Unit 4: Human Impacts

CONTENT AREA: General Earth Science	GRADES: 8	UNIT: 1 of 8
Pacing: Approx. 1 Month		
Constructing Explanations and Designing Solutions · 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) **Asking Questions and Defining Problems** · Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. (MS-ETS1-1) Engaging in Argument from Evidence · Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. (MS-ETS1-2) **Analyzing and Interpreting Data** · Analyze and interpret data to determine similarities and differences in findings. (MS-ETS1-3)	**Disciplinary Core Ideas** ESS3.C: Human Impacts on Earth Systems • 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. (MSESS3-3),(MS-ESS3-4) ETS1.A: Defining and Delimiting Engineering Problems • The more precisely a design task's criteria and constraints can be defined, the more likely it is that the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. (MS-ETS1-1) ETS1.B: Developing Possible Solutions A solution needs to be tested, and then modified on the basis of the test results, in order to improve it. (MS-ETS1-4) • There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. (MS-ETS1-2), (MS-ETS1-3) • Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. (MS-ETS1-3) • Models of all kinds are important for testing solutions. (MS-ETS1-4)	**Crosscutting Concepts** **Cause and Effect** ● Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. (MS-ESS3-3) - ***Connections to Engineering, Technology, and Applications of Science*** **Influence of Science, Engineering, and Technology on Society and the Natural World** ● 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-ESS3-3) **Influence of Science, Engineering, and Technology on Society and the Natural World** ● 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-ETS1-1) ● The uses of technologies and 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. (MS-ETS1-1)

Performance Expectations: MS-ESS3-3, MS-ETS1-1, MS-ETS1-2, and MS-ETS1-3		
Evidence Statement(s): MS-ESS3-3, MS-ETS1-1, MS-ETS1-2, and MS-ETS1-3		
Essential Question: How do we monitor the health of the environment (our life support system)? Is it possible to predict and protect ourselves from natural hazards?		
21st Century Skills: 9.2.8.B.3, 9.2.8.B.4		
Career Ready Practices: CRP4, CRP6, CRP7		
Technology:HS-ETS1-1 HS-ETS1-3		
Technical Terms (Suggested)	**Core Instructional Materials**	**Assessment Statement**
Extinction **Fossil Record** **Time** **Relative Fossil Dating** **Natural Selection** **Minerals** **Energy** **Resources** **Renewable and Nonrenewable** **Population** **Pollution** **Fossil Fuels** **Climate** **Atmosphere** **Greenhouse Gases** **** All terms should be taught in context rather than in isolation. These terms should be addressed after conceptual understanding.****	**MS-ESS3-3 - Chromebook, internet access, smartboard, notebook, pen, pencil, whiteboard.** **MS-ETS1-1- Computer, Internet access, smartboard, notebook, pen, pencil, whiteboard.** **MS-ETS1-2- Computer, Internet access, smartboard, notebook, pen, pencil, whiteboard.** **MS-ETS1-3- Computer, Internet access, smartboard, notebook, pen, pencil, whiteboard.**	*Students who understand the concepts can:* **Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.**

Modifications

English Language Learners	Special Education	At Risk	Gifted & Talented
Scaffolding	**Word walls**	**Teacher tutoring**	**Curriculum compacting**
Word walls	**Visual aides**	**Peer tutoring**	**Challenge assignments**
Sentence/paragraph frames	**Graphic organizers**	**Study guides**	**Enrichment activities**
Bilingual dictionaries/translation	**Multimedia**	**Graphic organizers**	**Tiered activities**
Think alouds	**Leveled readers**	**Extended time**	**Independent research/inquiry**
Read alouds	**Assistive technology**	**Parent communication**	**Collaborative teamwork**
Highlight key vocabulary	**Notes/summaries**	**Modified assignments**	**Higher level questioning**
Annotation guides	**Extended time**	**Counseling**	**Critical/Analytical thinking tasks**
Think-pair-share	**Answer masking**		**Self-directed activities**
Visual aides	**Answer eliminator**		
Modeling	**Highlighter**		
Cognates	**Color contrast**		

5E Model	
Performance Expectation: MS-ESS3-3, MS-ETS1-1, MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment. MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions. MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem. MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.	
Engage: Anticipatory Set	**Have students view the following video and online quiz** **Human Impact on the Environment:** **http://study.com/academy/lesson/human-impacts-on-the-environment.html**
Exploration: Student Inquiry	**Will the Air Be Clean Enough to Breath?** **This online interactive is comprised of five modules. In completing these activities, students will explore real-time air quality data with maps from the United States EPA. They will run experiments with computational models to investigate how pollutants flow in the atmosphere and look at how factors such as wind, sun, rain, geography and pollution affect ai quality. By the end of the module, students will be able to predict the effect of human development on a region's future air quality.** **http://concord.org/stem-resources/will-air-be-clean-enough-breathe** **Design Your Society** **In this activity, students will use all they have learned about the potential impacts of climate change to create a 3D mode of a self-sustaining, resilient society.** **http://betterlesson.com/lesson/644797/design-your-society**
Explanation: Concepts & Practices	**In these lessons:** **Teachers Should: Introduce formal labels, definitions, and explanations for concepts, practices, skills or abilities.** **Students Should: Verbalize conceptual understandings and demonstrate scientific and engineering practices.** **Topics to Be Discussed in Teacher Directed Lessons (Disciplinary Core Ideas):** **ESS3.C: Human Impacts on Earth Systems** **Human activities have significantly altered the biosphere, sometimes damaging or destroying natural habitats and causir the extinction of other species. But changes to Earth's environments can have different impacts (negative and positive) for different living things.** **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.**
	Mix and Math Ecology: Human Impact

Elaboration: Extension Activity	**Challenge students to think of a way to reduce the threat to the natural resource of their mix-and-match combinations without eliminating the human action.** **http://www.learnnc.org/lp/media/uploads/2008/12/ecologyworksheet.pdf** **In what ways could the human action be changed to achieve the same result but with better environmental consequences?** **Could any buffers or protection be placed on the ecological communities that might better preserve the natural resource?** **What policies or laws could be passed that might help?**
Evaluation: Assessment	**Assessment Task A: Design Your Society using Google Sketch Up** **Apply scientific principles to design an object, tool, process or system.** **Using what students have learned about the potential impacts of climate change, students will create a 3D model of a self-sustaining, resilient society (using Google Sketch Up).** **Assesment Task B: Society Presentations** **Students will present 3D models to the class. Students viewing the presentations will use the Society Presentation Notes Guide to synthesize and interpret information learned from presentations.**

How do we monitor the health of the environment (our life support system)? Is it possible to predict and protect ourselves from natural hazards?

In this unit of study, students analyze and interpret data and design solutions to build on their understanding of the ways that human activities affect Earth's systems. The emphasis of this unit is the significant and complex issues surrounding human uses of land, energy, mineral, and water resources and the resulting impacts of these uses. The crosscutting concepts of cause and effect and the influence of science, engineering, and technology on society and the natural world are called out as organizing concepts for these disciplinary core ideas. Building on Unit 3, students define a problem by precisely specifying criteria and constraints for solutions as well as potential impacts on society and the natural environment; systematically evaluate alternative solutions; analyze data from tests of different solutions; combining the best ideas into an improved solution; and develop and iteratively test and improve their model to reach an optimal solution. In this unit of study students are expected to demonstrate proficiency in analyzing and interpreting data and designing solutions. Students are also expected to use these practices to demonstrate understanding of the core ideas.

This unit is based on MS-ESS3-3, MS-ETS1-1, MS-ETS1-2, and MS-ETS1-3.		
#	**STUDENT LEARNING OBJECTIVES**	**CORRESPONDING PEs and DCIs**
1	**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-ESS3-3)**
2	**Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.**	**(MS-ETS1-1)**
3	**Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of the problem.**	**(MS-ETS1-2)**
4	**Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.**	**(MS-ETS1-3)**

The Student Learning Objectives above were developed using the following elements from the NRC document *A Framework for K-12 Science Education*:		
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. Apply scientific principles to design an object, tool, process or system. **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.	ESS3.C: Human Impacts on Earth Systems 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. 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. ETS1.A: Defining and Delimiting Engineering Problems The more precisely a design task's criteria and constraints can be defined, the more likely it is that	**Crosscutting Concepts** **Cause and Effect** Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation. Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering, and Technology on Society and the Natural World 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

Define a design problem that can be solved through the development of an object, tool, process or system and includes multiple criteria and constraints, including scientific knowledge that may limit possible solutions. 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. Evaluate competing design solutions based on jointly developed and agreed-upon design criteria. Analyzing and Interpreting Data Analyzing data in 6–8 builds on K–5 experiences and progresses to extending quantitative analysis to investigations, distinguishing between correlation and causation, and basic statistical techniques of data and error analysis. Analyze and interpret data to determine similarities and differences in findings.	the designed solution will be successful. Specification of constraints includes consideration of scientific principles and other relevant knowledge that are likely to limit possible solutions. ETS1.B: Developing Possible Solutions **There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem.** **ETS1.B: Developing Possible Solutions** There are systematic processes for evaluating solutions with respect to how well they meet the criteria and constraints of a problem. Sometimes parts of different solutions can be combined to create a solution that is better than any of its predecessors. ETS1.C: Optimizing the Design Solution Although one design may not perform the best across all tests, identifying the characteristics of the design that performed the best in each test can provide useful information for the redesign process—that is, some of those characteristics may be incorporated into the new design.	resources, and economic conditions. Thus technology use varies from region to region and over time. Influence of Science, Engineering, and Technology on Society and the Natural World 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. The uses of technologies and 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.

Connections to other DCIs in this grade-band: **MS.LS2.A ; MS.LS2.C , MS.LS4.D, MS-ETS1.A, MS-PS3-3, MS-PS1-6, MS-PS3-3,MS-LS2-5, Physical Science: MS-PS1-6, MS-PS3-3, Life Science: MS-LS2-5**
Articulation of DCIs across grade-bands:

3.LS2.C ; 3.LS4.D ; 5.ESS3.C ; HS.LS2.C ; HS.LS4.C ; HS.LS4.D ; HS.ESS2.C ; HS.ESS2.D ; HS.ESS2.E ; HS.ESS3.C ; HS.ESS3.D; 3-5.ETS1.A ; 3-5.ETS1.C ; HS.ETS1.A ; HS.ETS1.B, 3-5.ETS1.A ; 3-5.ETS1.B ; 3-5.ETS1.C ; HS.ETS1.A ; HS.ETS1.B, Physical Science: MS-PS1-6, 3-5.ETS1.A ; 3-5.ETS1.B ; 3-5.ETS1.C ; HS.ETS1.B ; HS.ETS1.C

Common Core State Standards Connections:

ELA: WHST.6-8.7, WHST.6-8.8, RST.6-8.1, WHST.6-8.8, RST.6-8.1, RST.6-8.9, WHST.6-8.7 , WHST.6-8.9, RST.6-8.1, RST.6-8.7, RST.6-8.9

Math: 6.RP.A.1, 7.RP.A.2, 6.EE.B.6, 7.EE.B.4, MP.2, 7.EE.3, MP.2, 7.EE.3