

Coral reefs, climate change, and the impacts on human populations

Duration:

1 class

Objectives:

Students will:

- Examine world maps of population and coral reef locations
- Estimate the number of people worldwide that may be affected by declining corals

Vocabulary:

Coral bleaching

In overly warm waters corals lose their symbiotic algae cells, zooanthellae, over the long term this leads to coral death

PLO's:

Science 6, 7, 8
Social Studies 6, 7, 8
Math 6, 7, 8

Background:

For this activity students will use maps to estimate how the human population may be affected by the decline of corals reefs worldwide due to climate change. This is a good activity to use at any point in a climate change unit after the introduction has been done. It can be used in conjunction with the *Acidic Oceans* and *Plankton* lesson plans to expand on how pH change impacts the oceans.

With climate change altering both the pH levels and the temperature of the world's oceans, coral reefs have been identified as the marine ecosystem that will be most negatively impacted. Coral reefs depend on warm waters, sunshine, and good water conditions to grow and build their calcium carbonate skeletons. In a world where climate change is rapidly changing ocean chemistry coral reefs are increasingly threatened. Currently, 30% of the world's corals are in a degraded state and an estimated 60% will be compromised by the year 2030.

Aesthetically pleasing and teeming with life, coral reefs support local communities across

the planet as vital fishing grounds. Along the eastern coast of Africa the fishing industry employs over 100,000 people. With reefs in decline, more than half of the workers may lose their livelihood. Reefs also support tourist industries in many countries such as the Maldives in the Indian Ocean, where 45% of the country's economy is based on tourist activities such as diving. The degradation of coral reefs will have impacts on ecosystems and people worldwide.

Materials:

- *Ocean News* article *Coral Reefs*
- Copies of human population map handouts
- Overhead of reef locations
- Atlases
- Calculators
- Pencils and paper

Procedure:

1. On the overhead place the image of Coral reef locations in the world.
2. Ask the students to Think, Pair, Share about how humans use and benefit from coral reefs. Fish habitat, fisheries, oxygen production, protection from coastal erosion, tourism industry, etc.

3. Ask the students to estimate the number of people worldwide they believe will be affected by coral reefs loss due to climate change. Have them record their answer in their notebooks.
4. Read the *Ocean News* article *Coral Reefs* together as a group or individually.
5. Ask the students to list and explain the ways in which coral reefs will be affected by climate change.
6. Distribute the maps showing the world population, the atlases, and the map showing the locations of coral reefs.
7. Using the reef map and the atlases have the students create a list of the countries where coral reefs are located. This will take some cross-referencing as the coral reef distribution map has no names. A world map showing political boundaries from the atlas should be used for country identification.
8. On the board have the students create a list of the countries that should be included by having the students write them up as they find them, or by going around the class and having each student contribute at least one. There should be more than enough countries in the list for the entire class to contribute at least one, if not several. Ask students to confirm the list and come to a consensus with class discussion.
9. Have the students add the populations of these countries to their lists using the atlases. These are the populations that will be affected by coral reefs loss.
10. Ask the students what is wrong with the estimate (they should recognize that not everyone in the country lives on the coast). Taking into consideration how many ways humans depend on coral reefs ask how they might estimate the amount of the population that does live on the coast. Small countries everyone is near the coast, large countries many people may be hundreds of kilometers from the coast. Some may argue that we are all affected by the coral reef, which is definitely a viable argument. Estimates say about 40% of the world's population live on the coast.
11. Come to some consensus about how to estimate the population of each country dependant on coral reefs. This could be half of the population, or a quarter because size of the country, or level of development. Something straight forward and easy to calculate is best as the numbers will be in the millions regardless, and the point is to show that LOTS of people will be affected.
12. Alternatively, if there are many good ideas have the class use different methods to estimate the amount of the countries populations affected and compare the numbers at the end.
13. Using the agreed upon methodology for population estimates for each coral reef country calculate how many people in each country will be impacted.
14. Add all the country populations that will be impacted together to get a final number. This is your world population that will be affected.
15. Have the students compare their estimates to their original guesses. How close were they? What factors did they not think about when doing their original estimate?
16. Compare this final number to the population of Canada (33 million as of July 2007). Is it more or less people than are living in this country?
17. If time permits you can finish the class with reading the article *The Impacts of Climate Change* (see resource section) and wrap up the activity.

Discussion:

- How does climate change impact coral reef ecosystems?
- How does the degradation of coral reefs impact humans?
- How do humans impact coral reefs?

- Why will coral reefs not simply shift northward with the cooler waters?
- How do Marine Protected Areas help protect the corals reefs from climate change?

Extension and Resources:

- For maps of the human population distribution on earth see antwrp.gsfc.nasa.gov/apod/ap030305.html or http://en.wikipedia.org/wiki/Image:World_population.PNG
- For a map of the distribution of coral reefs see http://en.wikipedia.org/wiki/Coral_reef
- For a current list of country populations see http://en.wikipedia.org/wiki/List_of_countries_by_population
- Another layer could be applied to this activity by incorporating what geographical areas will mostly likely affected by climate change. Have the students research which regions of the world are most likely to be hit hardest by global warming and have them re-estimate the world's population that will be most affected.
- The Flower Garden Banks Marine Sanctuary has a great education section that has other coral activities that could be used in conjunction with this article and lesson plan. http://flowergarden.noaa.gov/document_library/ed_documents.html#teach
- A news story, The Impacts of Climate Change, discussing the impacts of climate change on coral reefs can be used as to wrap up the class and connect this topic with some others that are discussed. http://www.news24.com/News24/Technology/News/0,9294,2-13-1443_2083012,00.html