MS EARTH AND SPACE SCIENCE: NATURAL HAZARDS

Introduction:

This task asks students to help city leaders develop an emergency plan for natural hazards by showing them how data can be used to inform such a plan. Throughout the task, students are asked to analyze and interpret different sets of data, drawing on multiple sets of data to make claims.

This task is intended to be used as a classroom-based performance assessment that can monitor progress toward MS-ESS3-2, and is independent of any specific curriculum or instructional materials.

STANDARDS:

This task is intended to assess the NGSS PE:

MS-ESS3-2: Analyze and interpret data on natural hazards to forecast future catastrophic events and inform the development of technologies to mitigate their effects.

ANNOTATION KEY

EQUITY
Supporting a wide range of diverse students.

SCENARIOS
Information provided to elicit performances.

SEPs
Opportunities to demonstrate science and engineering practices.

DCIs
Opportunities to demonstrate understanding of disciplinary core ideas.

CCCs
Opportunities to demonstrate understanding of crosscutting concepts.

SENSE-MAKING
Opportunities for reasoning about phenomena and problems.

ASSESSMENT PURPOSE
Highlights how the task features connect to intended assessment use.

✓ STRENGTHS

The **scenario is tied to a real-world situation** that might engage the targeted SEPs, DCIs, and CCCs. ▬ ▬ ▬ ▬

The task **includes several supports** to help students work their way through the task. ▬

The task includes **opportunities for students to make meaningful decisions** throughout the task—including which hazards to target, which data to use, and what critiques to offer—that can help support students' confidence and scientific agency. ▬

Students are asked to **analyze and interpret data across multiple graphs,** requiring a MS-appropriate sophistication of the SEP Analyzing and Interpreting Data. ▬

The **scoring guidance makes clear connections between the assessment target, the target of the specific question, and expected student responses, including connections to specific SEPs, CCCs, and DCIs as well as their use together.** ▬

Questions in the **task clearly focus on meaningful student sense-making with the potential for using multiple dimensions**—for example, Question 4 is a strong question requires that students to deeply consider the information provided in light of their own ideas about natural hazard preparation and prevention, providing an opportunity to integrate multiple dimensions while also supporting student agency in science. ▬

❗ OPPORTUNITIES FOR IMPROVEMENT

The **task scenario is not grounded in a specific phenomenon or problem**. While there is a specific driver—the need for an emergency plan for a natural hazard—the lack of city-specific information (geography, occurrences of natural hazards in the city, environmental changes, etc) that helps students identify why the plan needs to be created limits both student engagement as well as student demonstration of appropriate DCIs, CCCs, and SEPs. ▬ ▬ ▬ ▬

The **task provides students the opportunity to practice and develop the DCI, but does not assess the DCI--in other words, the task does not surface whether students understand and can use the DCI**. While Question 4 has potential, neither the task nor the scoring guides require student understanding of the DCIs. The targeted DCI emphasizes that students demonstrate that they understand that mapping events specific to a geographic location can be used in forecasting; students do not need to bring this understanding to the table for several reasons: ▬

- The task asks students to make decisions based on national data, not local data, limiting to degree to which students can forecast.

- The task provides students with information and carefully guides them through connecting trends in natural hazards to recommendations for the city—this means that students can respond simply by following prompts, even if they do not understand the DCI.

- The "content" students need to know are facts about identified natural hazards, which are not part of NGSS DCIs.

How does this task support all students?

✓ This task provides commendable supports for **engaging student ideas as part of an assessment task.** For example, Questions 2 and 3 provide students with the opportunity to choose a hazard that they are most interested in or connect with most readily, and Question 4 provides students with the opportunity to use their ideas about what data would be needed to create a good plan. These are features that are commonly backgrounded in assessment tasks—their foregrounding here provides a model for how assessment tasks can 1) better engage all students, 2) emphasize student agency in science as an important target for teaching and learning, and 3) better mimic the kinds of decisions and activities that students need to pursue in the real-world.

❗ The task's lack of a specific phenomenon, problem, or city-specific information may **limit how well students understand and respond to the task**. Additionally, some questions in this task are overly supported (e.g., sample answer in Question 2), which can limit how well students engage with those questions.

What are the major takeaways?

📝 SUMMARY POINTS:

• Overall, this task is a unique example of an assessment task that <u>supports all learners</u> by foregrounding student decision-making and ideas as a meaningful part of a task that elicits sense-making with the targeted dimensions.

• The task emphasizes appropriately-sophisticated demonstrations of the <u>SEP</u> analyzing and interpreting data, and asks students to connect the provided data to multiple claims and conclusions.

• The task does not meaningfully require students to bring their understanding of a DCI to the table.

🛠 SUGGESTED IMPROVEMENTS

1. The <u>task scenario</u> could be grounded in a specific city context—this could be accomplished by providing students with data about a particular city to drive the task, or asking students to acquire that data (note that the latter would both expand the timing and scope of the task, including adding additional SEP expectations). This would serve multiple purposes: it would make the task more relevant, understandable and engaging; and depending on the information provided, it might better engage the targeted DCI.

2. The task scenario could be modified to require students use the <u>CCC</u> targeted. In question 1, students are asked to describe patterns in the graphs; however, they did not need to understand that graphs can be used to identify patterns. One way to require the CCC would be to provide students with raw data and ask them to choose or make a claim about which hazards the city council should prioritize in their city plan. Responding to a question/prompt like this would require that students 1) understand that they need to create a graph to identify patterns (CCC) and 2) use patterns of past hazard activity to make a prediction about the most likely hazards to strike the region again (DCI).

3. The task could be less dependent on prior knowledge related to specific natural hazards. For example, Questions 3 and 5 are currently dependent on knowledge of specific natural hazards (not required by the standards, although could have been part of instruction). These questions could be modified by expanding the scenario information provided to give students more context about specific hazards, or expanding the task to involve obtaining/evaluating information about the specific features of different natural hazards.

4. Some of the more limiting supports (sample answers) could be removed, and replaced with scaffolds that help students understand what to include in their response without providing an exact template.

How should this task be used?

To be used as intended—to assess MS.ESS3.2—the recommended improvements (above) should be incorporated. Alternatively, this task could be used as part of an instructional sequence focused on natural hazards, during which students are investigating different hazards and developing an understanding of how geologic forces may give rise to catastrophic events. If used as part of an instructional sequence, this task might provide particularly useful focus on student thinking using the SEPs—and with appropriate modifications, the DCIs and CCCs as well.