

CCPS Environmental Science Unit Plan

Grade	9th-12th	Subject	Environmental Science	Unit #	3
Unit Name	Environmental Quality		Timeline	5 weeks	
How to use the Framework	<p>This Framework should be used to implement daily science instruction. The resources and instructional strategies reflected in the Framework will provide a foundation for effective implementation and student mastery of standards. Please see the hyperlinked abbreviation document to ensure understanding all abbreviations used with this framework.</p>				
Unit Overview	<p>Students can complete Crosscutting Concept Graphic Organizers as weekly homework assignments. Also, consider using the Environmental Science Self-Evaluation Checklist, daily or weekly, as an informal feedback to support students progressing towards standard mastery.</p>				
Lesson Plan guidance document and template	<p>Lesson Plan Template Science-HS-Environmental-Science-Self-Evaluation-Checklist</p>				
3Dimensional Instruction	GSE		Science and Engineering Practices		Crosscutting Concepts
	<p>SEV3. Obtain, evaluate, and communicate information to evaluate types, availability, allocation, and sustainability of energy resources.</p> <p>SEV4. Obtain, evaluate, and communicate information to analyze human impact on natural resources.</p>		<ul style="list-style-type: none"> ● Asking questions and defining problems ● Developing and Using Models ● Planning and carrying out investigations ● Analyzing and interpreting data ● Constructing explanations and designing solutions ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information 		<ul style="list-style-type: none"> ● Stability and Change ● Cause and Effect ● Systems and System Models
NGSS Alignment	<p>NGSS Alignment to Disciplinary Core Ideas</p>				
Anchoring Phenomena					
The Boiling River (pp. 414 - 415)					
Weekly Lesson Tasks					

Week 1

Focused Concept:
Energy Consumption

GSE:
SEV3. a. Analyze and interpret data to communicate information on the origin and consumption of renewable forms of energy (wind, solar, geothermal, biofuel, and tidal) and non-renewable energy sources (fossil fuels and nuclear energy).

Phenomenon: Daily [phenomena](#) are found in the Opening.

DQ: Why is energy efficiency an important energy resource?

- SEP:**
- Planning and carrying out investigations
 - Analyzing and interpreting data
 - Using mathematics and computational thinking
 - Constructing explanations (for science) and designing solutions (for engineering)
 - Engaging in argument from evidence
 - Obtaining, evaluating, and communicating information

- CCC:**
- Patterns
 - Systems and system models
 - Energy and matter: Flows, cycles, and conservation
 - Structure and function

	Day 1	Day 2	Day 3	Day 4	Day 5
Learning Targets:	<p>I can...</p> <ul style="list-style-type: none"> ● explore the energy used by many household appliances, such as television sets, hair dryers, lights, computers, etc. ● make estimates for how long each item is used on a daily basis to get an estimate for the total power consumed during a day, a week, a month, and a year, and how that relates to consumer costs and environmental impact. 	<p>I can...</p> <ul style="list-style-type: none"> ● identify ways in which energy is used inefficiently with regard to the school building. ● describe ways to improve energy efficiency with regard to the school building. 	<p>I can...</p> <ul style="list-style-type: none"> ● identify ways in which energy is used inefficiently with regard to the school building. ● describe ways to improve energy efficiency with regard to the school building. 	<p>I can...</p> <ul style="list-style-type: none"> ● describing renewable energy pros and cons and evaluate each article for its usefulness and reliable evidence. 	<p>I can...</p> <ul style="list-style-type: none"> ● create energy pathways to show where our energy comes from. ● describe the different forms of energy. ● identify ways that energy is converted from one form to another. ● determine that sunlight is the primary source of most of the usable energy on Earth. <ul style="list-style-type: none"> ○ Solar cells convert sunlight to electricity. ○ Sunlight causes wind and rain, powering wind turbines and hydroelectricity.

					<ul style="list-style-type: none"> ○ Sunlight provides energy for plant growth. ○ Plants or plant remains can be burned or eaten to provide energy. ● describe four types of renewable resources.
Opening	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <p>• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.</p> <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p>energy consumption voltage wattage halogen lamp</p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <p>• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.</p> <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p>fluorescent lamp incandescent lamp lumen</p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <p>• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.</p> <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p>kilowatt hour insulation thermal heat</p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <p>• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.</p> <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p>solar panel oil refinery turbine nonrenewable</p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <p>• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.</p> <p>TTW provide further prompts concerning the image from the textbook (p. 430):</p> <p>ARTS IN SCIENCE</p> <p>First Impressions</p> <p>Elicit from students their initial reactions to the photograph on these two pages. Encourage discussion with questions such as:</p> <ul style="list-style-type: none"> ● What came to your mind when you first saw this image? ● What emotions do the women seem to be feeling? ● How might this

					<p>image raise awareness or entice people to be more involved in developing and using solar energy?</p> <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p>energy efficient fossil fuel hydroelectricity nuclear energy</p>
<p>Guided Practice/ Transition</p>	<p>Household Energy Usage Gizmo : Lesson Info : ExploreLearning TTW review the Prior Knowledge Questions via discussion with the students. TTW review and model the Gizmo Warm-up to the students via the Mimio Board.</p>	<p>Lab Manual Chapter 13 Investigation An Energy Audit (pp. 105 - 117) Investigation Question: <i>What can an energy audit tell you about how your school uses energy?</i></p> <p>TSW complete the “Prelaboratory Assignment” (2 questions)</p> <p>TTW will model how to conduct a lighting audit (Part 1) for the classroom. TSW record the data in the Part 1 Classroom Lighting Data table (p. 108).</p> <p>TTW review the safety procedures for the lab with the students.</p> <p>TTW organize the students into groups of no more than 3 and assign each group an area within the school to conduct the three audits (Parts 1, 2, & 3).</p>	<p>TTW show Home Energy Assessments video (Time: 3:30 minutes). TSW write, in complete sentences, at least 4 key points they learned from the video.</p> <p>TTW review the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric with the whole class and address any questions or concerns for completing the C-E-R.</p> <p>TTW review the use of the ADI Annotating Text format.</p>	<p>Part II. Nearpod TTW present a Nearpod lesson on The Renewable Energy Debate. TSW use the code to join the Nearpod and participate in the lesson by responding to the prompts as the teacher presents the information. (30 slides)</p>	<p>Part I. EXPLAIN SCIENCE TALK Energy Efficiency Clarified Coming into this lesson, some students might have thought that energy efficiency referred only to wasting less energy by making choices such as leaving lights on when not in use or driving less often. TTW explain that this is not the whole story. Build a list on the board titled “Types of Energy Efficiency.” Then ask students to identify different types of energy efficiency, such as efficiently designed machines, advances in technology, and designs in architecture. (p. 418)</p> <p>Part II. Energy Conversions Gizmo : Lesson Info : ExploreLearning TTW review the Prior Knowledge Questions via discussion with the students.</p>

		<p>Example: Group 1 - Office Group 2 - Restroom Group 3 - Hallway Group 4 - Stairwell Group 5 - Cafeteria</p>			<p>TTW review and model the Gizmo Warm-up to the students via the Mimio Board.</p>
<p>Independent Practice</p>	<p>TSW complete Activity A and Activity B of the Household Energy Usage Gizmo.</p> <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p>	<p>Lab Manual Chapter 13 Investigation An Energy Audit</p> <p>Materials: map or blueprint of school and heat resistant gloves</p> <p>TSW complete the three audits for their assigned area in the school: Part 1: Conducting a Lighting Audit Part 2: Conducting an Appliance Audit Part 3: Conducting a Heating, Cooling, and Insulation Audit</p> <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p>	<p>TSW read and annotate the How to Lower Your Energy Bill and Avoid Erratic Energy Rates using the Annotating Text format.</p> <p>Lab Manual Chapter 13 Investigation An Energy Audit C-E-R</p> <p>Investigation Question: <i>What can an energy audit tell you about how your school uses energy?</i></p> <p>Materials: White board, dry erase markers, dry eraser</p> <p>TSW</p> <ul style="list-style-type: none"> • make a claim based on the investigation question • provide evidence from the lab that support the claim • use reasoning to logically connect the evidence to the claim and show how the evidence supports it <p>* TTW circulate to monitor student performance and will</p>	<p>Part I. FIGURE 13-2 U.S. Commercial Energy EXPLORE INTERPRET VISUALS Sum It Up</p> <p>TSW look carefully at Figure 13-2, which shows commercial energy flow through the U.S. economy. Have them make summary statements about the figure using the following prompts:</p> <ul style="list-style-type: none"> • Nonrenewable fuels provide . . . • Renewable fuels provide . . . • Useful energy comprises about . . . • Energy loss and waste . . . • To reduce the impacts of climate change, energy inputs could be changed by . . . <p>(pp. 417 - 418)</p> <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p>	<p>Part II. Energy Conversions Gizmo : Lesson Info : ExploreLearning</p> <p>TSW complete Activity A, Activity B, and the Extension of the Energy Conversions Gizmo.</p> <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p>

			clarify instructions as needed.		
Assessment Summary	<p>TSW complete the Household Energy Usage Gizmo Assessment (5 multiple choice questions) located below the simulation on Explore Learning.</p> <p>TTW use Illuminate to administer the Unit 3 Pre-Assessment at the beginning of class.</p>	<p>Lab Manual Chapter 13 Investigation An Energy Audit TSW complete the “Analysis and Conclusion” section of the Chapter 13 Investigation, questions 1 through 4 (p. 110).</p>	<p>Lab Manual Chapter 13 Investigation An Energy Audit TSW present their C-E-R whiteboards during a Gallery Walk. TTW use the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to evaluate the group’s C-E-R on the whiteboard.</p> <p>TSW take notes during the Gallery Walk to complete the “Analysis and Conclusion” section of the Chapter 13 Investigation, questions 5 through 7 (pp. 110 - 111).</p>	<p>TSW respond, in at least 3 complete sentences, to one of the following questions:</p> <p>Explain How can landowners benefit from allowing wind turbines to be placed on their property? (13.2 Assessment, question 2 on page 441)</p> <p>or</p> <p>Prompt: I could/ could not imagine my household making use of solar energy in the year 2025 because . . . (SCIENCE TALK Solar Energy Investment, p. 429)</p>	<p>Part II. Energy Conversions Gizmo : Lesson Info : ExploreLearning TSW complete the Energy Conversions Gizmo Assessment (5 multiple choice questions) located below the simulation on Explore Learning.</p>
Small Group Tasks (TBA)					

Week 2

Focused Concept: Renewable versus nonrenewable energy sources	GSE: SEV3. b. Construct an argument based on data about the risks and benefits of renewable and nonrenewable energy sources.				
Phenomenon: Daily phenomena are found in the Opening.	DQ: How can society transition to a more sustainable energy future?				
SEP:	CCC:				
<ul style="list-style-type: none"> ● Planning and carrying out investigations ● Analyzing and interpreting data ● Constructing explanations (for science) and designing solutions (for engineering) ● Engaging in argument from evidence ● Obtaining, evaluating, and communicating information 	<ul style="list-style-type: none"> ● Patterns ● Cause and effect: Mechanism and explanation ● Systems and system models 				
	Day 6	Day 7	Day 8	Day 9	Day 10

<p>Learning Targets:</p>	<p>I can...</p> <ul style="list-style-type: none"> • design and conduct an experiment to determine the optimal turbine blade angle for energy production. • explain the benefits of using wind power instead of fossil fuels and other renewable energy sources. • identify the environmental impacts of generating electricity using wind power. 	<p>I can...</p> <ul style="list-style-type: none"> • explain how wind turbines function to create electricity. • explain the science behind capturing wind energy and how it can be used to solve the world's energy crisis. • describe the impact of wind turbines on wildlife, particularly bats. • critically assess the trade-offs between renewable energy development and wildlife conservation. 	<p>I can...</p> <ul style="list-style-type: none"> • calculate the land area required to meet the demand of 100 houses using solar panels. • describe the environmental impacts of solar energy. 	<p>I can...</p> <ul style="list-style-type: none"> • identify sources of renewable energy and their applications. • understand the advantages and disadvantages of each source of renewable energy. 	<p>I can...</p> <ul style="list-style-type: none"> • identify sources of renewable energy and their applications. • understand the advantages and disadvantages of each source of renewable energy.
<p>Opening</p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <p>• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.</p> <p>The essential vocabulary will be taught in context throughout the lesson.</p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <p>• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.</p> <p>Teacher resource: BATS & WIND ENERGY</p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <p>• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.</p> <p>SCIENCE TALK First Impressions (TE, p. 427)</p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <p>• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.</p> <p>The essential vocabulary will be taught in context throughout the lesson.</p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <p>• Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions.</p> <p>The essential vocabulary will be taught in context throughout the lesson.</p>

	<p>turbine hub amperes</p>	<p>The essential vocabulary will be taught in context throughout the lesson.</p> <p>rotor wind farm</p>	<p>Elicit how the image strikes students when they first look at it. Prompts:</p> <ul style="list-style-type: none"> • At first, I thought the photo showed _____ because . . . • This does/does not seem like a good use of land because . . . • Advantages of a solar system like this over a typical household system include . . . <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p>solar panel photovoltaic cells radiant energy</p>	<p>geothermal energy hydrogen fuel biofuel</p>	<p>environmental justice clean energy</p>
<p>Guided Practice/Transition</p>	<p>Pivot Interactives: Maximizing Wind Power TTW pair students to complete all five parts. TTW monitor student progress and provide students support for the completion of all five parts.</p>	<p>Part I. TTW present a Nearpod video on How Do Wind Turbines Work? (Time: 4:44 minutes). TSW use the code to join the Nearpod and participate in the lesson by responding to the prompts as the teacher shows the video.</p> <p>Part II. <u>C.E.R. BATS & WIND ENERGY</u> TTW organize students, according to data, in groups of no more than 3.</p> <p>TTW model components of the CER using this template. TTW review the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric with the whole class</p>	<p>Part I. EOS LINX Field Trip TTW give students 7 minutes to read EOS Linx Partners with Clayton County Public Schools (CCPS). TTW take students to the EOS LINX station in the parking lot for students to explore. Upon returning to the classroom, TSW write a paragraph about what they learned from the reading and the exploration of the station.</p> <p>Part II. Pivot Interactives: Impacts of Solar Photovoltaic Power TTW pair students to complete all five parts. TTW monitor student progress and provide</p>	<p>Sources of Energy C-E-R TTW organize students, according to data, in groups of no more than 3.</p> <p>TTW model components of the CER using this template. TTW review the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric with the whole class and address any questions or concerns for completing the C-E-R.</p>	<p>Part I. TTW facilitate an academic discussion amongst the students using the following prompt: Analyze In what ways are subsidies for renewable energy resources helpful and harmful? (13.2 Assessment, question 3 on page 441)</p> <p>Part II. TTW explain the Letter-Writing : Letter To Your Representative Rubric</p>

		and address any questions or concerns for completing the C-E-R.	students support for the completion of all five parts.		
Independent Practice	<p>Pivot Interactives: Maximizing Wind Power TSW collaborate with their partners to complete the following activities: Part 1: Energy Use Part 2: Design an Experiment Part 3: Data Collection and Analysis Part 4: The Importance of Blade Angle Part 5: Using Wind Energy</p> <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p>	<p>Part II. C.E.R. BATS & WIND ENERGY TSW read and annotate the Hope for Stemming Wind Energy is Toll on Bats.</p> <p><i>Guiding Question:</i> <i>What impact do windmills have on bat fatalities?</i></p> <p>TTW give students Cause of Bat Mortality graph to use as evidence. TSW summarize the graph in three complete sentences.</p> <p>TSW write their claim based on the evidence and at least three reasons why the evidence supports the claim.</p> <p>Materials: White board, dry erase markers, dry eraser</p> <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p>	<p>Part II. Pivot Interactives: Impacts of Solar Photovoltaic Power TSW collaborate with their partners to complete the following activities: Introduction Part I: Power Output of Solar Panels Part II: Factors Affecting Solar Panels Part III: Solar Energy Calculations Part IV: Impacts of Solar Energy</p> <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p>	<p>Sources of Energy C-E-R <i>Guiding Question:</i> <i>Considering the social, economic, and environmental factors, which type of energy do you think has the most promise for sustainable usage?</i> TSW use the Figures and text on pages 426 - 440 to gather evidence to support a claim and address the guiding question.</p> <p>Materials: White board, dry erase markers, dry eraser</p> <p>TSW write their claim based on the evidence and at least three reasons why the evidence supports the claim.</p> <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p>	<p>Part II. SCIENCE AND ENGINEERING PRACTICES Engaging in Argument TSW write a letter to congressional representative David Scott urging the government to step up its support for renewable energy resources. Argue for the benefits of renewable energy and suggest measures the government can take to promote them. Use details from the text (pp. 425 - 440) and their own research to support their argument. (13.2 Assessment, question 5 on page 441)</p> <p>Resources:</p> <ul style="list-style-type: none"> • Sample Letter To Your Representative • Letter-Writing : Letter To Your Representative Rubric <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p>
Assessment/Summary	<p>In at least three complete sentences, TSW respond to the following prompts:</p> <ol style="list-style-type: none"> 1. Why was it important to maintain a 	<p>TSW present their C-E-R whiteboards during a Gallery Walk. TTW use the Claims, Evidence and Reasoning – Scientific Explanations &</p>	<p>TSW respond to the prompt. SCIENCE TALK Solar Energy Investment (TE, p. 429) Share with students that</p>	<p>Sources of Energy C-E-R TSW present their C-E-R whiteboards during a Gallery Walk. TTW use the Claims, Evidence and Reasoning –</p>	<p>Part II. Each student will use the Letter-Writing : Letter To Your Representative Rubric to check and give feedback to a peer before submitting</p>

	<p>consistent wind speed during the experiment?</p> <p>2. Explain two environmental benefits of using wind power instead of fossil fuels.</p>	<p>Argumentative Writing Rubric to evaluate the group's C-E-R on the whiteboard.</p> <p>Summary: TTW show the video Wind Turbines Killing Alarming Number of Bats: Scientists (Time: 1:56 minute). TSW respond to the five multiple choice questions on Wind Turbines Killing Alarming Number of Bats video questions.</p> <p>TSW complete the following short answer question in at least four sentences:</p> <p>What is one potential environmental impact of wind turbines, and how can it be mitigated?</p>	<p>according to reports by Bloomberg New Energy Finance and the World Bank Group's Lighting Global Program, off-grid solar products and related services are projected to be a part of 99 million households by 2020. In 2016, predictions put spending on off-grid appliances at \$4.7 billion. As solar energy usage becomes more widespread and popular, investors will be willing to put more money into the development of products and systems that use solar energy. The predicted rapid growth of the solar industry indicates that renewable energy sources are not only viable options for the future, but profitable options as well. Prompt: I could/could not imagine my household making use of solar energy in the year 2020 because . . .</p>	<p>Scientific Explanations & Argumentative Writing Rubric to evaluate the group's C-E-R on the whiteboard.</p>	<p>the final paper to the teacher.</p>
Small Group Tasks (TBA)					

Week 3

Focused Concept:
Sustainable energy

GSE:
SEV3. c. Obtain, evaluate, and communicate data to predict the sustainability potential of renewable and non-renewable energy resources.

SEV3. d. Design and defend a sustainable energy plan based on scientific principles for your location.

Phenomenon: Daily phenomena are found in the Opening.

DQ:

SEP:

CCC:

- Asking questions (for science) and defining problems (for engineering)
- Developing and using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Using mathematics and computational thinking
- Constructing explanations (for science) and designing solutions (for engineering)
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

- Cause and Effect: Mechanism and Explanation
- Stability and Change
- Systems and system models
- Energy and matter: Flows, cycles, and conservation

	Day 11	Day 12	Day 13	Day 14	Day 15
Learning Targets:	<p>I can...</p> <ul style="list-style-type: none"> • develop a plan to ensure that there is enough water available to meet the current and near-future needs of the people living in the Phoenix metropolitan area. 	<p>I can...</p> <ul style="list-style-type: none"> • create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity. 	<p>I can...</p> <ul style="list-style-type: none"> • construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems. 	<p>I can...</p> <ul style="list-style-type: none"> • understand the benefits and problems associated with dams and reservoirs. 	<p>I can...</p> <ul style="list-style-type: none"> • understand the principles of sustainable energy. • design a sustainable energy plan for their location. • defend their energy plan based on scientific principles.
Opening	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. <p>TTW ask students to</p>	<p>FIGURE 10-1 The Colorado River Basin (p. 322)</p> <p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record 	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. 	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. <p>TTW show Day 12</p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. <p>The essential vocabulary</p>

respond to the following questions:

- How do people use the waters of the Colorado River?
- How can water shortages occur on a planet covered with water?

The essential vocabulary will be taught in context throughout the lesson.

**reservoir
recharge
water footprint**

students' questions.

ON THE MAP

Colorado River

(TE, p. 320)

Display a map of the Colorado River watershed (FIGURE 10-1 The Colorado River Basin, p. 322), showing dams along the Colorado River and its tributaries. Inform students that the Colorado River is one of the most dammed and controlled rivers in the world. Point out both the source of the river in the mountains of Colorado and its mouth at the Gulf of California in Mexico. Remind students that the river is often used up long before it reaches the sea.

TTW ask students to respond to the following questions:

- Through which states does the Colorado River flow?
- Some of the dams along the Colorado are hydroelectric dams. Hoover Dam supplies electricity and water for an important city near it. What city?
- Why is Mexico at a disadvantage in using the water of the Colorado River?

Guide students' comprehension of the problems of water diversion from the Colorado River,

The essential vocabulary will be taught in context throughout the lesson.

**wastewater
natural resource
reclaimed water**

phenomenon picture as a visual to explain Day 14 phenomenon picture.

CONNECT TO THE

CASE STUDY

(TE, p. 322)

The three scientific factors of sustainability are linked to the Colorado River story. First, solar energy drives cycles of precipitation, which feed the Colorado River. Second, in the Colorado Basin, the biodiversity of ecosystems and nutrient cycling within them are maintained by the river. In places where diversions have caused the river to run dry, biodiversity and nutrient cycling have decreased in local ecosystems.

The essential vocabulary will be taught in context throughout the lesson.

**wetland
delta
irrigation**

will be taught in context throughout the lesson.

**Sustainable energy
Carbon Emissions**

		<p>especially its effects on the Colorado River Delta.</p> <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p>groundwater surface water water demand</p>			
<p>Guided Practice/Transition</p>	<p>Part I. ENGAGE BRAINSTORM Fresh Water TTW ask students to brainstorm the instances in a typical day when they use fresh water. TTW list each one on the board as students call it out. Discuss the importance of these activities. Identify those that are crucial for life and those that are helpful but not necessary. (TE, p. 323)</p> <p>Part II. Earth Science ADI Lab #23 Human Use of Natural Resources TTW model how to annotate the introduction of the ADI using the Annotating Text format.</p> <p>TTW organize students, according to data, in groups of no more than 3.</p> <p>Part III. TTW show the video The Story of the Hoover Dam (Time: 4:52 minutes) to the whole class via the Mimio Board.</p>	<p>Part I. Interpret Visuals The Colorado River Basin (TE, p.322) A river basin, or watershed, is all of the land drained by a river and its tributaries. The map shows that the Colorado drains a huge area. It also shows that the river is blocked by several dams and tapped by several canals along its course. TTW ask students to respond to the following questions:</p> <ul style="list-style-type: none"> • In which part of the river is the most water withdrawn? • Based on the map, why is more water withdrawn in this part of the river basin? <p>Part II. Earth Science ADI Lab #23 Human Use of Natural Resources Teacher resource: Water Supply and Demand Models for Anticipatory Research and Education</p> <p>Material : Access WaterSim Phoenix</p>	<p>Part I. Earth Science ADI Lab #23 Human Use of Natural Resources TTW review The 4 Ground Rules of Critique in Science and other protocols for providing peer feedback in preparation of groups presenting their ADI boards and peers giving feedback on sticky notes.</p> <p>* Ensure that students put their name or something for you to identify them for grading purposes.</p> <p>*Sticky note instructions: TSW - write group number and initial of first and last name on sticky side - on the non-sticky side, write one question and one comment concerning the information on the presenter’s board (not judging speech of presenter)</p> <p>TTW give instruction to students on the procedure for presenting their boards. * Gallery Walk: One student per group presents</p>	<p>Part I. TTW show the video LOCALS HELP RESTORE THE COLORADO DELTA (Time: 3:45 minutes) to the whole class via the Mimio Board. TSW respond to any one of the video prompts according to the questions from the LOCALS HELP RESTORE THE COLORADO DELTA video worksheet.</p> <p>Part II. TTW direct students to http://nationalgeographic.com/explorers/explorersa-z/ (search for Osvel Hinojosa Huerta) to find out more information about the Colorado River.</p> <p>Part III. Resources: National Inventory of Dams Google Earth TTW model how to use the National Inventory of Dams to identify dams in the United States. *The teacher should use a dam in Georgia to model. TTW use <i>Google Earth</i> to locate the dam and display</p>	<p>Part I. TTW instruct the students to have brief discussion (1 minute) with their elbow partner on the importance of sustainable energy.</p> <p>TTW say <i>Did you know that to make cars, airplanes, and boats work, we need energy? Sometimes, the energy we use can hurt our planet. But don't worry, we can use clean energy that doesn't pollute! Let's learn about the types of energy that are good for our planet.</i></p> <p>TTW show the video Renewable Energy For Kids (Learning Videos For Kids) (Time: 5:01 minutes). TSW answer the 5 multiple choice questions on the Renewable Energy video questions based on the video.</p> <p>Part II. TTW divide students into small groups of 3 and assign each group a specific type of sustainable energy (solar, wind, hydroelectric,</p>

	<p>TSW respond to any one of the video prompts according to the questions from the The Story of the Hoover Dam video worksheet.</p>	<p>TTW allot students time to conduct investigation in their group. TTW model components of the CER using this template. TTW review and give the students the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to complete the ADI white board for next day presentation.</p>	<p>the information while other group members rotate to other presentations.</p> <p>TTW used the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to evaluate the ADI board.</p> <p>Part II. Earth Science ADI Lab #23 Human Use of Natural Resources TTW provide instruction to student on how to complete the Argumentation Session Notes based on comments on sticky notes and presentations.</p>	<p>it to the students via the Mimio Board.</p>	<p>biomass). TTW provide each group with the Sustainable Energy Plan outline and allow access to the textbook and computers for research. TTW instruct students to gather information on their assigned energy type based on the Sustainable Energy Plan outline. TTW explain the Sustainable Energy Plan outline using the Example Sustainable Energy Plan.</p>
<p>Independent Practice</p>	<p>Part II. Earth Science ADI Lab #23 Human Use of Natural Resources TSW record, on the ADI Human Use of Natural Resources Note Taking Worksheet, what they already know about dams.</p> <p>TSW be given no more than 20 minutes to read and annotate the introduction of the ADI using the ADI Annotating Text format.</p> <p>TSW complete the ADI Human Use of Natural Resources Note Taking Worksheet based on annotating the introduction.</p> <p>TSW play with the WaterSim visualization tool as part of the tool</p>	<p>Part I. TSW read Case Study The Colorado River Story on page 322 and write three key points.</p> <p>TSW read Dams Provide Benefits and Create Problems on pages 326 and 328 and write at least three key points which may be used for the reasoning portion of the ADI white board.</p> <p>Part II. Earth Science ADI Lab #23 Human Use of Natural Resources TSW be allotted time to conduct investigation Access WaterSim Phoenix in their group.</p> <p>TSW complete the second</p>	<p>Part I. Earth Science ADI Lab #23 Human Use of Natural Resources TSW present their ADI boards while peers write comments on sticky notes to give to each group after presenting.</p> <p>Part II. Earth Science ADI Lab #23 Human Use of Natural Resources TSW complete the Argumentation Session Notes based on comments on sticky notes and presentations.</p> <p>Part III. Earth Science ADI Lab #23 Human Use of</p>	<p>Part II. TSW read Rescuing the Colorado River Delta with National Geographic Explorer Osvel Hinojosa Huerta (p. 320) and respond, in one paragraph, to the following question: Thinking Critically Analyze What ecological factors do you think might come into play when deciding how to time a pulse flow?</p> <p>Part III. TSW use the National Inventory of Dams to choose a dam within the United States to research. TTW write a list on the board and approve each student’s choice to ensure no one in that class period chose the same dam.</p>	<p>Part II. Designing a Sustainable Energy Plan: How should we power our future? TSW design an engaging and informative sustainable energy plan based on the Sustainable Energy Plan outline.</p> <p>Materials: poster paper and markers</p> <p>TSW create and present an infographic poster that includes the Defense of the Plan and Conclusion (from the Sustainable Energy Plan outline) and graphics (labeled diagram, chart, or graph).</p> <p>* TTW circulate to monitor student</p>

	<p>talk before they begin to design their investigation. This gives students a chance to see what they can and cannot do with the visualization tool. Be sure to encourage them to click on the question marks so they can see definitions for each variable.</p> <p>TTW monitor students progress and check Investigation Proposal A. TTW approve the proposal before allowing students to conduct the investigation.</p> <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p>	<p>page of the Investigation Proposal A.</p> <p>Materials: White board, dry erase markers, dry eraser</p> <p>Using the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric, TSW complete the ADI white board for next day presentation.</p> <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p> <p>TTW continuously monitor student progress in completing the ADI white board. TTW approve proposals, if needed.</p> <p><i>* Be sure that students record actual values (e.g., amount of groundwater that needs to be extracted from aquifers, per capita water use, how many years the water supply can support the current population) and are not just attempting to hand draw or summarize what they see on the computer screen.</i></p>	<p>Natural Resources TSW complete and submit a lab report.</p> <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p>	<p>TSW use the U.S. Dam Brochure Rubric to create a brochure and address the following question based on their chosen dam:</p> <p>How does the dam impact the biodiversity of the ecosystem in which it was built?</p> <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p>	<p>performance and will clarify instructions as needed.</p>
<p>Assessment/Summary</p>	<p>Earth Science ADI Lab #23 Human Use of Natural Resources TSW submit the following documents as the TTW record grades on the ADI Progression Grade Document for Day 1.</p> <ul style="list-style-type: none"> • Annotation 	<p>Earth Science ADI Lab #23 Human Use of Natural Resources TSW submit the following document as the TTW record grades on the ADI Progression Grade Document for Day 2.</p> <ul style="list-style-type: none"> • Investigation 	<p>Earth Science ADI Lab #23 Human Use of Natural Resources TSW submit the following documents as the TTW record grades on the ADI Progression Grade Document for Day 3.</p> <ul style="list-style-type: none"> • Rubric 	<p>1. A solid barrier constructed at a suitable location across a river valley to impound water is called _____</p> <ol style="list-style-type: none"> Reservoir Dam Bridge Retaining wall 	<p>TSW respond to any 1 of the 10 short answer questions on Sustainable Energy.</p>

	<ul style="list-style-type: none"> Note Taking Worksheet Investigation Proposal A (first page) <p>Exit Ticket</p> <ol style="list-style-type: none"> What is the best way to reduce water use? Who should be required to cut their water use? 	<p>Proposal A (second page)</p> <p>Checkpoint</p> <ol style="list-style-type: none"> Explain how access to fresh water affects human health, economies, security, and the environment. (p. 323) What is the goal of a dam-and-reservoir system? (p. 328) 	<ul style="list-style-type: none"> Commentary (sticky notes) Session Notes <p>Checkout Questions</p> <p>TSW respond to the six open-ended questions.</p>	<ol style="list-style-type: none"> Which among the following is not an objective for the construction of the dam? <ol style="list-style-type: none"> To make sure rains occur periodically Generation of hydropower energy Providing water supply for domestic and industrial purposes Providing irrigation facilities Water stored behind the dam is known as _____. <ol style="list-style-type: none"> Dam Penstock Water reservoir Spillway 	
Small Group Tasks (TBA)					

Week 4

Focused Concept:
Human activities on natural resources

GSE:
SEV4. a. Construct and revise a claim based on evidence on the effects of human activities on natural resources.

Phenomenon: Daily phenomena are found in the Opening.

DQ: What effects do human activities have on natural resources?

- SEP:**
- Asking questions (for science) and defining problems (for engineering)
 - Developing and using models
 - Planning and carrying out investigations
 - Analyzing and interpreting data
 - Using mathematics and computational thinking
 - Constructing explanations (for science) and designing solutions (for engineering)
 - Engaging in argument from evidence
 - Obtaining, evaluating, and communicating information

- CCC:**
- Cause and Effect: Mechanism and Explanation
 - Stability and Change

Day 16

Day 17

Day 18

Day 19

Day 20

<p>Learning Targets:</p>	<p>I can...</p> <ul style="list-style-type: none"> • explain why nonrenewable resource extraction becomes more difficult over time. • understand the process of mining minerals, the economics of mining and its effect on the environment. 	<p>I can...</p> <ul style="list-style-type: none"> • examine mining and its effects on the environment. • identify the legislation introduced to encourage mining. 	<p>I can...</p> <ul style="list-style-type: none"> • simulate an oil spill that affects the ocean and nearby coastline. • design a way to clean up the oil spill effectively and efficiently. 	<p>I can...</p> <ul style="list-style-type: none"> • explain the environmental impacts of oil use, specifically oil spills and the impact on wildlife. • explain mining and its effects on the environment. 	<p>I can...</p> <ul style="list-style-type: none"> • construct a claim based on evidence on the effects of human activities on natural resources. • research and communicate information to analyze human impact on natural resources.
<p>Opening</p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the <u>phenomenon</u>.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. <p>TTW say <i>Mining touches so many aspects of modern life. Without it, materials like Copper to carry electricity, aluminum for aircraft, iron and steel for construction - wouldn't be readily available. More than half of a mobile phone's components – including its electronics, display, battery</i></p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the <u>phenomenon</u>.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p>air percussion drill andesite rock capsule</p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the <u>phenomenon</u>.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. <p>Based on the phenomenon, TTW ask students to respond to the following questions:</p> <ol style="list-style-type: none"> 1. What comes to mind when you view this picture? 2. How does this picture make you feel? 	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the <u>phenomenon</u>.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p>restoration surface water adsorption</p>	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the <u>phenomenon</u>.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p>biodiversity deforestation overharvesting</p>

and speakers – are made from mined and semi-processed materials.

The essential vocabulary will be taught in context throughout the lesson.

conserve
reserves
trade-offs

The essential vocabulary will be taught in context throughout the lesson.

sorbent
skimmer
boom
dispersant

Guided Practice/Transition

TTW read the [Resource Extraction: Hi Ho, It's to the Mine We Go_TE and Resource Extraction: Hi Ho, It's to the Mine We Go_SE](#) prior to delivering the lesson for the day to prepare all material.

TTW conduct the “Introduction/Motivation”, “Guided Practice” and “Vocabulary/Definitions” sections of the [Resource Extraction: Hi Ho, It's to the Mine We Go_TE](#) with the students.

TTW organize students, according to data, in groups of no more than 3.

Part I.
TTW present a Nearpod video on Bozeman [Mining](#) (Time: 6:49 minutes). TSW use the code to join the Nearpod and participate in the lesson by responding to the prompts as the teacher shows the video.

Part II.
Before showing the two videos, TTW prompt students to complete the “Background Knowledge” section of the [HO_Video Note Taking Worksheet](#). TTW show the following two videos to the whole class:
[Chilean miners rescued after 69 days underground](#) (Time: 1:15 minute)

[Flashback: How The Chilean Miners Rescue Happened | NBC Nightly News](#) (Time: 3:44 minutes)

TSW complete one [HO_Video Note Taking Worksheet](#) for both videos.

Part I.
TTW say *Following the Industrial Revolution, there has been an increase in the use of coal, oil, and natural gas for energy production. While these energy sources are useful in that they provide a high net energy, are available when needed, and are easily transportable. However, one major drawback to transporting oil is the risk of oil spills on land or in aquatic ecosystems.*

TTW ask the students to list some different types of oil spill cleanup methods as the teacher writes them on the board.

Different types of oil spill cleanup methods		
Mechanical	Chemical	Biological

Lab Manual Chapter 12 Investigation Simulate an Oil Spill Clean-up (pp. 99 - 104)
Investigation Question:
How can an oil spill be effectively and efficiently cleaned up?

Part I.
TTW give TSW 5 minutes to read [Like Oil and Water](#). TTW discuss with the students the five discussion questions based on the reading.

TTW show [Oil Spill Clean-up Experiment - Cool Science Experiment](#) video (Time: 4:30 minutes).

TSW respond, based on the video, to the three prompts:

1. Is the oil more dangerous on the surface of the ocean or the bottom?
2. What does the polymer do to the oil?
3. Which state of matter is the polymer after the adsorption of the oil?

After the video, TTW ask the students:
What are your thoughts on burning the boomers while still in the ocean? Do you think it would have a negative impact on the aquatic ecosystem?

TTW divide students into small groups of 3 and allow each group to 30 minutes to research an effect of human activities on a specific natural resource.

Human Activities	Natural Resources
Agriculture	Land
Forestry	Water
Ranching	Air
Mining	Organisms
Urbanization	
Fishing	
Water use	
Pollution	
Desalination	
Waste water treatment	

*Each topic should be different as there are 40 different combinations.

TTW write a list on the board and approve each student’s choice to ensure no one in that class period chose the same topic.

			<p>Part II. TSW complete the “Prelaboratory Assignment” (2 questions)</p> <p>TTW review the safety procedures for the lab with the students.</p> <p>TTW organize the students into groups of no more than 3.</p> <p>Part III. TTW model components of the CER using this template. TTW review and give the students the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to complete the CER white board for next day presentation.</p>		
<p>Independent Practice</p>	<p>TSW work in groups of no more than 3 to complete their own Resource Extraction: Hi Ho, It's to the Mine We Go_SE</p> <p>Material: container with beans dried in clay, toothpick or paper clip</p> <p>* TTW circulate to monitor student performance and will clarify instructions as needed.</p>	<p>Part III. TSW read the following articles: The rescue of the 33 Freedom for the Chilean miners</p> <p>TSW respond to the three short answer questions on the Freedom for the Chilean miners</p> <p>Part IV. TTW show 69 days underground: The miraculous rescue of 33 miners (2015) (Stop video</p>	<p>Lab Manual Chapter 12 Investigation Simulate an Oil Spill Clean-up Investigation Question: <i>How can an oil spill be effectively and efficiently cleaned up?</i></p> <p>Part II. Materials: 25 mL graduated cylinders, tablespoon, ruler (cm), goggles, lab apron, gloves, aluminum foil, roasting pans or plastic dishpan containers, rocks, water, vegetable oil, cocoa powder, dish detergent,</p>	<p>Part I. C.E.R. Oil Spill Clean-Up TSW complete the HO Presentation Note Taking Worksheet during group presentations.</p> <p>Part II. Mining TSW complete the HO Presentation Note Taking Worksheet during group presentations.</p> <p>* TTW circulate to monitor student performance and will</p>	<p>TSW conduct research within 30 minutes on their chosen topic.</p> <p>Materials: poster paper and markers</p> <p>TSW use the Effects of Human Activities Rubric to create (20 minutes) an infographic poster that includes evidence (graph or chart with 3 explaining sentences) and claim based on the guiding question: <i>What effects do human activities have on natural resources?</i></p>

at time 35:26 minutes).
TSW complete the 10 multiple choice questions on [69 days underground: The miraculous rescue of 33 miners video questions](#) and take notes to complete one of the following assignments:

[Miner Newscast Role Play Rubric](#)

TSW work in groups of three to act out the following role-play. One person is a newspaper reporter, the other two are rescued miners (or one miner and one relative). Decide on your roles and then take ten minutes to plan what you might say. TSW record the newscast via Canvas Studio. Be sure to include props for effect!

[Creative Writing: Dairy of a Miner Rubric](#)

TSW imagine they are one of the miners from the story. With a partner, TSW write three diary extracts describing the experience. The first is written on the day when the tunnel initially collapsed; the second on day 17; the final extract describes day 69, the final rescue.

*** TTW circulate to monitor student performance and will clarify instructions as needed.**

feathers, faux fur (small pieces), stirring utensils, beaker (large) or pitcher for the water
Additional materials: sand, gravel, pebbles, sticks (small), salad greens (mixed), string or yarn, cotton balls, turkey baster, spoon, paper towel (cut 2 cm x 2 cm)

TSW complete the two test for the investigation:

Part 1: Create a Habitat and Cleanup Plan

Part 2: Test Your Oil Spill Plan

*TTW approve Part 1 Cleanup Plan before allowing students to complete Part 2 of the investigation. The teacher may modify or allow students to use [Oil Spill Cleanup Teacher Approval](#)

**Part III.
C.E.R. Oil Spill Clean-Up**

Investigation Question:
How can an oil spill be effectively and efficiently cleaned up?

Materials: White board, dry erase markers, dry eraser

TSW provide evidence from the lab that supports a claim, make a claim about the investigation question, then use reasoning to logically connect the evidence to the claim to show how the evidence

clarify instructions as needed.

*** TTW circulate to monitor student performance and will clarify instructions as needed.**

			supports the claim. * TTW circulate to monitor student performance and will clarify instructions as needed.		
Assessment/Summary	<p>Summary TTW read the summary from Resource Extraction: Hi Ho, It's to the Mine We Go TE</p> <p>Exit ticket A cost-benefit analysis done to investigate a proposed mine site would likely take which of the following into account?</p> <p>I. The medical costs of mine worker injuries</p> <p>II. The cost of environmental restoration of the site when it is shut down</p> <p>III. The value of the ore to be extracted from the mine</p> <p>a. II only b. I and II only c. II and III only d. I, II, and III</p>	<p>TSW write a paragraph to respond to the following prompt. The Future of Mining What do you think are possible benefits and risks to mining in space (asteroids, other planets) or mining on the ocean floor?</p>	<p>Summary TTW provide students with some facts from the OIL SPILL TEACHER INFO</p> <p>Lab Manual Chapter 12 Investigation Simulate an Oil Spill Clean-up TSW complete the “Analysis and Conclusion” section of the Chapter 12 Investigation, questions 1 through 6 (pp. 103-104).</p>	<p>Part I. C.E.R. Oil Spill Clean-Up TSW present their C-E-R whiteboards during a Gallery Walk. TTW use the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to evaluate the groups’ C-E-R on the whiteboard.</p> <p>Part II. Mining TSW present their mining assignments from day 17.</p> <p>TTW use the the appropriate rubric to evaluate the groups’ assignment:</p> <ul style="list-style-type: none"> • Miner Newscast Role Play Rubric • Creative Writing: Dairy of a Miner Rubric 	<p>TSW present their infographic posters during a Gallery Walk. TTW use the Effects of Human Activities Rubric to evaluate the groups’ posters.</p>
Small Group Tasks (TBA)					

Week 5

Focused Concept:
Human impact and demand on the environment

GSE:
SEV4. b. Design, evaluate, and refine solutions to reduce human impact on the environment including, but not limited to, smog, ozone depletion, urbanization, and ocean acidification.

SEV4. c. Construct an argument to evaluate how human population growth affects food demand and food supply (GMOs, monocultures, desertification, Green Revolution).

Phenomenon: Daily phenomena are found in the Opening.

DQ: How can we mitigate human impact on the environment while addressing the challenges posed by human population growth on food demand and supply?

- | | |
|--|---|
| <p>SEP:</p> <ul style="list-style-type: none"> • Developing and using models • Planning and carrying out investigations • Analyzing and interpreting data • Constructing explanations (for science) and designing solutions (for engineering) • Engaging in argument from evidence • Obtaining, evaluating, and communicating information | <p>CCC:</p> <ul style="list-style-type: none"> • Cause and effect: Mechanism and explanation • Systems and system models • Stability and change |
|--|---|

	Day 21	Day 22	Day 23	Day 24	Day 25
Learning Targets:	<p>I can...</p> <ul style="list-style-type: none"> • research and understand the impact of GMOs, monocultures, desertification, and the Green Revolution on food supply. • construct an argument based on the research to evaluate the sustainability of different food supply strategies. 	<p>I can...</p> <ul style="list-style-type: none"> • identify agriculture and agricultural practices. • explain industrial agriculture along with its drawbacks and the role of the green revolution in enhancing agricultural production. • communicate an argument based on the research to evaluate the sustainability of different food supply strategies. 	<p>I can...</p> <ul style="list-style-type: none"> • design an air filter according to criteria and constraints. • test and improve an air filter based on results. 	<p>I can...</p> <ul style="list-style-type: none"> • analyze the effects of ocean acidification on coral reefs by collecting data from a model and drawing conclusions. • assess environmental problems caused by humans and predict future consequences and describe how these problems can be solved. 	<p>I can...</p> <ul style="list-style-type: none"> • explain how various surfaces impact Urban Heat Island.
Opening	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? 	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? 	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? 	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see? 	<p>Use the See-Think-Wonder protocol to guide student thinking as they engage in the phenomenon.</p> <p>Ask students:</p> <ul style="list-style-type: none"> ➤ What do you see?

	<ul style="list-style-type: none"> ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p style="text-align: center;"> GMOs Monocultures Desertification Green Revolution </p>	<ul style="list-style-type: none"> ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p style="text-align: center;"> monocropping pesticide resistance desalinization </p>	<ul style="list-style-type: none"> ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p style="text-align: center;"> smog ozone pollution </p>	<ul style="list-style-type: none"> ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p style="text-align: center;"> carbon dioxide (CO₂) pH acidic </p>	<ul style="list-style-type: none"> ➤ What do you think about what you are seeing? ➤ What does it make you wonder? <ul style="list-style-type: none"> • Teachers should provide students opportunities to share observations and develop questions. The teacher should record students' questions. <p>The essential vocabulary will be taught in context throughout the lesson.</p> <p style="text-align: center;"> urbanization heat island water use </p>
<p style="text-align: center;">Guided Practice/Transition</p>	<p>Investigating Food Supply Strategies TTW briefly review the guiding question and project overview. <i>Driving question: How can we design a sustainable city that balances human population growth with food demand and supply?</i></p> <p>Part I. TTW provide the students with a choice of guiding questions:</p> <ul style="list-style-type: none"> • What are GMOs, and how do they affect food supply? • What is monoculture, and what are its impacts? • How does desertification occur, and how does it affect agriculture? • What was the Green Revolution, and how 	<p>Part I. TTW present a Nearpod video on Bozeman Agriculture (Time: 9:23 minutes). TSW use the code to join the Nearpod and participate in the lesson by responding to the prompts as the teacher shows the video.</p> <p>Part II. Investigating Food Supply Strategies <i>Driving question: How can we design a sustainable city that balances human population growth with food demand and supply?</i></p> <p>TTW give the groups 30 minutes to complete a presentation (Prezi, Google Slides, Canva, etc.)</p>	<p>Part I. Outdoor Field Trip TTW take the students outside to observe the air in their environment.</p> <p>Prompt: Does the air in our environment look the same as the image or different? Explain.</p> <p>The teacher and students will return to class. TSW discuss any previous experiences with smog.</p> <p>TTW allow students 5 minutes to obtain information about smog and how it affects natural resources. (Reference pp. 529-530, Smog Is a Major Health Hazard) TTW randomly select three students to share their findings.</p>	<p>Ocean Acidification Lab <i>TTW read the Ocean Acidification Lab (second page, Prior to the lesson) prior to delivering the lesson for the day to prepare all material.</i></p> <p>Part II. TTW introduce the lab to the students and guide the students through lab setup.</p> <p>TTW pair students, based on data, to conduct the lab.</p> <p>Part III. TTW model components of the CER using this template. TTW review and give the students the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to complete the CER white board for next</p>	<p>Part I. Urban Heat Island C.E.R. Investigation Question: <i>How do various surfaces impact Urban Heat Island?</i></p> <p>TTW organize the students into groups of no more than 3.</p> <p>TTW take students around the school campus to measure the temperatures of different surfaces such as cement, asphalt, dirt, and grass in the sun and the shade.</p> <p>Upon returning to the classroom, TTW model components of the CER using this template. TTW review and give the students the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing</p>

	<p>did it change food production?</p> <p>Part II. TTW organize the students into groups based on the guiding question they chose. *Each group should not have more than 3 students.</p> <p>Project Milestones TTW explain the research activity and its importance in designing a sustainable city.</p>		<p>Lab Manual Chapter 16 Investigation Filtering Air Pollution (pp. 135 - 142) Investigation Question: <i>What is an effective design of an air filter to reduce SPM pollution?</i></p> <p>Part II. TSW complete the “Prelaboratory Assignment” (2 questions)</p> <p>TTW review the safety procedures for the lab with the students.</p> <p>TTW organize the students into groups of no more than 3.</p> <p>Part III. TTW model components of the CER using this template. TTW review and give the students the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to complete the CER white board for same day presentation.</p>	<p>day presentation.</p> <p>Rubric to complete the CER white board for same day presentation.</p> <p>Part II. Human Impact Scenarios TTW organize the students into groups of no more than 3 and assign each group a scenario.</p>	
<p>Independent Practice</p>	<p>Investigating Food Supply Strategies <i>Driving question: How can we design a sustainable city that balances human population growth with food demand and supply?</i></p> <p>Part I. TSW conduct research and write a one-page summary</p>	<p>Part II. Investigating Food Supply Strategies <i>Driving question: How can we design a sustainable city that balances human population growth with food demand and supply?</i></p> <p>TSW complete a presentation (Prezi, Google</p>	<p>Lab Manual Chapter 16 Investigation Filtering Air Pollution (pp. 135 - 142) Investigation Question: <i>What is an effective design of an air filter to reduce SPM pollution?</i></p> <p>Part II. Materials: rectangular</p>	<p>Ocean Acidification Lab Part I. TSW read the passage “Ecology – Ocean Acidification” and answer the corresponding questions on the Ocean Acidification Lab SE</p> <p>Part II. Materials: Acetic Acid</p>	<p>Part I. Urban Heat Island C.E.R. Investigation Question: <i>How do various surfaces impact Urban Heat Island?</i></p> <p>Materials: thermometer and timer</p>

reflecting on their chosen food supply strategy of how it is most sustainable and why.

Part II.
Project Milestones

TSW complete Milestones 1, 2, and 3.

TSW complete a presentation (Prezi, Google Slides, Canva, etc.) addressing all 6 Key Questions.

*** TTW circulate to monitor student performance and will clarify instructions as needed.**

Slides, Canva, etc.) addressing all 6 Key Questions.

TSW present (Milestone 4) their project to the whole class.

*** TTW circulate to monitor student performance and will clarify instructions as needed.**

cardboard box (~25 cm x 12.5 cm x 12.5 cm), scissors, tape, string, aluminum foil, compass, index cards (3 in x 5 in), hair dryer, metric ruler or meter stick, protractor, balance, small paper cup, salt, timer, small paint brush, collection container, various materials to build air filter (ie., nylon stocking, cotton, coffee filter, etc.)

TSW complete the three test for the investigation:

Part 1: Build the Test Device

Part 2: Design Your Air Filter

Part 3: Test Your Air Filter

Part III.
C.E.R. Filtering Air Pollution

Investigation Question:
What is an effective design of an air filter to reduce SPM pollution?

Materials: White board, dry erase markers, dry eraser

TSW provide evidence from the lab that supports a claim, make a claim about the investigation question, then use reasoning to logically connect the evidence to the claim to show how the evidence supports the claim.

(vinegar), cups, water, chalk (equal size pieces), timers

TSW work as partners to conduct the lab investigation including the identification of the variables and the formulation of the hypothesis.

TSW work in pairs to organize and analyze their data, using the provided analysis in the [Ocean Acidification Lab SE](#).

Part III.
C.E.R. Ocean Acidification

Investigation Question:
What would happen to the biodiversity of coral reefs as the concentration of acid in the ocean increases?

Materials: White board, dry erase markers, dry eraser

TSW provide evidence from the lab that supports a claim, make a claim about the investigation question, then use reasoning to logically connect the evidence to the claim to show how the evidence supports the claim.

*** TTW circulate to monitor student performance and will clarify instructions as needed.**

C.E.R. Materials: White board, dry erase markers, dry eraser

TSW complete the [Urban Heat Island Investigation](#)

TSW provide evidence from the investigation that supports a claim, make a claim about the investigation question, then use reasoning to logically connect the evidence to the claim to show how the evidence supports the claim.

Part II.
[Human Impact Scenarios](#)

Using the chart below, TSW work in groups of 3 to respond to the three questions for their given scenario.

Human Activities	Natural Resources
Agriculture	Land
Forestry	Water
Ranching	Air
Mining	Organisms
Urbanization	
Fishing	
Water use	
Pollution	
Desalination	
Waste water treatment	

Hint:
Human Activities = Human Impact

Natural Resources = Impact on Environment

*** TTW circulate to monitor student performance and will clarify instructions as needed.**

			* TTW circulate to monitor student performance and will clarify instructions as needed.		
Assessment/Summary	TSW complete the Human Population Growth Affects Food Demand and Food Supply	<p>Part II. Investigating Food Supply Strategies TSW complete the HO Presentation Note Taking Worksheet for each group presentation.</p> <p>TTW use the Project Milestones as a checklist to evaluate the group projects.</p>	<p>Lab Manual Chapter 16 Investigation Filtering Air Pollution</p> <p>Part II. TSW complete the “Analysis and Conclusion” section of the Chapter 16 Investigation, questions 1 through 6 (pp. 141-142).</p> <p>Part III. C.E.R. Filtering Air Pollution TSW present their C-E-R whiteboards during a Gallery Walk. TTW use the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to evaluate the groups’ C-E-R on the whiteboard.</p>	<p>Part II. TSW complete the “Analysis” section of the Ocean Acidification Lab SE, questions 1 through 5.</p> <p>Part III. C.E.R. Ocean Acidification TSW present their C-E-R whiteboards during a Gallery Walk. TTW use the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to evaluate the groups’ C-E-R on the whiteboard.</p>	<p>Part I. Urban Heat Island C.E.R. TSW present their C-E-R whiteboards during a Gallery Walk. TTW use the Claims, Evidence and Reasoning – Scientific Explanations & Argumentative Writing Rubric to evaluate the groups’ C-E-R on the whiteboard.</p> <p>Part II. Human Impact Scenarios Each group will share their response to the three questions for their given scenario.</p> <p>TTW use Illuminate to administer the Unit 3 Post-Assessment at the end of class.</p>
Small Group Tasks (TBA)					

Assessment Prep

Prepare students for assessment by reviewing the following Assessment Prep concepts.

Energy Consumption

- Reference Chapter 13 Summary (p. 445)
 - Section 13.1 - Energy efficiency

Renewable versus nonrenewable energy sources

- Reference Chapter 13 Summary (p. 445)

- **Section 13.2 - Renewable energy**

- Reference Chapter 12 Summary (p. 409)
 - **Section 12.2 - Fossil fuels**
 - **Section 12.3 - Nuclear power**

Sustainable energy

- Reference Chapter 13 Summary (p. 445)
 - **Section 13.3 - Sustainable energy**

Human activities on natural resources

- Reference Chapter 10 Summary (p. 349)
- Reference Chapter 11 Summary (p. 379)
 - **Section 11.3 - Mineral resources**
 - **Section 11.4 - Sustaining mineral resources**

Human impact and demand on the environment

- Reference Chapter 9 Summary (p. 315)
- Reference Chapter 14 Summary (p. 485)
 - **Section 14.3 - Urbanization**
- Reference Chapter 16 Summary (p. 563)
 - **Section 16.1 - Air pollution (Smog)**

Labs / Investigations

Mandatory Labs	Explore Learning Gizmo	Pivot Interactives/Phet
Earth Science ADI Lab #23 Human Use of Natural Resources	Energy Conversions Energy Conversions Gizmo : Lesson Info : ExploreLearning Household Energy Usage Household Energy Usage Gizmo : Lesson Info : ExploreLearning	<ul style="list-style-type: none"> ● Impacts of Solar Photovoltaic Power ● Materials and Thermal Energy Transfer ● Maximizing Wind Power ● Nuclear Power, Radioactive Decay, and Half-Life (Environmental Science Focus) ● Optimizing Power Generation from Photovoltaic Cells

Additional Resources/Tasks

Supplemental Resources	Earth Science ADI Lab #22 Minimizing Carbon Emissions Active Reading Workbook - Environmental Science: <ul style="list-style-type: none"> ● Biomes
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○	Section: Forest Biomes.	31
●	Water	
○	Section: Water Pollution	57
●	Air	
○	Section: What Causes Air Pollution?	59
○	Section: Acid Precipitation	63
●	Land	
○	Section: Urban Land Use	73
○	Section: Land Management and Conservation.	75
●	Food and Agriculture	
○	Section: Feeding the World	77
○	Section: Crops and Soil.	79
○	Section: Animals and Agriculture.	81
●	Mineral Resources	
○	Section: Mining Regulations and Mine Reclamation	87
●	Nonrenewable Energy	
○	Section: Energy Resources and Fossil Fuels	89
○	Section: Nuclear Energy	91
●	Renewable Energy	
○	Section: Renewable Energy Today	93
○	Section: Alternative Energy and Conservation	95
●	Economics, Policy, and the Future	
○	Section: The Importance of the Individual	111