

## HS-ETS1-1

Students who demonstrate understanding can:

**HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.**

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

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p><b>Asking Questions and Defining Problems</b> Asking questions and defining problems in 9–12 builds on K–8 experiences and progresses to formulating, refining, and evaluating empirically testable questions and design problems using models and simulations.</p> <ul style="list-style-type: none"> <li>Analyze complex real-world problems by specifying criteria and constraints for successful solutions.</li> </ul>	<p><b>ETS1.A: Defining and Delimiting Engineering Problems</b></p> <ul style="list-style-type: none"> <li>Criteria and constraints also include satisfying any requirements set by society, such as taking issues of risk mitigation into account, and they should be quantified to the extent possible and stated in such a way that one can tell if a given design meets them.</li> <li>Humanity faces major global challenges today, such as the need for supplies of clean water and food or for energy sources that minimize pollution, which can be addressed through engineering. These global challenges also may have manifestations in local communities.</li> </ul>	<p style="text-align: center;">----- <b>Connections to Engineering, Technology, and Applications of Science</b> -----</p> <p><b>Influence of Science, Engineering, and Technology on Society and the Natural World</b></p> <ul style="list-style-type: none"> <li>New technologies can have deep impacts on society and the environment, including some that were not anticipated. Analysis of costs and benefits is a critical aspect of decisions about technology.</li> </ul>

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

1	Identifying the problem to be solved	
	a	Students analyze a major global problem. In their analysis, students:
		i. Describe the challenge with a rationale for why it is a major global challenge;
		ii. Describe, qualitatively and quantitatively, the extent and depth of the problem and its major consequences to society and/or the natural world on both global and local scales if it remains unsolved; and
	iii. Document background research on the problem from two or more sources, including research journals.	
2	Defining the process or system boundaries, and the components of the process or system	
	a	In their analysis, students identify the physical system in which the problem is embedded, including the major elements and relationships in the system and boundaries so as to clarify what is and is not part of the problem.
	b	In their analysis, students describe societal needs and wants that are relative to the problem (e.g., for controlling CO <sub>2</sub> emissions, societal needs include the need for cheap energy).
3	Defining the criteria and constraints	
	a	Students specify qualitative and quantitative criteria and constraints for acceptable solutions to the problem.