |
| SCI.HS-ESS3-3 | Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.  |
| SCI.HS-ESS3-1 | Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.                                |

## **Target 1**

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SWBAT define the minerals and ore.

## **Target 2**

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SWBAT explain the difference between a metal and a nonmetal.

## **Target 3**

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SWBAT describe the methods of surface mining and subsurface mining.

## **Target 4**

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SWBAT to describe the important environmental consequences of mining.

## **Target 5**

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SWBAT name the federal laws that relate mining and reclaiming mined land.

## **Learning Goal 2**

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Describe the fundamentals of energy use in our society.

based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.

SCI.HS-ESS3-6

Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.

SCI.HS-ESS3-4

Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

SCI.HS-ESS3-2

Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.

SCI.HS-ESS3-3

Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.

SCI.HS-ESS3-1

Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.

## **Target 1**

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SWBAT identify patterns of energy consumption and production in the world and the United States.

## **Target 2**

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SWBAT compare the advantages and disadvantages of fossil-fuel use and production.

## **Target 3**

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SWBAT list the factors that influence the value of a fuel.

## **Target 4**

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SWBAT describe nuclear fission and describe how a nuclear power plant works.



## Learning Goal 3

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Describe how renewable and alternative energy resources play an increasing important role in reducing our dependence on renewable energy sources.

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|---------------|--|
| SCI.HS-ESS3-5 | Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. |
| SCI.HS-ESS3-6 | Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.   |
| SCI.HS-ESS3-4 | Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.   |
| SCI.HS-ESS3-2 | Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.   |
| SCI.HS-ESS3-3 | Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.  |
| SCI.HS-ESS3-1 | Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.                                |

### Target 1

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SWBAT compare the advantages and disadvantages of the different forms of renewable energy.

### Target 2

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SWBAT list and describe the different alternative energy technologies.

### Target 3

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SWBAT explain the difference between energy efficiency and energy conservation.

## Learning Goal 4

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Discuss our society's waste problems.

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|---------------|--|
| SCI.HS-ESS3-5 | Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems. |
| SCI.HS-ESS3-6 | Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.   |
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| SCI.HS-ESS3-1 | Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.                                |

### **Target 1**

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SWBAT describe the characteristics that makes a material biodegradable.

### **Target 2**

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SWBAT identify the types of solid waste and how a modern landfill works.

### **Target 3**

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SWBAT identify the different ways you can produce less waste and list the steps that an item must go through to be recycled.

### **Target 4**

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SWBAT list the characteristics of hazardous waste and describe the laws that govern hazardous waste.

## **Formative Assessment and Performance Opportunities**

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Class discussions

Paper and pencil tests

Science notebook

Student displays and presentations

Student experiments

Student sheets

## **Summative Assessment**

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All assessments are differentiated and aligned to the science standards and curriculum. Alternate assessments may include projects or presentations, or a common paper/pencil assessment or both. Common Assessment is administered through LinkIt.

## **Accommodations/Modifications**

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- Additional resources , such as <https://www.toppr.com/guides/geography/minerals-and-energy-resources/what-are-minerals-and-energy-resources/>
- Partner students for support
- Provide access to Albert.io online resource specific to mineral and energy resources

## **Unit Resources**

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- Environmental Science, Holt, Reinhart & Winston, 2008
- Interactive classroom and whiteboard activities
- Internet
- Supplemental textbooks/teacher resources
- Videos and online videos

## 21st Century Life and Careers

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|-----------------|--|
| CAEP.9.2.12.C.1 | Review career goals and determine steps necessary for attainment.            |
| CAEP.9.2.12.C.2 | Modify Personalized Student Learning Plans to support declared career goals. |
| CAEP.9.2.12.C.3 | Identify transferable career skills and design alternate career plans.       |

## Interdisciplinary Connections

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|-----------------|---|
| MA.K-12.2       | Reason abstractly and quantitatively.   |
| MA.K-12.4       | Model with mathematics.   |
| MA.N-Q.A.1      | Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. |
| MA.N-Q.A.2      | Define appropriate quantities for the purpose of descriptive modeling.  |
| MA.N-Q.A.3      | Choose a level of accuracy appropriate to limitations on measurement when reporting quantities.   |
| LA.RST.11-12.1  | Accurately cite strong and thorough evidence from the text to support analysis of science and technical texts, attending to precise details for explanations or descriptions.   |
| LA.RST.11-12.2  | Determine the central ideas, themes, or conclusions of a text; summarize complex concepts, processes, or information presented in a text by paraphrasing them in simpler but still accurate terms.                          |
| LA.RST.11-12.7  | Integrate and evaluate multiple sources of information presented in diverse formats and media (e.g., quantitative data, video, multimedia) in order to address a question or solve a problem.                               |
| LA.RST.11-12.8  | Evaluate the hypotheses, data, analysis, and conclusions in a science or technical text, verifying the data when possible and corroborating or challenging conclusions with other sources of information.                   |
| LA.WHST.11-12.2 | Write informative/explanatory texts, including the narration of historical events, scientific procedures/experiments, or technical processes.   |