

MS-ESS3-4 Earth and Human Activity

California Science Test—Item Content Specifications

# MS-ESS3-4 Earth and Human Activity

Students who demonstrate understanding can:

Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.

[Clarification Statement: Examples of evidence include grade-appropriate databases on human populations and the rates of consumption of food and natural resources (such as freshwater, mineral, and energy). Examples of impacts can include changes to the appearance, composition, and structure of Earth’s systems as well as the rates at which they change. The consequences of increases in human populations and consumption of natural resources are described by science, but science does not make the decisions for the actions society takes.]

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 |
| --- | --- | --- |
| Engaging in Argument from EvidenceEngaging 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(s).Construct an oral and written argument supported by empirical evidence and scientific reasoning to support or refute an explanation or a model for a phenomenon or a solution to a problem. | ESS3.C: Human Impacts on Earth Systems1. 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.
 | Cause and EffectCause and effect relationships may be used to predict phenomena in natural or designed systems.Connections to Engineering, Technology, and Applications of ScienceInfluence of Science, Engineering, and Technology on Society and the Natural WorldAll 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.Connections to Nature of ScienceScience Addresses Questions About the Natural and Material WorldScientific knowledge can describe the consequences of actions but does not necessarily prescribe the decisions that society takes. |

## 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.

7.1 Ability to construct scientific arguments

### 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.

7.1.1 Ability to identify evidence/data that supports a claim

7.1.2 Ability to develop scientific arguments that are supported by evidence/data

7.1.3 Ability to use reasoning to explain how relevant evidence/data supports or refutes the claim; the reasoning should reflect application of scientific concepts, principles, ideas, and models

### Disciplinary Core Idea Assessment Targets

#### ESS3.C.4

* Identify changes in human population over various timespans within and between different geographic regions
* Identify changes in the availability of natural resources of a region and relate those changes to the needs of human populations
* Describe how changes in the availability of natural resources of a region will impact the ecology of the region
* Explain how humans can cause a change in one region to impact other Earth systems (e.g., the conversion of arable land for farming impacts erosion)
* Describe potential design solutions in terms of their effect on limiting resource use
* Describe potential design solutions in terms of the needs of a changing human population

### Crosscutting Concept Assessment Target(s)

CCC2 Use cause and effect relationships to predict phenomena in natural or designed systems

## Examples of Integration of Assessment Targets and Evidence

Note that the list in this section is not exhaustive.

Task provides data regarding the availability of a resource, current rates of consumption by a relevant human population, and details regarding a proposed engineering project designed to limit future use of that resource:

* Develops a scientific argument in support or in opposition of the proposal using the data provided as evidence with reasoning that considers nonscientific factors (7.1.1, ESS3.C.4, and CCC2)

Task provides a claim with evidence regarding the potential impact of projected increases in human population based on a particular data set:

* Evaluates (with reasoning) whether the provided evidence/data are sufficient to defend the claim (7.1.2, ESS3.C.4, and CCC2)

Task provides an incomplete argument regarding a potential negative consequence for humans based on overconsumption of a particular resource that includes both a claim and reasoning but no evidence:

* Identifies a potential source of evidence or data that could be used to support the claim (7.1.2, ESS3.C.4, and CCC2)
* Evaluates the impact of the proposed project using relevant scientific principles (7.1.3, ESS3.C.4, and CCC2)
* Explains the role that society plays in determining the viability of a design solution (7.1.3, ESS3.C.4, and CCC2)

Task provides contrasting arguments about the magnitude of a potential negative impact based on current rates of resource consumption:

* Selects the best argument based on the quantity and appropriateness of evidence (7.1.2, ESS3.C.4, and CCC2)
* Indicates the argument best supported by reasoning that considers both scientific and societal factors (7.1.2, ESS3.C.4, 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.

## Possible Phenomena or Contexts

Note that the list in this section is not exhaustive.

* Evidence to support or refute a claim about per capita consumption of natural resources in different populations
* The merits of a project designed to limit impacts of consumption issues (e.g., changing from fossil fuels to solar power for electricity generation, methods for preventing overfishing)
* The quality and/or quantity of evidence used to support an argument that current rates of consumption of a given natural resource are (or are not) sustainable
* Comparison of the amount of available resource (such as water, forest, petroleum) to the amount consumed over time
* Increase in extinction rates
* Possible negative environmental effects of design solutions intended to reduce resource consumption (e.g., windmills may cause noise and loss of wildlife habitat, dams may cause loss of wildlife habitat and coastal erosion)

## Common Misconceptions

Note that the list in this section is not exhaustive.

* Solutions to mitigating human resource needs should only consider relevant scientific principles.
* Natural resources are abundant and will last forever.
* Features of Earth systems are always in flux; therefore, no steps need to be taken to mitigate the impacts of human resource consumption.

## Additional Assessment Boundaries

None listed at this time.

## Additional References

MS-ESS3-4 Evidence Statement [https://www.nextgenscience.org/sites/default/files/evidence\_statement/black\_white/MS-ESS3-4 Evidence Statements June 2015 asterisks.pdf](https://www.nextgenscience.org/sites/default/files/evidence_statement/black_white/MS-ESS3-4%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 California Environmental Principles and Concepts <https://www.cde.ca.gov/ci/sc/cf/documents/scifwappendix2.pdf>

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