

## MS-ESS3-3 Earth and Human Activity

Students who demonstrate understanding can:

**MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.\*** [Clarification Statement: Examples of the design process include examining human environmental impacts, assessing the kinds of solutions that are feasible, and designing and evaluating solutions that could reduce that impact. Examples of human impacts can include water usage (such as the withdrawal of water from streams and aquifers or the construction of dams and levees), land usage (such as urban development, agriculture, or the removal of wetlands), and pollution (such as of the air, water, or land).]

The performance expectation above was developed using the following elements from the NRC document *A Framework for K-12 Science Education*:

### Science and Engineering Practices

#### Constructing Explanations and Designing Solutions

Constructing explanations and designing solutions in 6–8 builds on K–5 experiences and progresses to include constructing explanations and designing solutions supported by multiple sources of evidence consistent with scientific ideas, principles, and theories.

- Apply scientific principles to design an object, tool, process or system.

### Disciplinary Core Ideas

#### ESS3.C: Human Impacts on Earth Systems

- 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.

### Crosscutting Concepts

#### Cause and Effect

- Relationships can be classified as causal or correlational, and correlation does not necessarily imply causation.

#### Connections to Engineering, Technology, and Applications of Science

#### Influence of Science, Engineering, and Technology on Society and the Natural World

- The uses of technologies and any limitations on their use are driven by individual or societal needs, desires, and values; by the findings of scientific research; and by differences in such factors as climate, natural resources, and economic conditions. Thus technology use varies from region to region and over time.

### Observable features of the student performance by the end of the course:

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| 1 | Using scientific knowledge to generate design solutions  |
| a | Given a problem related to human impact on the environment, students use scientific information and principles to generate a design solution that: <ol style="list-style-type: none"> <li>Addresses the results of the particular human activity.</li> <li>Incorporates technologies that can be used to monitor and minimize negative effects that human activities have on the environment.</li> </ol> |
| b | Students identify relationships between the human activity and the negative environmental impact based on scientific principles, and distinguish between causal and correlational relationships to facilitate the design of the solution.  |
| 2 | Describing* criteria and constraints, including quantification when appropriate  |
| a | Students define and quantify, when appropriate, criteria and constraints for the solution, including: <ol style="list-style-type: none"> <li>Individual or societal needs and desires.</li> <li>Constraints imposed by economic conditions (e.g., costs of building and maintaining the solution).</li> </ol>  |
| 3 | Evaluating potential solutions   |
| a | Students describe* how well the solution meets the criteria and constraints, including monitoring or minimizing a human impact based on the causal relationships between relevant scientific principles  |

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|   | about the processes that occur in, as well as among, Earth systems and the human impact on the environment. |
| b | Students identify limitations of the use of technologies employed by the solution.                          |