

Inconvenient Truth

Discussion Questions

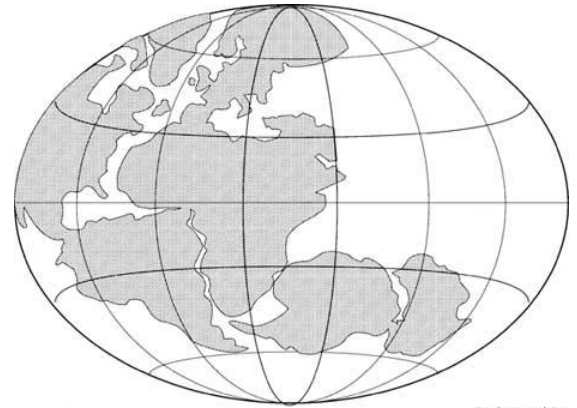
Background

1. A quote often attributed to Mark Twain states,

“What gets us into trouble is not what we don't know. It's what we know for sure that just ain't so.”

How does this relate to Pangaea and the Theory of Plate Tectonics?

The idea that the continents fit together was rejected by many for along time, as the notion of entire land masses moving was simply too unbelievable. This, of course, turned out to be true.



Tech-Graphics

2. The sun emits three main wavelengths of energy that reach the earth. Which is responsible for global warming?

- a. **Infrared**
- b. Ultraviolet
- c. Visible

3. A clip from the Futurama episode *Crimes of the Hot* is shown. At the end of the clip, global warming is “solved” by dropping larger and larger ice cubes into the ocean.

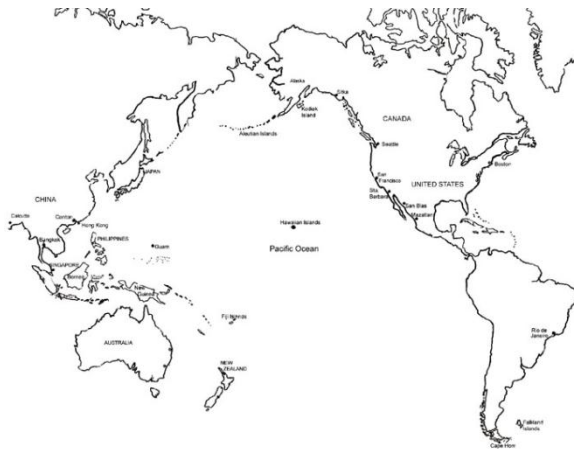
- a. How is this a metaphor for how global warming has been handled in the real world?

The problem isn't really being dealt with or given any urgency. We may be forced to come up with a last-minute solution.



- b. Assume that humanity had the technology to mine and transport large amounts of ice from other planets to the Earth. Why would this solution not actually work?

Among other problems, as the ice in the ocean melted, it would cause sea levels to rise, creating a massive amount of flooding in coastal areas.

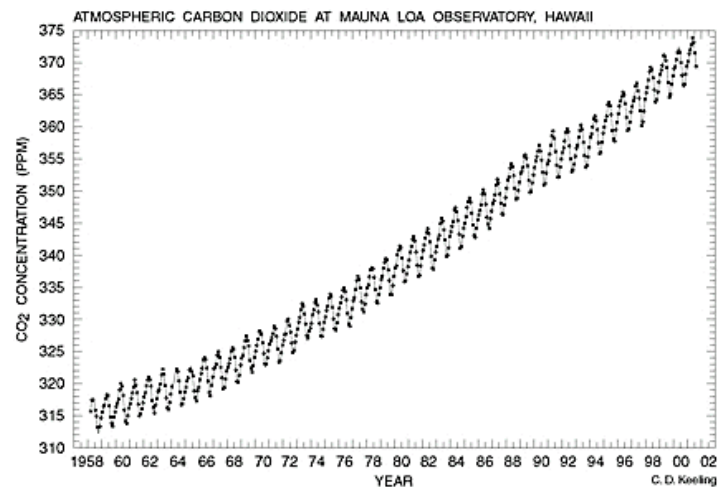


4. A scientist named Charles David Keeling began recording daily carbon dioxide levels at an observatory in Mauna Loa, Hawaii in 1958. Why was this location chosen? How would data recorded at an observatory located near a city or forest be affected?

The prevailing wind currents bring air into Hawaii from across the Pacific Ocean. This air is considered a good sampling of the atmosphere because it is well mixed, and far away from cities, which would skew towards higher CO₂ levels, and forests, which would skew towards lower CO₂ levels.

5. The carbon dioxide graph to the right is often called the “Keeling Curve”. Why do the atmospheric CO₂ levels fluctuate up and down every year?

Most of the Earth’s land mass is in the Northern Hemisphere, so when that part of the Earth is experiencing winter, many of the deciduous trees are no longer using photosynthesis – they are dormant. This causes a rise in carbon dioxide. In the summer, many more of the trees are in bloom, meaning more carbon dioxide is absorbed.



6. Al Gore shows multiple pictures of glaciers that have melted significantly over the last few decades. Special attention was given to the glaciers of the Himalaya Mountains, due to the possibility they would disappear within the next 25 years. This statement, also found in the United Nations global warming report, was later retracted because it was based on the speculation of a single scientist, not actual data. In your view, does this affect the documentary’s credibility?

This is a tough question to answer, as the statement was part of the United Nations IPCC report, which would normally be considered as credible as you can get. However, these kinds of mistakes create the perception that climate scientists are overly eager to document climate change.

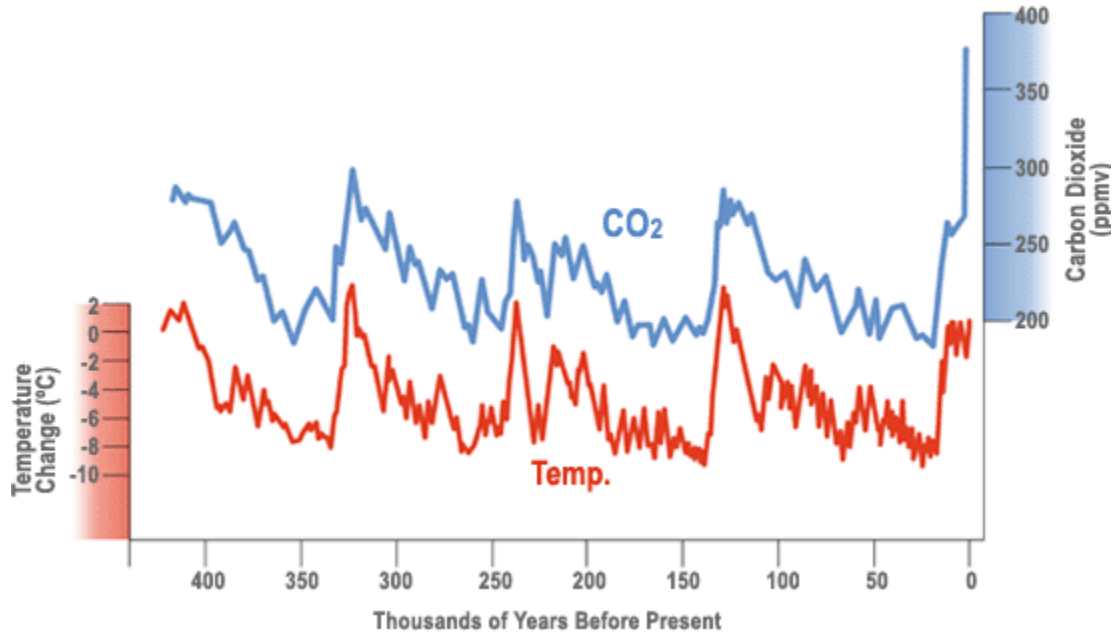
7. Ice cores are drilled and removed from the glaciers of Antarctica. The ratio of oxygen (Oxygen-16 and Oxygen-18) isotopes is measured and used to determine the approximate temperature during the time that part of the ice core was formed. This method is one example of a *proxy*. Explain what a proxy is, and why it is necessary research like this.

Proxies are indirect measurements, such as estimating the age of a tree from its rings. They are necessary in studying climate science, as written records only exist going back into the 19th century. There is no way to go back in time and directly measure older temperature and carbon dioxide levels.

8. Al Gore claims that the effects of the Clean Air Act of 1970 are visible in the Antarctic ice cores. This is actually inaccurate, as the effects are only visible from ice cores taken from the Arctic. Regardless, does this claim relate in any way to carbon dioxide pollution? Explain.

No. Carbon dioxide is not visible. Anything that is visually apparent from ice cores is the result of a reduction in visible pollutants, such as particulates or sulfur dioxide.

9. This is the graph of carbon dioxide concentration and surface temperature as recorded from ice core data.



Is the relationship between CO₂ and temperature a *direct* one? What would be a reasonable conclusion to draw from this graph?

The relationship is not exactly direct. The patterns are very similar and suggest some kind of correlation, but there are some other variables in play as well. Look at the part of the graph farthest on the right – carbon dioxide levels have spiked, but temperatures have not increased as quickly.

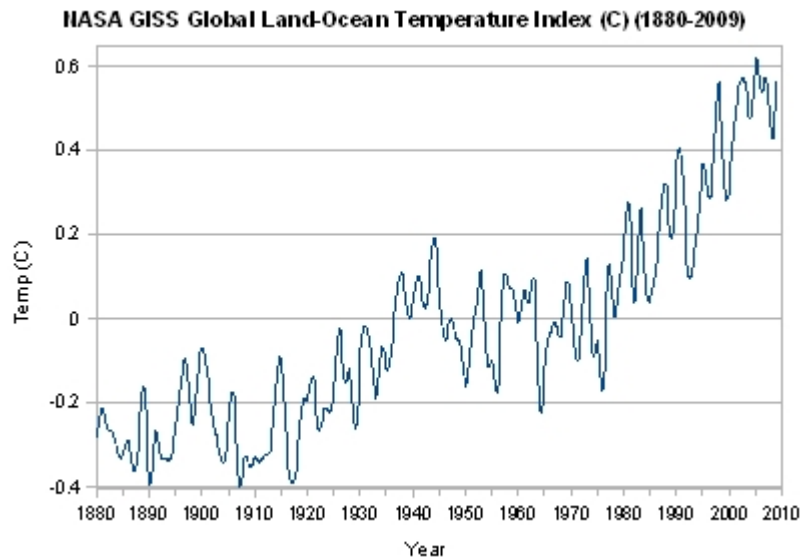
10. As a conclusion to this segment, Al Gore makes the following statement:

“This is really not a political issue so much as a moral issue. If we allow that to happen, it is deeply unethical.”

Do you believe this is a moral issue? Is the continued increase in carbon dioxide pollution by the human civilization deeply unethical? Explain your reasoning.

These answers are going to vary, but the documentary strongly makes the case that it is a moral issue. The effects of global warming have been objectively measured, and if human influences are a major cause, which they appear to be, then we certainly must have a moral responsibility to do something about it.

Ocean Temperatures and Hurricanes



11. The graph above shows the change in ocean temperatures since the late 19th century. How does the warming of ocean water relate to the frequency of strong storms, such as hurricanes?

The documentary implies that hurricane frequency is directly tied to ocean temperatures, but the studies on this have been pretty mixed. There is some evidence that hurricane intensity and duration may be related to ocean temperatures.

12. Hurricane Katrina is used as an example of a storm linked the changes in ocean temperatures. When it originally struck Florida, it was a category 1 (74-95mph). Explain how this hurricane changed before it hit New Orleans and how this relates to global warming.

The hurricane quickly increased in intensity (category 5) as it traveled across the Gulf. While it did weaken somewhat to a category 3 before it hit Louisiana, the speed that the hurricane strengthened was dramatic. The Gulf of Mexico contained exceptionally warm water that summer, and this fueled the increase in intensity.

13. This section is concluded with a quote given by Winston Churchill in late 1936:

"The era of procrastination, of half-measures, of soothing and baffling expedients, of delays, is coming to a close. In its place we are entering a period of consequences..."

Why does Gore choose this quote? What parallel is he attempting to draw between the circumstances of Churchill's speech and the current global warming debate?

Churchill gave this speech in the time leading up to World War I. Gore is arguing that the damage to the Earth that will result from global warming is analogous to that from the World Wars, and that we are failing to prevent that damage, just like World War I was not prevented.

Effects on the Poles

14. Due to the increase in global temperature, the duration and thickness of the permafrost of the northern tundra has been decreasing. Describe how each of these have been affected.
- Alaska Oil Pipeline – **The pipeline has become damaged in some areas as it sinks.**
 - Truck Transportation – **The amount of time trucks can safely cross the permafrost has been reduced.**
 - Buildings – **The foundation of some buildings has sunk dramatically.**
15. Why does snow and ice reflect much of the sun's infrared energy, while ocean water absorbs it?
- Snow is white, reflecting most wavelengths of energy back. Water does not have this property, so the infrared energy causes it to warm.**
16. The latitude of the United Kingdom is similar to that of Northern Quebec and Labrador in Canada, yet the temperatures are much milder. Use the diagram below to explain why.

The warm current of the ocean conveyor system releases a great deal of heat just to the West of Europe. The prevailing winds carry this heat over the continent, keeping its climate much more mild than the counterpart latitudes in North America.



17. How might the melting of Greenland's glaciers impact this system?

Greenland is located just to the Northwest of where this heat is released and the cold current begins. If the glaciers there melt, a lot of fresh water will be added to this system, which could alter the dynamics and density of the water, potentially disrupting the system. (Like what happened with Lake Agassiz thousands of years ago)

Effects on Life

1. What is the relationship between global warming and the increase of invasive species such as the Pine Bark Beetle?
- The pine bark beetle has been able to extend its range. This has allowed it to prey on trees that normally would have been protected from it.**
2. Al Gore states that species loss is currently occurring at a rate 1000x the normal background rate. There are multiple causes of extinction, with habitat loss generally considered the most significant. How does global warming contribute to habitat loss?

As the climate changes, the layout of ecosystems on the Earth as we know it change. Deserts can widen, other areas can receive more rainfall. All known habitats have the potential of changing.

3. Why was the collapse of the Larsen B ice shelf in Antarctica such a surprise to scientists?

The size of the ice that broke off was unprecedented.

4. If the ice covering Greenland were to melt, how much would global sea levels rise?

Sea levels could rise 3 feet or more.

5. Explain why a rise in sea level is a concern for the human populations. Give specific cities that would be most at risk.

Many of the world's largest cities are located on or near coastlines. New York City, Miami, Los Angeles, London, and Shanghai just to name a few.

Technology

6. Al Gore presents two formulas regarding technology:

“Old habits plus old technology = predictable consequences.”

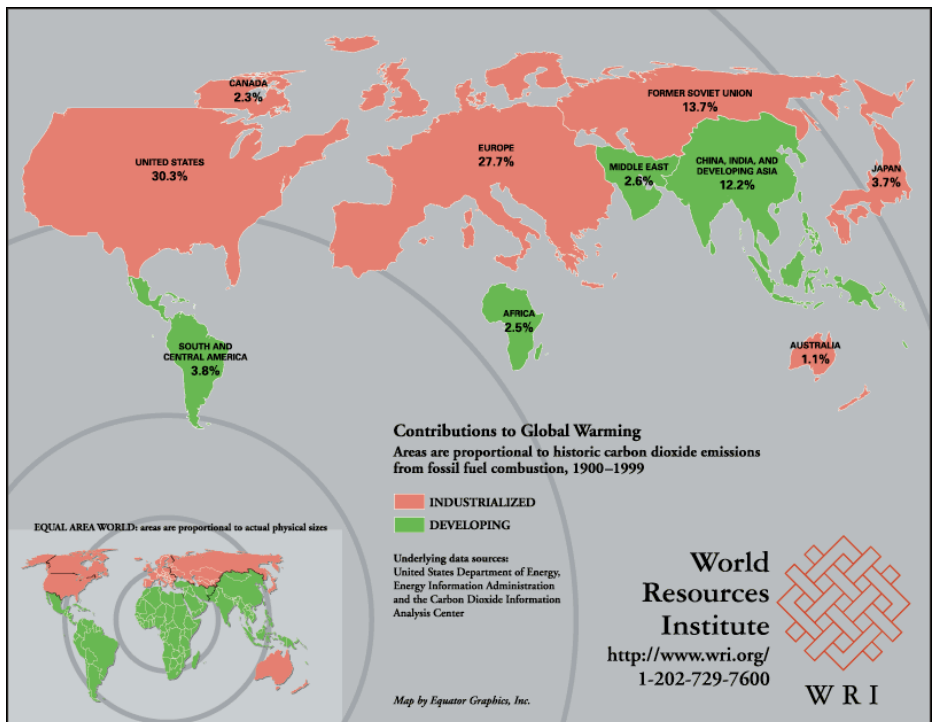
“Old habits plus new technology = dramatically altered consequences.”

How does the given example of traditional vs. modern warfare compare with global warming and greenhouse gases? Why are the consequences of human actions so much greater now than in our past?

As technologies improve, as the world industrializes, greater and greater amounts of greenhouse gas pollution is being released. Yet, the restrictions dealing with the release of these gases has hardly changed since the beginning of the industrial age. The consequences are greater now, because we produce such a greater volume of pollution.

7. The map below shows the relative contribution of each of the major countries/continents to global warming. Why is the United States the greatest contributor, even though we have a lower population than China or the entirety of Europe?

The rate of resource consumption in the United States, including fossil fuels, is much higher *per capita* than in other countries. Despite the lower population, we simply produce more pollution per person.



Call to Action

8. A sample of 928 scientific articles regarding global climate change were surveyed to see how many disagreed with the IPCC's conclusions that global warming is occurring and that it is primarily human caused. How many disagreed with these conclusions?

None.

9. What percent of the mass media articles disagreed with those conclusions?

About half.

10. How does this quote from Upton Sinclair relate to the global warming "debate" as presented by the mass media?

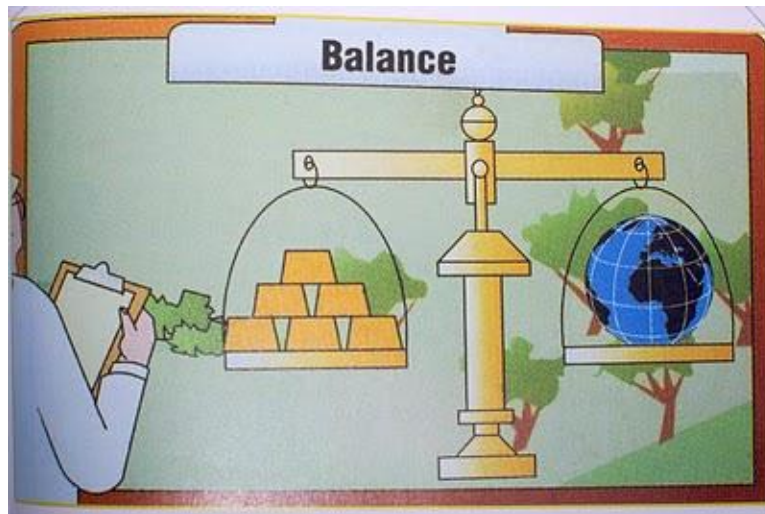
"It's difficult to get a man to understand something if his salary depends on him not understanding it."

Dealing with climate change would require a serious sacrifice on the part of the developed world. People would have to use fewer resources, which would slow down the growth of the global economy. These short-term consequences are not considered acceptable by many people.

11. Why is there such a big difference between the results of the two surveys?

The mass media stands to gain a bigger audience if it presents debates and arguments.

12. The conflict between the economy and the environment is summarized in this image from a White House conference. Explain, in your own words, the decision we as a civilization are faced with.



We must choose between the health of the planet in the long-term and the health of the global economy (money) in the short-term.

13. List three potential strategies that could be used to reduce carbon dioxide in the atmosphere.

- **Reducing fossil fuel consumption.**
- **Switching to cleaner sources of energy (renewables like solar or wind).**
- **Carbon sequestration, capturing carbon dioxide and injecting it into the Earth.**
- **Encouraging the growth of large plants.**

Further Reading

14. One potential solution of global warming that has been discussed is the stratoshield. Learn more about this idea at the Intellectual Ventures Lab website. Do you think this is a viable strategy, or a dangerous risk? Explain. Do you see any parallels between this and the satirical “Ice cube in the ocean” solution presented by the *Futurama* clip?

Article: <http://intellectualventureslab.com/?p=474>

Video: <http://intellectualventureslab.com/?p=296>

15. The National Oceanic and Atmospheric Administration (NOAA) website (<http://www.ncdc.noaa.gov/oa/reports/weather-events.html>) has a list of current climate extreme events. Choose a specific, recent event from the list. Explain how this event may relate to planetary changes due to global warming.

16. The *Tragedy of the Commons* is an essay written by Garrett Hardin about the abuse of natural resources that are not owned but shared by everyone. The two cartoons below summarize the essay.

http://www.garretthardinsociety.org/info/cartoon_commons1.html

http://www.garretthardinsociety.org/info/cartoon_commons2.html

Would you consider global warming and carbon dioxide pollution to be an example of a *Tragedy of the Commons*? Explain your answer.