WCSD High School Environmental Science Unit Overview

This course model arranges the Performance Expectations for High School Environmental Science into different units with guiding questions. Throughout this semester you will be incorporating global issues including sustainability, population, energy, ethics, and policies.

1st Semester Ecology

Unit Title: Introduction to Environmental Science & Environmental Ethics	**Unit title: Characteristics of Ecosystems & Cycling of Energy**	**Unit title: Biogeochemical Cycles & Biomes**
Guiding Question: How can we design and evaluate solutions that reduce human impact on ecosystems while balancing societal needs and values? In what ways have natural resources, climate change, and natural hazards shaped human decisions and ethical responsibilities toward the environment?	**Guiding Question:** How do human activities alter the flow of energy and matter in ecosystems, and what solutions can we design to reduce their impact on biodiversity and climate systems? What factors determine the carrying capacity of ecosystems, and how can computational models help us understand and predict the effects of environmental changes at different scales?	**Guiding Questions:** How do biogeochemical cycles connect Earth's systems, and what happens when these natural cycles are disrupted by human activity? How do interactions within the biosphere balance dynamic feedback mechanisms that determine the number and types of biomes, ecosystems, and species?
HS-LS2-7. Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. **HS-ETS1-1.** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **HS-ESS3-1.** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.	**HS-LS2-7.** Design, evaluate, and refine a solution for reducing the impacts of human activities on the environment and biodiversity. **HS-ESS2-4.** Use a model to describe how variations in the flow of energy into and out of Earth's systems result in changes in climate. **HS-ESS3-6.** Use a computational representation to illustrate the relationships among Earth systems and how those are being modified due to human activity. **HS-LS2-1.** Use mathematical and/or computational representations to support explanations of factors that affect carrying capacity of ecosystems at different scales.	**HS-ESS2-6.** Develop a quantitative model to describe the cycling of carbon among the hydrosphere, atmosphere, geosphere, and biosphere. **HS-ESS3-6.** Use a computational representation to illustrate the relationships among Earth systems and how those are being modified due to human activity. **HS-ESS2-2.** Analyze geoscience data to make the claim that one change to Earth's surface can create feedback that causes changes to other Earth systems. **HS-LS2-4.** Use mathematical representations to support claims for the cycling of matter and flow of energy among organisms in an ecosystem.
Topics: Ethics Experiment Design Environmental Science vs. Environmentalism Ecosystem Service SDG - Sustainable Development Goals Tragedy of the Common	**Topics** Biotic vs. Abiotic Food Chains/Webs Energy Flow/Energy Pyramids Trophic Levels Carrying Capacity/Limiting Factors Symbiotic Relationships Endangered/Extinction/Invasive Succession K vs. r selected Species Survivorship Curves	**Topics** Impacts on Biodiversity Biogeochemical Cycles Terrestrial Biome Aquatic Biomes

Several Performance Expectations are covered in multiple units; mastery is expected at the end of the year.

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2nd Semester Resource Use

Unit title: Population Dynamics	Unit Title: Environmental Degradation	Unit title: Renewable/Non-Renewable Resources	Unit title: Climate Change & Sustainability
Guiding Questions: How can we design and evaluate solutions to the environmental challenges caused by human population growth, considering the complex interactions between natural resources, climate, and societal needs?	**Guiding Question:** How can we analyze and design solutions to reduce the environmental impacts while balancing economic and societal needs? How does current geoscience and climate data reveal the impacts of pollution on Earth's systems, and how can data help us predict and address future environmental challenges?	**Guiding Questions:** How have natural resource availability, climate change, and natural hazards shaped human choices about energy use, and how can we evaluate the trade-offs of different energy technologies?	**Guiding Questions:** How can we design and evaluate solutions to global sustainability challenges by balancing environmental, social, and economic needs in the face of climate change and resource limitations? How can data and simulations help us understand the impacts of climate change on Earth's systems and guide the development of sustainable technologies and resource management strategies?
HS-ETS1-1. Analyze a major challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **HS-ETS1-2.** Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering. **HS-ETS1-4.** Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem. **HS-ESS3-1.** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity.	**HS-ESS3-2.** Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. **HS-ESS3-4.** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. **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's systems. **HS-ESS3-6.** Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.	**HS-ESS3-1.** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. **HS-ESS3-2.** Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios. **HS-ESS3-3.** Create a computational simulation to illustrate the relationships among the management of natural resources, the sustainability of human populations, and biodiversity. **HS-ESS3-4.** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.	**HS-ETS1-1.** Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants. **HS-ESS3-1.** Construct an explanation based on evidence for how the availability of natural resources, occurrence of natural hazards, and changes in climate have influenced human activity. **HS-ESS3-3.** Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity. **HS-ESS3-4.** Evaluate or refine a technological solution that reduces impacts of human activities on natural systems. **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's systems. **HS-ETS1-3.** Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics, as well as possible social, cultural, and environmental impacts.
Topics Human Population Resources/Services Land Management Urbanization Farming	**Topics** Overfishing Pollution Habitat Fragmentation/Loss Endangered Species	**Topics** Nonrenewable Energy Renewable Energy Mining	**Topics** Climate Change Greenhouse Gases Sustainability

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