

Lesson Topic: Unit 5: Earth and Human Activity

Grade level: 6th

Length of lesson: 10 days (50 minute period)

Content Standards

Content Standard(s):

MS.ESS3-5: Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

MS.ESS3-2 Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technology to mitigate their effects.

MS.ESS3-3 Apply scientific principles to design a method for monitoring and minimizing the human impact on the environment.

MS.ESS3-4 Construct an argument support by evidence for how increases in human populations and per cap consumption of natural resources impact earths systems.

Understanding (s)/goals

Students will understand:

- Global Temperature raise
- Human Impact on Earth’s Resources
- Human Impact on Earth’s Environment
- What are natural hazards, and how are they predicted/mitigated.
- Identify renewable versus nonrenewable.

Essential Question(s):

- How do we know our global climate is changing?
- Is this resources renewable or non-renewable?
- How does human activity affect earths systems?
- How can natural hazards be predicted?
- How is the availability and harvesting of needed natural resources related to the rock and hydrological cycles?

Student objectives (outcomes):

Students will be able to:

Collect and analyze data of global temperature rise to create an argument to minimize human impact.
Use data to predict natural hazards, and lessen the effect of natural hazards.

Assessment Evidence

Performance Task(s):

<http://www.oar.noaa.gov/k12/pdfs/gresall.pdf>

Research an animal species that has been effected by human impact.

Other Evidence:

Discovery Ed "Planet Earth The Future Saving Species" see teacher guides, videos

Test (to be developed)

Learning Plan

Learning Activities:

- Teach vocabulary concepts: biosphere, atmosphere, resources, green-house effect, renewable, hurricane, flood, tornado, forest fire, tsunami, volcano, earthquakes, aquifer, mitigate, renewable, nonrenewable

Resources:

- Lab <http://gabesapeslabs.weebly.com/greenhouse-effect-lab.html>
- Lab -<http://phet.colorado.edu/en/simulation/greenhouse>
- Note this lesson ties well with the 6th grade KPBSD Curriculum Map Geography Unit 6
- <http://www.bozemanscience.com/ngs-ess3c-human-impacts-on-earth-systems>
- <http://www.bozemanscience.com/ngs-ess2d-weather-climate>
- <http://www.bozemanscience.com/ngs-ess3a-natural-resources>
- <http://www.bozemanscience.com/ngs-ess3b-natural-hazards>
- <http://www.bozemanscience.com/ngs-ess2e-biogeology> renewable vs nonrenewable resources
- http://www.ck12.org/earth-science/Renewable-vs-Non-Renewable-Energy-Resources/lesson/Renewable-vs-Non-Renewable-Energy-Resources/?referrer=concept_details

Cross Curricular Connections: Note this lesson ties well with the 6th grade KPBSD Curriculum Map Geography Unit 6

Students who demonstrate understanding can:

- MS-ESS3-2. Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.**[Clarification Statement: Emphasis is on how some natural hazards, such as volcanic eruptions and severe weather, are preceded by phenomena that allow for reliable predictions, but others, such as earthquakes, occur suddenly and with no notice, and thus are not yet predictable. Examples of natural hazards can be taken from interior processes (such as earthquakes and volcanic eruptions), surface processes (such as mass wasting and tsunamis), or severe weather events (such as hurricanes, tornadoes, and floods). Examples of data can include the locations, magnitudes, and frequencies of the natural hazards. Examples of technologies can be global (such as satellite systems to monitor hurricanes or forest fires) or local (such as building basements in tornado-prone regions or reservoirs to mitigate droughts).]
- MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.*** [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]
- MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.**[Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth's systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]
- MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.** [Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]

The performance expectations above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Asking Questions and Defining Problems Asking questions and defining problems in grades 6–8 builds on grades K–5 experiences and progresses to specifying relationships between variables, and clarifying arguments and models.</p> <ul style="list-style-type: none"> Ask questions to identify and clarify evidence of an argument. (MS-ESS3-5) <p>Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis.</p> <ul style="list-style-type: none"> Analyze and interpret data to determine similarities and differences in findings. (MS-ESS3-2) 	<p>ESS3.A: Natural Resources</p> <ul style="list-style-type: none"> Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes. (MS-ESS3-1) <p>ESS3.B: Natural Hazards</p> <ul style="list-style-type: none"> Mapping the history of natural hazards in a region, combined with an understanding of related geologic forces can help forecast the locations and likelihoods of future events. (MS-ESS3-2) <p>ESS3.C: Human Impacts on Earth Systems</p>	<p>Patterns</p> <ul style="list-style-type: none"> Graphs, charts, and images can be used to identify patterns in data. (MS-ESS3-2) <p>Cause and Effect</p> <ul style="list-style-type: none"> Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3) Cause and effect relationships may be used to predict phenomena in natural or designed systems. (MS-ESS3-1),(MS-ESS3-4) <p>Stability and Change</p> <ul style="list-style-type: none"> Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)

<p>Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.</p> <ul style="list-style-type: none"> Construct a scientific explanation based on valid and reliable evidence obtained from sources (including the students' own experiments) and the assumption that theories and laws that describe the natural world operate today as they did in the past and will continue to do so in the future. (MS-ESS3-1) Apply scientific principles to design an object, tool, process or system. (MS-ESS3-3) <p>Engaging in Argument from Evidence Engaging in argument from evidence in 6–8 builds on K–5 experiences and progresses to constructing a convincing argument that supports or refutes claims for either explanations or solutions about the natural and designed world(s). Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. (MS-ESS3-4)</p>	<ul style="list-style-type: none"> Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causing the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things. (MS-ESS3-3) Typically as human populations and per-capita consumption of natural resources increase, so do the negative impacts on Earth unless the activities and technologies involved are engineered otherwise. (MS-ESS3-3),(MS-ESS3-4) <p>ESS3.D: Global Climate Change Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge, such as understanding of human behavior and on applying that knowledge wisely in decisions and activities. (MS-ESS3-5)</p>	<p>----- Connections to Engineering, Technology, and Applications of Science -----</p> <p>Influence of Science, Engineering, and Technology on Society and the Natural World</p> <ul style="list-style-type: none"> All human activity draws on natural resources and has both short and long-term consequences, positive as well as negative, for the health of people and the natural environment. (MS-ESS3-1),(MS-ESS3-4) The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time. (MS-ESS3-2),(MS-ESS3-3) <p>----- Connections to Nature of Science -----</p> <p>Science Addresses Questions About the Natural and Material World Scientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. (MS-ESS3-4)</p>
<p><i>Connections to other DCIs in this grade-band:</i> MS.PS3.C (MS-ESS3-2); MS.LS2.A (MS-ESS3-3),(MS-ESS3-4); MS.LS4.D (MS-ESS3-3),(MS-ESS3-4)</p>		
<p><i>Articulation of DCIs across grade-bands</i> 3.LS2.C (MS-ESS3-3),(MS-ESS3-4); 3.LS4.D (MS-ESS3-3),(MS-ESS3-4); 3.ESS3.B (MS-ESS3-2); 4.ESS3.B (MS-ESS3-2); 5.ESS3.C (MS-ESS3-3),(MS-ESS3-4); HS.LS2.A (MS-ESS3-4); HS.LS2.C (MS-ESS3-3),(MS-ESS3-4); HS.LS4.C (MS-ESS3-3),(MS-ESS3-4); HS.LS4.D (MS-ESS3-3),(MS-ESS3-4); HS.ESS2.B (MS-ESS3-2); HS.ESS2.C (MS-ESS3-3); HS.ESS2.D (MS-ESS3-2),(MS-ESS3-3); HS.ESS2.E (MS-ESS3-3),(MS-ESS3-4); HS.ESS3.A (MS-ESS3-4); HS.ESS3.B (MS-ESS3-2); HS.ESS3.C (MS-ESS3-3),(MS-ESS3-4); HS.ESS3.D (MS-ESS3-2),(MS-ESS3-3)</p>		
<p>RST.6-8.1</p> <p>RST.6-8.7</p> <p>WHST.6-8.8</p> <p>WHST.6-8.9 <i>Mathematics -</i></p> <p>MP.2</p> <p>6.RP.A.1</p> <p>6.EE.B.6</p>	<p>Cite specific textual evidence to support analysis of science and technical texts. (MS-ESS3-1),(MS-ESS3-2),(MS-ESS3-4),(MS-ESS3-5)</p> <p>Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).</p> <p>Gather relevant information from multiple print and digital sources; assess the credibility of each source; and quote or paraphrase the data and conclusions of others while avoiding plagiarism and providing basic bibliographic information for sources. (MS-ESS3-3)</p> <p>Draw evidence from informational texts to support analysis, reflection, and research. (MS-ESS3-4)</p> <p>Reason abstractly and quantitatively. (MS-ESS3-2)</p> <p>Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. (MS-ESS3-3),(MS-ESS3-4)</p> <p>Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. (MS-ESS3-1),(MS-ESS3-2),(MS-ESS3-3),(MS-ESS3-4),(MS-ESS3-5)</p>	

