

**Earth and Space Science HS-ESS3 Earth and Human Activity**

- HS-ESS3-1. Construct an explanation based on evidence for how the availability of key natural resources and changes due to variations in climate have influenced human activity.** [Clarification Statement: Examples of key natural resources include access to fresh water (such as rivers, lakes, and groundwater), regions of fertile soils (such as river deltas), high concentrations of minerals and fossil fuels, and biotic resources (such as fisheries and forests). Examples of changes due to variations in climate include changes to sea level and regional patterns of temperature and precipitation.]
- HS-ESS3-2. Evaluate competing design solutions for minimizing impacts of developing and using energy and mineral resources, and conserving and recycling those resources, based on economic, social and environmental cost-benefit ratios.\*** [Clarification Statement: Examples include developing best practices for agricultural soil use, mining (for metals, coal, tar sands, and oil shales), and pumping (for petroleum and natural gas).]
- HS-ESS3-3. Illustrate relationships among management of natural resources, the sustainability of human populations, and biodiversity.** [Clarification Statement: Examples of factors related to the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors related to human sustainability include agricultural efficiency, levels of conservation, and urban planning. Examples of factors related to biodiversity include habitat use and fragmentation, and land and resource conservation.]
- HS-ESS3-5. Analyze results from global climate models to describe how forecasts are made of the current rate of global or regional climate change and associated future impacts to Earth systems.** [Clarification Statement: Climate model outputs include both climate changes (such as precipitation and temperature) and associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.]

[Note: HS-ESS3-4 and HS-ESS3-6 from NGSS is not included.]

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  |
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| <p><b>Constructing Explanations and Designing Solutions</b></p> <ul style="list-style-type: none"> <li>Construct an explanation based on valid and reliable evidence obtained from a variety of sources (including students' own investigations, models, theories, simulations, peer review) 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. (HS-ESS3-1)</li> </ul> <p><b>Engaging in Argument from Evidence</b></p> <ul style="list-style-type: none"> <li>Evaluate competing design solutions to a real-world problem based on scientific ideas and principles, empirical evidence, and logical arguments regarding relevant factors (e.g. economic, societal, environmental, ethical considerations). (HS-ESS3-2)</li> </ul> | <p><b>ESS3.A: Natural Resources</b></p> <ul style="list-style-type: none"> <li>Resource availability has guided the development of human society. (HS-ESS3-1)</li> <li>All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. (HS-ESS3-2)</li> </ul> <p><b>ESS3.C: Human Impacts on Earth Systems</b></p> <ul style="list-style-type: none"> <li>The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. (HS-ESS3-3)</li> </ul> <p><b>ETS1.B: Developing Possible Solutions</b></p> <ul style="list-style-type: none"> <li>When evaluating solutions, it is important to take into account a range of constraints, including cost, safety, reliability, and aesthetics, and to consider social, cultural, and environmental impacts. (<i>secondary to HS-ESS3-2</i>)</li> </ul> |