Activity 2.2: Investigating the Issue

Introduction to the Issue

Due to extreme weather events such as hurricanes, policy makers and private citizens—among others—wonder about the viability of spending billions of dollars of private and public money to rebuild coastal communities. For instance, Hurricane Sandy, which is anticipated to be the second costliest natural disaster, is estimated to cost at least $50 billion. This kind of weather event is hypothesized to be linked to climate change. To address the issue, the goal for this investigation is for you to write an evidence-based position paper that responds to the problem below.

Problem: To what extent should we build and/or rebuild coastal communities?

Position Paper Criteria:

Write a 500- to 1000-word position paper that . . .

- Makes an argument and supports the argument with reasons and evidence.
- Demonstrates organization and use of transitions to clarify relationships among ideas.
- Demonstrates use of a formal style and standard English.

General Procedures:

In groups of 2–3, follow the steps below (step 1, 2, 3 . . .) to collect, organize, and analyze geoscience climate data and forecast models. This data is the evidence for your position paper. In addition, read the most recent scientific report from the Intergovernmental Panel on Climate Change (IPCC). This research is additional evidence for your position paper.

Step 1: Select a Study Area

In groups, select a coastal community study area. You may choose from the list below or choose a different study area (e.g. Boston). Every group must select a different study area.

▶ Show coastal community study area

Step 2: Research the Study Area

Use Google Earth and the Internet to describe the study area. You may divide the task from the list of guiding questions below. Record the group's findings in Table 2: Investigating the Problem.

- *Google Earth:* How densely developed is your area? Describe the topography (use 3D mode to see the relief, and hold the mouse over an area to show the

elevation). What is the length of the shoreline? (You can measure this using the distance tool.) Has the urban area changed over time? (You can use the historical imagery tool.) Alternatively, you can also use the National Map Viewer in lieu of Google Earth.You can refer to the resources below if you need help using Google Earth.

- *Web***:** What is the population? Demographics? Urbanization? How has this changed over time? What is the economic output of the region?

Step 3: Research Geoscience Data

Record a summary of the CO_2 and temperature trends from Table 1: The Issue into Table 2: Investigating the Problem. Include the temperature data from your study area, too. Then, divide Data Set 1, 2 and 3 (see below) among the group members. For each data set, read the "Data Collection Procedures" and "Guided Analysis Questions" for assistance.

After you collect the data, construct a graph for each data set. Record the summaries and analyses of the data in Table 2.

Note:If you are unfamiliar with Google Earth, KML/KMZ files, or MS Excel graphing, you might want to use the Data Analysis Resources at the end of this handout. Ask your instructor for guidance, too.

- Data Set 1: Sea Level Trends (KMZ File 23kB Aug5 14)

▶ Show instructions for working with the data

- Data Set 2: Greenland Ice Sheet Trends (KMZ File 247kB Aug5 14)

▶ Show instructions for working with the data

- Data Set 3: Intensity of Tropical Cyclones (Excel 21kB Aug5 14)

▶ Show instructions for working with the data

Step 4: Research Geoscience Forecast Models *(optional—ask your instructor)*

Analyze the forecast models from the National Center for Atmospheric Research (NCAR) Community Climate System Model. Use the air temperature anomaly models from various "scenarios" (e.g. low/ high CO_2 emissions). Examine the US data and global data. Record your findings in Table 2.

Also, analyze the sea level change model from United States Geological Survey (USGS) Sea Level Rise Animations from the Center of Excellence for Geospatial Thinking. It is best to click onto the state (e.g. CT, NY, FL) that you are investigating. Record your findings in Table 2.

Step 5: Construct Initial Working Hypotheses

As a group, create a list of three or more "initial working hypotheses" that respond to the problem: *To what extent are coastal communities at risk due to climate change?* Record these initial hypotheses in Table 2. Consider the following questions when constructing your initial working hypotheses:

1. What data sets (e.g. intensity of hurricanes) or products (forecast models) correlate or link to one another?
2. Do certain data sets/products seem to affect others (e.g. feedback loops)? To what extent?
3. How robust are these correlations, links, and feedback loops? What is the level of certainty?
4. How might the working hypotheses predict the future of climate change for your community?

Step 6: Research the Literature

Read the Intergovernmental Panel on Climate Change (IPCC) report titled: *Summary for Policy Makers*. You may divide the task among/between your group members. If you divide the task, you must teach what you learned to your teammates. Record all summaries in Table 2.

- IPCC Summary for Policy Makers
- Learn more about the IPCC

If you would like to find out more about how to address the problem, *"To what extent should we build and/or rebuild coastal communities?*" these additional resources will go into greater depth in each area:

▶ Show optional resources about climate change and tropical cyclone intensity
▶ Show optional resources for the cost of rebuilding

Step 7: Construct a Climate Change Concept Map (Model) of Your Study Area

With your study area group, construct a concept map on poster paper with the evidence collected. This map must have links that depict the relationships (e.g. feedback loops) among the parts of the climate system as well as the human-built system (e.g. coastal communities).

Construction Procedures

1. Based on what you have learned thus far, create a list of as many concepts that you can think of. Consider the following questions. *Note: You may record these concepts on Post-its.*
    - What concepts correlate or link with one another?
    - Do certain concepts seem to affect other concepts (e.g. feedback loops)? To what extent?

- How robust are these correlations, links, and feedback loops? What is the level of certainty?
- How might the working hypotheses predict the future of climate change from your community?

2. From the list of concepts, organize and group related concepts.
3. Connect related concepts using lines with arrows that show a direct relationship.
4. Label each line with words or short phrases that describe the relationship between two or more concepts (e.g. how one concept affects another concept).

Evaluation Procedures

1. Examine the "lines" and "arrows" that link the concepts to make sure they are valid.
2. Rearrange and remove concepts to simplify the concept map.
3. When you are satisfied with your concept map, make sure it is neat and clear.

Step 8: Feedback from Peers

Post your group's concept map. Each study area group will then evaluate the concept maps of other groups. Record what you "agree" with as well as what you "question" on Post-it notes and place them on the concept map.

After all of the group evaluations are complete, review the comments from your concept map. Record what others from the class agreed with as well as the questions others had about your concept map. Based on this feedback, make final revisions to your concept map.

Step 9: Revise the Working Hypotheses and Make Claims

Reexamine the "initial working hypotheses" from Table 2. In light of the new evidence, create a list of three or more revised hypotheses based on your concept map that provide evidence to answer the problem: *To what extent should we build and/or rebuild coastal communities?*

Finally, cite a claim that you wish to state—based on your revised working hypotheses—that clearly answers the problem. Record this in the last row of Table 2.

Assessment for Activity 2.2: I used to think . . . but now I know

Create a T-chart. On the left-hand side, write "I used to think" and on the right-hand side, write "but now I know." Complete the chart based on what you have learned thus far.