

HS-ESS3-1 Earth and Human Activity

California Science Test—Item Content Specifications

**HS-ESS3-1 Earth and Human Activity**

Students who demonstrate understanding can:

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.

[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, and high concentrations of minerals and fossil fuels. Examples of natural hazards can be from interior processes (such as volcanic eruptions and earthquakes), surface processes (such as tsunamis, mass wasting and soil erosion), and severe weather (such as hurricanes, floods, and droughts). Examples of the results of changes in climate that can affect populations or drive mass migrations include changes to sea level, regional patterns of temperature and precipitation, and the types of crops and livestock that can be raised.]

Continue to the next page for the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts.

| Science and Engineering Practices | Disciplinary Core Ideas | Crosscutting Concepts |
| --- | --- | --- |
| Constructing Explanations and Designing Solutions Constructing explanations and designing solutions in 9–12 builds on K–8 experiences and progresses to explanations and designs that are supported by multiple and independent student-generated sources of evidence consistent with scientific knowledge, principles, and theories.  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. | ESS3.A: Natural Resources  1. Resource availability has guided the development of human society.  ESS3.B: Natural Hazards Natural hazards and other geologic events have shaped the course of human history; [they] have significantly altered the sizes of human populations and have driven human migrations. | Cause and Effect Empirical evidence is required to differentiate between cause and correlation and make claims about specific causes and effects.  Connections to Engineering, Technology, and Applications of Science Influence of Science, Engineering, and Technology on Society and the Natural World Modern civilization depends on major technological systems. |

## Assessment Targets

Assessment targets describe the focal knowledge, skills, and abilities for a given three-dimensional Performance Expectation. Please refer to the Introduction for a complete description of assessment targets.

### Science and Engineering Subpractice(s)

Please refer to appendix A for a complete list of Science and Engineering Practices (SEP) subpractices. Note that the list in this section is not exhaustive.

6.1 Ability to construct explanations of phenomena

6.2 Ability to evaluate explanations of phenomena

### Science and Engineering Subpractice Assessment Targets

Please refer to appendix A for a complete list of SEP subpractice assessment targets. Note that the list in this section is not exhaustive.

6.1.1 Ability to construct quantitative and/or qualitative explanations of observed relationships based on valid and reliable evidence

6.1.2 Ability to apply scientific concepts, principles, theories, and big ideas to construct an explanation of a real-world phenomenon

6.1.3 Ability to use models and representations in scientific explanations

6.2.1 Ability to evaluate and revise a given explanation based on an accepted scientific theory and/or data provided

6.2.2 Ability to use data to support or refute an explanation of a phenomenon

### Disciplinary Core Idea Assessment Targets

#### ESS3.A.4

* Identify cause-and-effect relationships between environmental factors (e.g., access to fresh water, soil fertility, available natural resources) and features of human societies including population size and migration patterns
* Describe the effect technology has on mitigating some of the effects of natural hazards, climate, and the availability of natural resources on human activity
* Identify and describe evidence that supports the following claims:
* Changes in climate affect human activity (e.g., agriculture) and human populations and can drive mass migrations
* Features of human societies have been affected by the availability of natural resources
* Human populations depend on technological systems to acquire natural resources and modify physical settings
* Use 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 to describe the availability of natural resources on features of human societies
* Differentiate between causal and correlational relationships between environmental factors and human activity and describe potential sources of evidence that could support a proposed causal relationship
* Describe differential trends in access to natural resources over time (e.g., that technology to access coal came before technology to access natural gas)

#### ESS3.B.5

* Identify cause-and-effect relationships between incidence of natural disasters and features of human societies including population size and migration patterns
* Identify and describe evidence that supports the claim that changes to climate have a primary effect on human populations and a secondary effect (by altering the incidence of natural hazards)
* Describe differential trends in incidence of natural hazards over time

### Crosscutting Concept Assessment Target(s)

CCC2 Identify empirical evidence to differentiate between cause and correlation and make claims about specific causes and effects

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task presents a graph of geologic factors on one axis and human population size on another axis:

* Constructs an explanation about the relationships between the independent and dependent variables (6.1.1, ESS3.A.4, and CCC2)

Task provides data on geologic factors particularly related to climate and the impact of climate change and data of human populations:

* Uses the data as evidence to support an explanation of the impact of changes to climate on human migration (6.1.2, ESS3.A.4, and CCC2)

Task presents a model or diagram representing changes in human activity throughout history (including population, geographic distribution, resource use, or the development of resource-acquiring technologies) along with map of availability of a particular natural resource:

* Uses the model to construct an explanation of a human activity over time based on natural resource availability (6.1.3, ESS3.A.4, and CCC2)

Task provides a claim about the effect of a natural hazard or geologic event on human populations in conjunction with a data table:

* Identifies (with reasoning) whether the provided data is sufficient to support the claim (6.2.1, ESS3.B.5, and CCC2)
* Identifies aspects of the data that do or do not align to the claim (6.2.1, ESS3.B.5, and CCC2)

Task provides data on a given geologic factor that could affect human activity:

* Uses data as evidence to support or refute an explanation for how that factor contributed to known changes in human activity (6.2.2, ESS3.B.5, and CCC2)

## California Environmental Principles and Concepts

* EP1: The continuation and health of individual human lives and of human communities and societies depend on the health of the natural systems that provide essential goods and ecosystem services.
* EP2: The long-term functioning and health of terrestrial, freshwater, coastal, and marine ecosystems are influenced by their relationships with human societies.
* EP3: Natural systems proceed through cycles that humans depend upon, benefit from, and can alter.
* EP4: The exchange of matter between natural systems and human societies affects the long-term functioning of both.
* EP5: Decisions affecting resources and natural systems are based on a wide range of considerations and decision-making processes.

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* The distribution or availability of a natural resource throughout history
* The incidence of natural disasters (i.e., meteorological, geological, hydrological, etc.) Changes in sea level and coastline over time
* Relationships between current population density and impact of natural disasters
* Relationships between current and prior population density and availability of natural resources

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Resources are universally distributed throughout the biosphere.
* Human populations have equal access to natural resources.
* Natural hazards and geologic events always negatively impact human populations.
* Human populations are not impacted by natural resource availability or natural disasters.
* The impact of resource availability on human populations has not changed with new technologies.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

HS-ESS3-1 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/HS-ESS3-1 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/HS-ESS3-1%20Evidence%20Statements%20June%202015%20asterisks.pdf)

California Environmental Principles and Concepts <http://californiaeei.org/abouteei/epc/>

California Education and the Environment Initiative <http://californiaeei.org/>

The *2016 Science Framework for California Public Schools Kindergarten through Grade 12*

Appendix 1: Progression of the Science and Engineering Practices, Disciplinary Core Ideas, and Crosscutting Concepts in Kindergarten through Grade 12 <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix1.pdf>

Appendix 2: Connections to Environmental Principles and Concepts <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix2.pdf>

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