Zoe's Mission: Protecting Earth From Space

Grade 6 science space-explorers

Students will be able to analyze human impacts on Earth's systems and evaluate solutions to reduce negative effects.

Name: _____ Date: _____

1. Zoe is a space explorer orbiting Earth. She looks down through her telescope. She sees brown haze over a big city. What is this haze most likely called? Circle one: (A) fog (B) smog (C) ozone (D) steam

2. True or False: Zoe reads that burning fossil fuels releases carbon dioxide into the air. Carbon dioxide is a greenhouse gas. True or False?

3. Zoe scans the Amazon rainforest from her ship. She notices large brown patches where green forest used to be. What human activity most likely caused this change? Explain using one science term.

4. Zoe finds a rare find: a data crystal showing ocean temperature records. Temperatures rose steadily over 50 years. What TWO human activities most likely caused this warming trend? Name both and explain the link.

5. Zoe's ship detects a hidden treasure: an island with healthy coral reefs. Nearby, a factory drains warm water into the sea. Zoe observes the coral turning white. What is this called, and why does it happen?

6. Zoe spots two cities from orbit. City A uses solar panels and wind turbines. City B burns coal for all its energy. Zoe must write a report for Earth's leaders. Explain TWO ways City A's energy choices reduce human impact on Earth's systems. Use evidence and science vocabulary.

7. Zoe discovers a unique item in the ship's archive: before-and-after satellite images of the Aral Sea. In 1960 it was one of Earth's largest lakes. By 2000 it had shrunk by 90%. Zoe reads that farmers diverted its rivers for irrigation. Identify the human impact, then explain TWO negative effects this caused on local ecosystems and people.

8. Zoe completes her mission. She must present one evidence-based solution to Earth's leaders that reduces a specific human impact on Earth's systems. Choose ONE real human impact from this mission. Name it, explain how it damages Earth's systems, then describe ONE specific solution. Explain why your solution works using science. End with: what will Earth look like if the solution succeeds?

Answer Key: Zoe's Mission: Protecting Earth From Space

GRADE 6 | TEACHER & PARENT USE ONLY

Before Q6, pause and ask students which solution Zoe should recommend to Earth's leaders. This mirrors the NGSS.MS-ESS3-3 design-solution skill and gives students ownership of the mission's outcome.

1. Zoe is a space explorer orbiting Earth. She looks down through her telescope. She sees brown haze over a big city. What is this haze most likely called? Circle one: (A) fog (B) smog (C) ozone (D) steam

Answer: Q1: Brown haze over cities is caused by vehicle exhaust and factory smoke. These mix with sunlight to form smog. Answer: (B) smog

2. True or False: Zoe reads that burning fossil fuels releases carbon dioxide into the air. Carbon dioxide is a greenhouse gas. True or False?

Answer: Q2: Burning fossil fuels such as coal and oil releases carbon dioxide (CO_2). CO_2 traps heat in the atmosphere. It is a greenhouse gas. Answer: TRUE

3. Zoe scans the Amazon rainforest from her ship. She notices large brown patches where green forest used to be. What human activity most likely caused this change? Explain using one science term.

Answer: Q3: The brown patches show where trees have been cut down. This is called deforestation. Humans clear forests for farming or logging. Deforestation reduces habitats and releases stored carbon into the atmosphere. Answer: Deforestation — humans cut down trees, destroying habitats and releasing carbon dioxide.

4. Zoe finds a rare find: a data crystal showing ocean temperature records. Temperatures rose steadily over 50 years. What TWO human activities most likely caused this warming trend? Name both and explain the link.

Answer: Q4: Step 1 — identify human activities that raise global temperatures. Step 2 — burning fossil fuels releases CO_2, which traps heat (greenhouse effect). Step 3 — deforestation removes trees that absorb CO_2, so more heat is trapped. Both activities increase greenhouse gases, raising ocean temperatures over time. Answer: (1) Burning fossil fuels and (2) deforestation — both increase CO_2, strengthening the greenhouse effect and warming oceans.

5. Zoe's ship detects a hidden treasure: an island with healthy coral reefs. Nearby, a factory drains warm water into the sea. Zoe observes the coral turning white. What is this called, and why does it happen?

Answer: Q5: Step 1 — when water gets too warm, coral expels the algae living inside it. Step 2 — without algae, coral loses its color and food source. Step 3 — this process is called coral bleaching. Answer: Coral bleaching — warmer water from the factory stresses the coral, causing it to expel its algae and turn white. Without algae the coral can starve and die.

6. Zoe spots two cities from orbit. City A uses solar panels and wind turbines. City B burns coal for all its energy. Zoe must write a report for Earth's leaders. Explain TWO ways City A's energy choices reduce human impact on Earth's systems. Use evidence and science vocabulary.

Answer: Q6: Step 1 — solar panels capture sunlight; wind turbines use moving air. Neither source burns fuel. Step 2 — no burning means no CO_2 or other greenhouse gases released. This slows the greenhouse effect and reduces climate change. Step 3 — no burning also means no sulfur dioxide or nitrogen oxide released, so acid rain risk drops. This protects soil and water systems. Answer: (1) Renewable energy produces no CO_2, slowing the greenhouse effect and climate change. (2) No combustion means no acid rain pollutants, protecting soil and freshwater ecosystems. City A's choices reduce human impact on atmosphere and water systems.

7. Zoe discovers a unique item in the ship's archive: before-and-after satellite images of the Aral Sea. In 1960 it was one of Earth's largest lakes. By 2000 it had shrunk by 90%. Zoe reads that farmers diverted its rivers for irrigation. Identify the human impact, then explain TWO negative effects this caused on local ecosystems and people.

Answer: Q7: Step 1 — human impact: diverting river water for irrigation removed the water supply feeding the Aral Sea. Step 2 — effect on ecosystem: the sea shrank, salinity (salt concentration) rose sharply. Fish could not survive in the saltier water. Fish populations collapsed, destroying the fishing industry. Step 3 — effect on people: fishing communities lost their livelihoods. Exposed dry lakebed released salt and pesticide dust, causing respiratory illness in nearby towns. Step 4 — this shows how one human water-use decision can damage both ecosystems and human communities at the same time. Answer: Human impact = river diversion for irrigation. Effect 1: Rising salinity killed fish, collapsing the local ecosystem and fishing industry. Effect 2: Exposed lakebed released toxic dust, harming the health of nearby human communities.

8. Zoe completes her mission. She must present one evidence-based solution to Earth's leaders that reduces a specific human impact on Earth's systems. Choose ONE real human impact from this mission. Name it, explain how it damages Earth's systems, then describe ONE specific solution. Explain why your solution works using science. End with: what will Earth look like if the solution succeeds?

Answer: Q8 — Full model answer: Chosen impact: Burning fossil fuels for energy. How it damages Earth's systems: Burning coal and oil releases carbon dioxide. CO_2 builds up in the atmosphere and traps solar heat (greenhouse effect). This raises global temperatures, melts ice caps, raises sea levels, and shifts weather patterns — damaging both land and ocean ecosystems. Chosen solution: Transition cities to solar and wind energy (renewable energy sources). Why the solution works: Solar panels convert sunlight directly into electricity. Wind turbines convert kinetic energy of moving air into electricity. Neither process burns fuel, so no CO_2 is released. Atmospheric CO_2 levels stop rising. Over decades, natural processes (plant photosynthesis and ocean absorption) slowly reduce existing CO_2. The greenhouse effect weakens. What Earth will look like if the solution succeeds: Global temperatures stabilize. Ice caps stop melting, slowing sea-level rise. Coral reefs face less thermal stress and begin recovering. Extreme weather events become less frequent. Zoe closes her mission log: Earth's systems are resilient — given the chance, they can heal. Answer: Burning fossil fuels raises CO_2 and triggers the greenhouse effect, warming Earth's systems. Switching to solar and wind energy stops new CO_2 emissions. Over time, atmospheric CO_2 levels fall, temperatures stabilize, and damaged ecosystems begin to recover. Zoe's mission is complete — she has delivered a science-based plan to protect Earth.