



## 2017 Collaborative Question Instructions

For the Collaborative Question (CQ) you have about 45 minutes:

- ✓ 5 minutes for introductions, writing down student names on the white board and listening to the CQ read out loud.
- ✓ 5 minutes for students to reread the CQ to themselves, structure thoughts and begin thinking about the issues.
- ✓ 20 - 25 minutes for students to discuss the issues and collaborate on their chosen direction, and plan a short presentation of their recommendations.
- ✓ 10 - 15 minutes for the actual presentation and Q&A. Tell the judges about your discussion, respond to the question below.
  - It is important to hear everyone's perspective and for all to participate.
  - Your individual participation counts toward the score of your school team.

### Background:

In 2016 the small Alaskan town of Newtok made history as the first town to ever ask the US Federal Government to declare it an “*impending* disaster zone”. All other requests for federal assistance due to natural disasters have been made *after* the area has already suffered significant damage. Newtok is built upon land frozen in place by permafrost, but as the climate continues to warm, the permafrost underneath this 450-person village is thawing. The town is losing an average of 70 feet per year as it thaws and slips beneath the banks of the nearby Ninglick River. Newtok has already lost its barge landing, sewage lagoon, and landfill to this great thaw, and they predict they will lose their drinking water in early 2017 as sewage spills over the expanding river and into their water sources. The Newtok airport and school are expected to be underwater by 2018 if nothing is done to save them. The town’s unprecedented request to be declared a disaster zone was made in order to receive Federal Emergency Management Agency (FEMA) funding to move the town 9 miles inland. (The price tag for moving the entire village is estimated to be between \$80 and \$130 million). Unfortunately for Newtok, their request was denied in January of 2017<sup>1</sup>. The people are now faced with the dilemma of how to fortify their town against the sinking land, or to abandon it entirely.

### Into the future:

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<sup>1</sup> Waldholz, R. (2017, January 18). Obama denies Newtok’s request for disaster declaration. Retrieved: <http://www.alaskapublic.org/2017/01/18/obama-denies-newtoks-request-for-disaster-declaration/>

The year is now 2050. Newtok, Alaska was the first of many small towns and villages that have disappeared or been relocated due to rising sea levels resulting from climate change. As the geography of the world has changed, so has the distribution of the population. Inhabitants of these lost towns have had to move toward cities as the planet's climate warmed. As a result, cities are now exponentially larger than they were in 2017 when Newtok was denied its request for government aid.

One of these now-enormous cities is Miami, Florida with a population of nearly 3.8 million people. Miami is now threatened by rising sea levels which are predicted to swallow the land where Miami sits, as well as much of the surrounding area. Like Newtok in 2017, now Miami's city officials must determine how to keep its citizens safe and the city functioning.

**CQ Task:**

You are members of the Miami local government faced with the task of protecting your city and its citizens. Consider the following list and decide which three categories of services are of greatest priority to protect and invest in as Miami loses land to the rising ocean. Support your choices with reasoning and rationale as you present your proposal to the Federal Government for assistance.

- a. **Agriculture** - Agriculture describes the practice of farming foods, both plant and animal, for human and animal consumption. It also includes the supply chain of goods and services from farms to grocery stores to consumers.
- b. **Water and sanitation** - Water and sanitation services include the distribution and cleaning of safe water and waste for human, animal, and plant needs. They also facilitate the safe disposal of solid waste.
- c. **Education** - In the United States, public education is free and compulsory for children between 6 and 16 - 18 years old, depending on the state. Most districts in the US have public and private schools, and some have charter/independent schools as well.
- d. **Trade/Commerce** - Services include the buying and selling of goods and services. Like agriculture, trade and commerce also affect the chain of goods and services, and getting them from their origins to consumers, both privately and through stores.
- e. **Climate/Environment** - Climate and environmental services include legislation to protect natural lands. They may also include the creation of state or federally protected lands, and management of those lands.
- f. **Transportation** - Transportation in a city is both public and private, and includes management of personal cars as well as metropolitan transit system. Transportation also includes the creation and maintenance of roads and traffic systems.
- g. **Energy/Utilities** - Energy and utilities provide reliable and safe electricity, heat, and fuel to homes and building and other public places.

- h. **Infrastructure** - Infrastructure refers to the systems, structures, and facilities that help to maintain a city's function (ie internet, communication into and out of the city and amongst its citizens, provides a way for systems like water, transportation, education, and other similar organizations to communicate and work together.)
- i. **Healthcare** - All cities offer forms of healthcare, both public and private. Hospitals and doctors' offices treat patients with medical needs and provide emergency medical care.
- j. **Anthropology/Community** - This includes religious institutes, cultural centers, museums, zoos, galleries, and all spaces and events meant to celebrate and connect individual and group identities.

#### Rationale for climate change:

The United Nations Decades of Education for Sustainable Development has made repeated calls for climate change education across the globe in many countries, including many parts of the United States. The UN has begun to explicitly teach the causes and effects of climate change (Wu & Lee, 2015) and to encourage schools worldwide to do the same. Some entities even argue that climate change education and climate justice are *fundamental rights*, and as such should be added to the Convention on the Rights of the Child (Gibbons, 2014). Climate change will be at the center of many future issues as humans expand their population and their impact.

The Earth is warming, and climates are changing. It is acknowledged and possible that some local climates may warm while others cool, but global climates are, in fact, shifting. With this change come increasing numbers of extreme and devastating weather events, such as Hurricane Sandy. (Solecki & Rosenzweig, 2014). Sadly, these changes are caused in part by human processes (Cai et al., 2014).

Teachers should get a copy with all of the references listed (as it was before.)

The Next Generation Science Standards (NGSS), the first national set of science standards, explicitly address climate change as reflected in MS-ESS3, Earth and Human Activity (Hestness, McDonald, Breslyn, McGinnis, & Mouza, 2014). The inclusion of climate change education in the NGSS framework indicates how essential this information is to a holistic science education.

Gibbons, E. D. (2014). Climate Change, Children's Rights, and the Pursuit of Intergenerational Climate Justice. *Health and human rights*, 16(1), 19-31.

Hestness, E., McDonald, R. C., Breslyn, W., McGinnis, J. R., & Mouza, C. (2014). Science teacher professional development in climate change education informed by the Next Generation Science Standards. *Journal of Geoscience Education*, 62(3), 319-329.

Solecki, W., & Rosenzweig, C. (2014). Climate change, extreme events, and Hurricane Sandy: From non-stationary climate to non-stationary policy. *Journal of Extreme Events*, 1(01), 1450008.

Wu, J. S., & Lee, J. J. (2015). Climate change games as tools for education and engagement. *Nature Climate Change*, 5(5), 413-418.

## NGSS Climate Change Standards

### Middle School

<p><b>MS-E SS3-3</b></p>	<p><b>Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.</b>*[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).]</p>
<p><b>MS-E SS3-4</b></p>	<p><b>Construct an argument supported by evidence for how increases in human population and per-capita consumption of natural resources impact Earth's systems.</b> [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.]</p>

MS-E SS3-5	<p><b>Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.</b>[Clarification Statement: Examples of factors include human activities (such as fossil fuel combustion, cement production, and agricultural activity) and natural processes (such as changes in incoming solar radiation or volcanic activity). Examples of evidence can include tables, graphs, and maps of global and regional temperatures, atmospheric levels of gases such as carbon dioxide and methane, and the rates of human activities. Emphasis is on the major role that human activities play in causing the rise in global temperatures.]</p>
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### High School

HS-ESS3-3.	<p><b>Create a computational simulation to illustrate the relationships among management of natural resources, the sustainability of human populations, and biodiversity.</b> [Clarification Statement: Examples of factors that affect the management of natural resources include costs of resource extraction and waste management, per-capita consumption, and the development of new technologies. Examples of factors that affect human sustainability include agricultural efficiency, levels of conservation, and urban planning.] [Assessment Boundary: Assessment for computational simulations is limited to using provided multi-parameter programs or constructing simplified spreadsheet calculations.]</p>
HS-ESS3-4.	<p><b>Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.*</b> [Clarification Statement: Examples of data on the impacts of human activities could include the quantities and types of pollutants released, changes to biomass and species diversity, or areal changes in land surface use (such as for urban development, agriculture and livestock, or surface mining). Examples for limiting future impacts could range from local efforts (such as reducing, reusing, and recycling resources) to large-scale geoengineering design solutions (such as altering global temperatures by making large changes to the atmosphere or ocean).]</p>
HS-ESS3-5.	<p><b>Analyze geoscience data and the results from global climate models to make an evidence-based forecast of the current rate of global or regional climate change and associated future impacts to Earth systems.</b> [Clarification Statement: Examples of evidence, for both data and climate model outputs, are for climate changes (such as precipitation and temperature) and their associated impacts (such as on sea level, glacial ice volumes, or atmosphere and ocean composition).] [Assessment Boundary: Assessment is limited to one example of a climate change and its associated impacts.]</p>
HS-ESS3-6.	<p><b>Use a computational representation to illustrate the relationships among Earth systems and how those relationships are being modified due to human activity.</b> [Clarification Statement: Examples of Earth systems to be considered are the hydrosphere, atmosphere, cryosphere, geosphere, and/or biosphere. An example of the far-reaching impacts from a human activity is how an increase in atmospheric carbon dioxide results in an increase in photosynthetic biomass on land and an increase in ocean acidification, with resulting impacts on sea organism health and marine populations.] [Assessment Boundary: Assessment does not include running computational representations but is limited to using the published results of scientific computational models.]</p>

