

K-12 Conceptual Vertical Articulation of ESS3 – Earth and Human Activity

ESS3.A: Natural Resources

Grade/Course	Disciplinary Core Idea Statement with 2021 Performance Expectation Linked
K	<ul style="list-style-type: none">• Living things need water, air, and resources from the land, and they live in places that have the things they need. Humans use natural resources for everything they do. (K-ESS3-1)
4	<ul style="list-style-type: none">• All materials, energy, and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1)
7	<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. (7-ESS3-1)
Earth and Space Science	<ul style="list-style-type: none">• Resource availability has guided the development of human society (E-ESS3-1)• All forms of energy production and other resource extraction have associated economic, social, environmental, and geopolitical costs and risks as well as benefits. New technologies and social regulations can change the balance of these factors. (E-ESS3-2)

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ESS3.B: Natural Hazards

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K	<ul style="list-style-type: none"> Some kinds of severe weather are more likely than others in a given region. Weather scientists forecast severe weather so that the communities can prepare for and respond to these events. (K-ESS3-2)
3	<ul style="list-style-type: none"> A variety of natural hazards result from natural processes. Humans cannot eliminate natural hazards but can take steps to reduce their impacts. (3-ESS3-1)
4	<ul style="list-style-type: none"> A variety of hazards result from natural processes (e.g., earthquakes, tsunamis, volcanic eruptions). Humans cannot eliminate the hazards but can take steps to reduce their impacts. (4-ESS3-2)
6	<ul style="list-style-type: none"> 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. 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. (6-ESS3-2)
<p>Earth and Space Science</p>	<ul style="list-style-type: none"> Natural hazards and other geologic events have shaped the course of human history by destroying buildings and cities, eroding land, changing the course of rivers, and reducing the amount of arable land. These have significantly altered the sizes of human populations and have driven human migrations. Natural hazards can be local, regional, or global in origin, and their risks increase as populations grow. (E-ESS3-1) Human activities can contribute to the frequency and intensity of some natural hazards. (E-ESS3-6)

ESS3.C: Human Impacts on Earth Systems

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K	<ul style="list-style-type: none"> • Things that people do to live comfortably can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (secondary) (K-ESS2-2) • Things that people do to live comfortably can affect the world around them, but they can make choices that reduce their impacts on the land, water, air, and other living things. (K-ESS3-3)
2	<ul style="list-style-type: none"> • Things that people do to live can affect the world around them. But they can make choices that reduce their impacts on the land, water, air, and other living things. (2-ESS3-1)
5	<ul style="list-style-type: none"> • Human activities in agriculture, industry, and everyday life have had major effects on the land, vegetation, streams, ocean, air, and even outer space. But individuals and communities are doing things to help protect Earth’s resources and environments. (5-ESS3-1)
7	<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. 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. (7-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. (7-ESS3-4)
Earth and Space Science	<ul style="list-style-type: none"> • The sustainability of human societies and the biodiversity that supports them requires responsible management of natural resources. When the source of an environmental problem is understood and international agreement can be reached, human activities can be regulated to mitigate global impacts (e.g., acid rain and the ozone hole near Antarctica). (E-ESS3-3) • Scientists and engineers can make major contributions by developing technologies that produce less pollution and waste and that preclude ecosystem degradation. (E-ESS3-4)

ESS3.D: Global Climate Change

Grade/Course	Disciplinary Core Idea Statement with 2021 Performance Expectation Linked
7	<ul style="list-style-type: none"> 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. 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. (7-ESS3-5)
Earth and Space Science	<ul style="list-style-type: none"> Global climate models are often used to understand the process of climate change because these changes are complex and can occur slowly over Earth’s history. Though the magnitudes of human impacts are greater than they have ever been, so too are human abilities to model, predict, and manage current and future impacts. (E-ESS3-5) Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities. (E-ESS3-6) Impacts of climate change--for example, increased frequency of severe storms due to ocean warming-- have begun to influence human activities. Through computer simulations and other studies, important discoveries are still being made about how the ocean, the atmosphere, and the biosphere interact and are modified in response to human activities, as well as to changes in human activities. Thus, science and engineering will be essential both to understanding the possible impacts of global climate change and to informing decisions about how to slow its rate and consequences - for humanity as well as for the rest of the planet. The impacts of climate change are uneven and may affect some regions, species, of human populations more severely than others. By using science-based predictive models, humans can anticipate long-term change more effectively than ever and plan accordingly. (E-ESS3-7)

Adapted from *The Framework for K-12 Science Education* and the *Next Generation Science Standards*.

References:

National Research Council. (2012). *A Framework for K-12 Science Education: Practices, Crosscutting Concepts, and Core Ideas*. Washington, DC: The National Academies Press.

NGSS Lead States. (2013). *Next Generation Science Standards: For States, By States (Appendix E: Disciplinary Core Idea Progression)*. Retrieved from <https://www.nextgenscience.org/>