

Englewood Public School District

Environmental Science

Fourth Marking Period

Unit 5: Toward a Sustainable Future

Overview: In this unit of study, students *evaluate claims, analyze and interpret data, and develop and use models* to explore the core ideas centered on the Earth's climate and energy systems. They apply these core ideas when they use a quantitative model to describe how variations in the flow of energy into and out of the Earth's systems result in changes in climate. Additionally, this unit focuses on the physics core ideas surrounding energy and energy transformations as related to the Earth system core idea of energy needs for human activity. At the basis of our energy needs is the need for resources to create energy, and therefore students evaluate competing design solutions for developing, managing, and utilizing energy resources based on cost-benefit ratios. The crosscutting concepts of *systems and system models, energy and matter, cause and effect, and stability and change* are called out as an organizing concept for these disciplinary core ideas.

Time Frame: 40 to 45 Days

Enduring Understandings:

Today's decisions determine our future environment.

Essential Questions:

What are the causes and consequences of a warming Earth?

Can we depend on nonrenewable energy sources for our energy needs?

What are the potential uses and limitation of renewable energy sources?

How do our choices as consumers and waste producers affect our environment?

Standards	Topics and Objectives	Activities	Resources	Assessments
HS-ESS2-2 Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth systems. HS-ESS2-4 Use a model to describe how variations in the flow of energy into and out of Earth's systems result	Topics	Students will complete the text and digital activities:	Text: <i>Environmental Science: Your World, Your Turn</i>	Student needs will be evaluated after completing Quick Labs, Go Outside Investigations, Map It and Real Data Activities.
	Global Climate Change Nonrenewable Energy Renewable Energy Alternatives Waste Management Twenty-First Century Themes	1. Central Case Studies 2. 3-D Geo Tours 3. Quick Labs 4. Go Outside Investigations 5. Map It and Real Data Activities 6. Unit Projects 7. Lab: Effects of Greenhouse Gasses 8. Lab: Tracking CO ₂ and	Materials: For Quick Labs and Go Outside Investigations: • See Teacher Edition p. 28 For Lab: Effects of Greenhouse Gasses • Lamp with 100W light	Students will receive a grade for the following lab activity conclusions: Effects of Greenhouse Gasses, Tracking CO ₂ and Temperature, Home Energy Use, Fossil Fuel Use,

<p>in changes in climate.</p> <p>HS-ESS3-2 Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.</p> <p>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.</p> <p>NJSLSA.R1 Read closely to determine what the text says explicitly and to make logical inferences and relevant connections from it; cite specific textual evidence when writing or speaking to support conclusions drawn from the text. RST.11-12.1 (HS-ESS2-2), (HS-ESS3-2), (HS-ESS3-5)</p> <p>NJSLSA.R2 Determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas. RST.11-12.2 (HS-ESS2-2), (HS-ESS3-5)</p> <p>NJSLSA.R7 Integrate and evaluate content presented in diverse media and</p>	<p>and Skills include:</p> <ul style="list-style-type: none"> • The Four C's • Life and Career Skills • Information and Media Literacy • Global Awareness • Environmental Literacy <p>Objectives</p> <p>Discuss the factors that determine Earth's climate and evaluate evidence that shows that climate change is occurring.</p> <p>State ways in which the warming atmosphere affects ecosystems and organisms and predict future effects.</p> <p>Evaluate the efficacy of strategies to reduce greenhouse gasses.</p> <p>Explain how fossil fuels are formed and list their uses.</p> <p>Describe the environmental problems associated with the use of fossil fuels.</p> <p>Evaluate the costs and benefits of nuclear energy.</p> <p>Explain the benefits and current status of renewable energy resources.</p> <p>Discuss strategies for managing solid and hazardous</p>	<p>Temperature</p> <p>9. Lab: Home Energy Use</p> <p>10. Lab: Fossil Fuel Use</p> <p>11. Lab: Compare Biofuels</p> <p>12. Lab: Energy from Wind</p> <p>13. Lab: Over-packaging</p> <p>14. Lab: Observing a Compost</p> <p>Students will watch Bellringer Videos to introduce topics and Crash Course Ecology videos to reinforce concepts.</p> <p>Students will explore Images of Change to analyze the impacts of climate change over time.</p> <p>Students use the Environmental Change Model of Climate Re-analyzer to study the feedbacks in the climate system.</p> <p>Student will complete the Know Your Energy Costs activity to become aware of how much energy they use at school and the financial and environmental costs.</p> <p>Students will construct and measure the energy efficiency and solar heat gain of a cardboard model house in the Build a Solar House simulation.</p> <p>Student will watch Climate Change: Earth's Giant Game of Tetris, A Guide to the Engery of the Earth, Vermicomposting: How Worms Can Reduce our Waste and participate in an online quiz and</p>	<p>bulb</p> <ul style="list-style-type: none"> • 100 mL graduated cylinder • 2 empty 2-L clear plastic bottles • 2 antacid seltzer tablets • Permanent marker • Metric ruler • 2 thermometers • 2 sheets of black construction paper • 2 No. 4 slitted two-hole stoppers • Timer (watch, clock, or stopwatch) <p>For Lab: Home Energy Use, Fossil Fuel Use, and Compare Biofuels</p> <ul style="list-style-type: none"> • Graph paper or computer with graphing software • Calculator <p>For Lab: Energy from Wind</p> <ul style="list-style-type: none"> • Circular pencil with eraser • Washers, large • Spool from thread • 3–5 sheets acetate or heavy paper • About 30 cm of thread • Aluminum foil • Large paper clip • 2 push-pins • 2 twist ties • Scissors • Tape • Electric fan <p>For Lab: Overpackaging</p> <ul style="list-style-type: none"> • Single large package of raisins 	<p>Compare Biofuels, Energy from Wind, Over-packaging, and Observing a Compost.</p> <p>Student portfolios will be used to monitor progress.</p> <p>A Common Formative Assessment will be given at the close of this unit to assess students' mastery of the skills identified.</p>
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formats, including visually and quantitatively, as well as in words. RST.11-12.7 (HS-ESS3-5)

NJSLSA.R8 Delineate and evaluate the argument and specific claims in a text, including the validity of the reasoning as well as the relevance and sufficiency of the evidence. RST.11-12.8 (HS-ESS3-2)

MP.2 Reason abstractly and quantitatively. (HS-ESS2-2), (HS-ESS2-4), (HS-ESS3-2), (HS-ESS3-5)

MP.4 Model with mathematics. (HS-ESS2-4), (HS-ESS3-2)

HSN.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. (HS-ESS2-2), (HS-ESS2-4), (HS-ESS3-5)

HSN-Q.A.2 Define appropriate quantities for the purpose of descriptive modeling. (HS-ESS2-4), (HS-ESS3-5)

HSN.Q.A.3 Choose a level of accuracy appropriate to

waste.

discussion for each.

Students will use nature-based solutions to solve urban sustainability issues in the [Sustainable Cities](#) activity.

Enrichment Activity:

Students play the [Carbon Stabilization Wedge](#) game in order to evaluate competing design solutions for developing, managing, and utilizing energy resources based on cost-benefit ratios.

- Multi-pack package of raisins
- Scissors
- Metric ruler
- Calculator

For Lab: Observing a Compost

- 2 L clear plastic soft drink bottle
- Dead weeds, dry leaves, wood chips
- Small nail or push-pin
- Raw vegetable and fruit scraps
- Scissors
- Waterproof marking pen
- Potting soil or top soil
- Cheesecloth
- 150 mL beaker
- 2 rubber bands
- Scraps of paper
- Plastic fork
- Grass clippings
- Foam packing tray or plastic tray

Websites:

- <http://www.pearsonrealize.com/>
- [Images of Change](#)
- [Climate Reanalyzer](#)
- [Build a Solar House](#)
- [Sustainable Cities](#)

Videos:

- <http://www.pearsonrealize.com/>
- [Crash Course Ecology](#)
- [Climate Change: Earth's Giant Game of Tetris](#)

limitations on measurement
when reporting quantities.
(HS-ESS2-2), (HS-ESS2-4),
(HS-ESS3-5)

- [A Guide to the Energy of the Earth](#)
- [Vermicomposting: How Worms Can Reduce our Waste](#)

Enrichment Lesson Plans:

See the [Carbon Stabilization Wedge](#) game

Modifications:

- New Jersey Department of Education – Instructional Supports and Scaffolds
- Suggested Strategies for English Language Learners
- Enrichment activities were created to allow for greater personalized learning to meet the needs of all learners including students with gifts and talents.