

Causes and Effects of Global Warming

WebQuest Description: This WebQuest addresses the major environmental issues that our planet is facing as a result of global warming. It helps the learner understand the causes global warming and it also lets them learn many different ways we are being affected by it. Finally, it brings into perspective what will happen to the planet if global warming continues to progress at the present rate.

Grade Level: 9-12

Curriculum: Business / Economics

Keywords: global warming, causes, effects, deforestation, air pollution, natural air pollution

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Introduction

The purpose of this WebQuest is to demonstrate to the learner that global warming is not an issue that should be taken lightly. Some of the more important causes are addressed, and each of the huge effects are discussed at length. This WebQuest will require that the learner actively go out to the provided internet links, either in groups or by themselves, and find the answers to the posed questions. By hands-on learning such as this, better retention and overall understanding is more likely. Then, after answering the questions to the best of their ability, they are able to check how their answers matched the suggested answers that are available on the Teacher's Page. In addition, other suggested internet links that might be of interest are provided on the Conclusion page.

Tasks

The learner will understand how the following things are contributing to global warming: Deforestation, Air pollution, Natural Causes (i.e., natural air pollution, natural warming and cooling trends). The learner will recognize the effects global warming is having on our environment. The learner will become aware of what the future of our planet will be like if the current global warming trend continues. Finally, the learner will create a summary articulating the knowledge he/she gained from this WebQuest.

Process

The learner will either choose to work alone, or split up into groups of two or three. The group will then use the links provided to answer questions regarding how the following things all contribute to global warming: natural and man-made air pollution, deforestation, and the Earth's natural warming and cooling trends. After the questions about the causes of global warming are answered, the group will provide answers to the questions about the effects of global warming. Questions and links about man-made air pollution: What is the main source of air pollution in the United States? http://www.ucsusa.org/clean_vehicles/vehicles_health/cars-trucks-air-pollution.html What are CFCs and why are they bad? <http://www.theozonehole.com/cfc.htm> What types of air pollution are caused by indoor activities? <http://journals.ohiolink.edu/ejc/article.cgi?issn=09056945&issue=v14is7&article=82> What are the terms that refer to the two human-generated sources of air pollution? (see Attachment 1 below for clarification) <http://www.epa.gov/apti/course422/ap3.html> What is the need for household pollution control devices? <http://journals.ohiolink.edu/ejc/article.cgi?issn=02779536&issue=v55i0004&article=571> Questions and links about natural air pollution: What is natural air pollution and what are some examples of natural air pollutants? http://www.ace.mmu.ac.uk/eae/Air_Quality/Older/Natural_Air_Pollution.html What are some examples of natural air pollution? Are they adding to global warming? http://www.chesapeakebay.net/info/air_pollution.cfm How does natural air pollution contribute to global warming? <http://www.sciencemag.org/cgi/content/full/289/5477/270> Is natural air pollution the leading cause of global warming? Explain. <http://www.cnn.com/2007/TECH/science/07/11/globalwarming.overview/index.html> Question and link about natural global warming and cooling trends: What are global warming trends and how do they relate to global warming? <http://www.cnn.com/2007/TECH/science/07/11/globalwarming.overview/index.html> Questions and links about deforestation: What is carbon dioxide and what causes it to be released into the atmosphere, contributing to global warming? http://www.pa.msu.edu/sciencet/ask_st/083194.html Why are tropical rain forests important and why are they disappearing? [http://earthobservatory.nasa.gov/Library/Deforestation/Two decades of drought have lasted in the interior of Africa as a result of what? http://www.nationalgeographic.com/eye/deforestation/effect.html](http://earthobservatory.nasa.gov/Library/Deforestation/Two%20decades%20of%20drought%20have%20lasted%20in%20the%20interior%20of%20Africa%20as%20a%20result%20of%20what%20http://www.nationalgeographic.com/eye/deforestation/effect.html) 11 million acres of land each year is destroyed by deforestation. Why is this necessary and who is responsible for this? <http://www.umich.edu/~gs265/society/deforestation.htm> What is desertification and what are the causes and effects of it? <http://green.nationalgeographic.com/environment/global-warming/deforestation-overview.html> Questions and links about the effects of global warming: Describe how global warming has affected the sea levels. <http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=21968359&site=ehost-live> Describe how global warming has affected the health of humans all around the world. <http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=20278786&site=ehost-live> Describe the affect

that global warming has had on the animals of the world.<http://search.ebscohost.com/login.aspx?direct=true&db=a9h&AN=7093041&site=ehost-live><http://www.cbsnews.com/stories/2004/01/07/tech/main591924.shtml>What are other, less thought about, effects of global warming?http://www.americanprogress.org/issues/2007/09/climate_100.html

Evaluation

Category and Score	Beginning 1	Developing 2	Very Good 3	Exemplary 4	Score
Content of answers	Answers showed no understanding of the issues	Answers somewhat showed an understanding of the issues	Answers showed an understanding of the issues	Answers showed a deep understanding of the issues	%25
Content of summary paragraph	Displayed no ability to bring the issues together	Displayed an ability to bring some of issues together into a paragraph	Displayed an ability to somewhat bring everything that was learned together into a cohesive paragraph	Displayed an ability to bring everything that was learned together into a cohesive, well-thought-out paragraph	%25
Work ethic	Did not work hard and had lots of distractions	Worked hard some of the time with several distractions	Worked hard most of the time with only a few distractions	Worked hard the whole time with no distractions	%25
Attitude	Did not have fun and displayed a negative attitude the whole time	Displayed a positive attitude some of the time	Displayed a positive attitude most of the time	Had fun and displayed a positive attitude the whole time	%25
				Total Score	%100

Conclusion

Even with all of these different effects of global warming, (i.e., rising sea levels, a decline in health, more endangered species) it is easy to see how all of them are somewhat tied together. In fact, the problems that have arisen could be described as similar to the domino effect. For example, the hotter temperatures are contributing to the melting of the polar ice caps, which is causing the sea levels to rise, which means there is less land to live and grow crops on, which contributes to the decline in health conditions of humans and animals worldwide. However, even with all the different kinds of problems that global warming is bringing to the world, it is important to realize that they are all very important and each one of them requires lots of attention. In order to fight against them all and try to conquer the problem of global warming in general, everyone needs to work together and believe that overcoming one of the biggest threats to mankind (global warming) is something that is still within reach. If global warming continues at the current rate, the possible results are alarming. The international panel of scientists predicts that the global average temperature could increase by 2 to 11 degrees Fahrenheit by 2100 and that sea levels could rise by up to 2 feet. It has also been speculated by scientists that a slight increase in the Earth's rotation rate could result. Other possible changes include the disappearance of glaciers, extreme climatic differences (while epic floods hit some areas, intense drought will strike others), a quarter of the planet's plants and animals being at risk of extinction, widespread water shortages, and an increase in famine and disease. Thompson, A., Than, K. (2007, April 19). Timeline: The Frightening Future of Earth. Retrieved November 20, 2007, from http://www.livescience.com/environment/070419_earth_timeline.html Possible websites of interest: Marian Koshland Science Museum of the National Academy of Sciences <http://www.koshland-science-museum.org/exhibitgcc/index.jsp> Environmental Law & Policy Center - Global Warming Solutions <http://www.globalwarmingsolutions.org/> Global Warming International Center <http://www.globalwarming.net/> Natural Resources Defense Council - Issues: Global Warming <http://www.nrdc.org/globalWarming/> The Photographic Documentation of Climate Change [http://www.worldviewofglobalwarming.org/Climate Change Essay Topics](http://www.worldviewofglobalwarming.org/Climate%20Change%20Essay%20Topics) <https://essayshark.com/blog/global-warming-topics-with-thesis-statement-suggestions/>

Teacher Page

Provided are the answers to the questions that were posed in the Process section. Man-made air pollution answers: Q. What is the main source of air pollution in the United States? A. The main source of air pollution in the United States is transportation. People everywhere across the country are "on the go" constantly day or night. Motor vehicles on our roads cause 2/3 of the carbon monoxide, 1/3 of the nitrogen oxides and a quarter of the hydrocarbons. All of this is going to unfortunately lead to smoggy skies and dirty air (Union of Concerned Scientists). Union of Concerned Scientists. (2005, August 10). Clean Vehicles: Cars and Trucks and Global Warming. Retrieved November 1, 2007, from http://www.ucsusa.org/clean_vehicles/vehicles_health/cars-and-trucks-and-global-warming.html#pollution.htm Q. What are CFCs and why are they bad? A. Chlorofluorocarbons (CFCs) are a family of chemical compounds that were developed in the 1930s as a safe, non-toxic, non-flammable alternative to dangerous substances like ammonia. Back in the 1930s ammonia was important because it was used for the purposes of refrigeration and spray can propellants. However, what the public didn't know about was the negative affect the CFCs would have on the

environment. The reason that CFCs are bad for the atmosphere stems from the fact that one of the main elements in them is chlorine and very little chlorine exists naturally in the atmosphere. Once the CFCs reach the atmosphere, the ultraviolet radiation breaks them down and frees the chlorine. Then, under the proper conditions, this freed chlorine can potentially destroy large amounts of ozone. Such destruction is already evident in many parts of the ozone layer, especially over Antarctica. The destruction of the ozone layer causes many problems including the increased allowance of harmful ultraviolet radiation to pass through. The Ozone Hole. (2007). CFCs. Retrieved October 20, 2007, from <http://www.theozonehole.com/cfc.htm>.

What types of air pollution are caused by indoor activities? A. Some examples of indoor activities that cause air pollution are tobacco smoking, fire places, cooking, heating, ventilation and air conditioning, building and furnishing materials and electronic equipment. "Sensory pollution can be used to predict the impact of indoor air quality." Even though the sensory pollution has some limits, it is very suitable for estimating the ventilation requirements for indoor air quality. Control pollution sources indoors and the avoidance of superfluous pollution sources is the most effective method to reduce sensory pollution loads in buildings (Wargocki). Q. What are the terms that refer to the two human generated sources of air pollution? A. Mobile sources and stationary sources are the terms that refer to the two human-generated sources of air pollution. Mobile sources are defined as air pollution that is caused mostly by automobiles, trucks, and airplanes. On the other hand, examples of stationary sources would be factories, power plants, and other types of industrial facilities. The term point source refers to the smokestacks that the industrial facilities. These smokestacks are the source of the air pollutants that are released from the factory into the outside air. U.S. Environmental Protection Agency. (2006, March 2). Air Pollution: Sources of Pollutants in the Ambient Air. Retrieved October 20, 2007, from <http://www.epa.gov/apti/course422/ap3.html>.

What is the need for household pollution control devices? A. More than 2 billion people have stoves or open fires to make food for themselves and their families, and to provide light and heat for their homes. While these things are necessities, they all play a role in the "global burden of disease." If everyone around the world was better informed about the sources of indoor air pollution, we could prevent many of the unwanted health risks. However, hardly anyone thinks that heating their homes or cooking for their families will cause pollution. Unfortunately though, that is a misconception, especially in undeveloped countries. If we could improve the cooking and heating methods in these undeveloped countries, we could improve the health of the people that live there. In all, indoor pollution caused by everyday activities contributes to the overall well-being of humans, whether we like it or not. It would be very beneficial if people all over the world were educated on this topic as understanding the relationship between fuel and health is crucial. Natural air pollution answers: Q. What is natural air pollution? A. Air pollution that is not man-made, but instead occurs naturally is considered to be natural air pollution. While man-made air pollution is obviously a large environmental concern, there are also many natural sources of pollution that should not be forgotten about. Sulfur dioxide and nitrogen oxide are examples of natural air pollution. The United Nations Environment Program estimated that between 80 million and 288 million tons of sulfur oxide is released into the atmosphere per year from natural sources (as opposed to the 69 million tons that are released from human sources worldwide). As for nitrogen oxide, it is estimated that between 20 million and 90 million tons per year are released from natural sources (compared to 24 million tons from human sources). Other natural pollutants that cause health problems include radon, pollen, and mold spores. Atmosphere, Climate & Environment Information Program. (2000). Natural Air Pollution. Retrieved November 15, 2007, from http://www.ace.mmu.ac.uk/eae/Air_Quality/Older/Natural_Air_Pollution.html.

What are some examples of natural air pollution? Are they adding to global warming? A. There are many sources of natural air pollution. For starters, dust storms and smoke from forest and grass fires are both large contributors. Also, plants and trees emit hydrocarbons. However, volcanic eruptions are said to be the major natural source of air pollution. They release tons of particulate matter and gases into the atmosphere. Still, although natural air pollution is partly to blame for our global warming problems, it is not considered to be the leading cause. Chesapeake Bay Program. (2005, August 8). Air Pollution. Retrieved November 15, 2007, from http://www.chesapeakebay.net/info/air_pollution.cfm.

How does natural air pollution contribute to global warming? A. Natural air pollution adds to carbon dioxide emissions, which increase the average global temperature. Tanneeru, M. (2007, July 12). Global warming: A natural cycle or human result? Retrieved November 15, 2007, from <http://www.cnn.com/2007/TECH/science/07/11/globalwarming.overview/index.html>.

Is natural air pollution the leading cause of global warming? Explain. A. No. Man-made air pollutants are thought to be the major cause of global warming. The total amount of man-made pollution doesn't compare to the amount of natural pollution in our world. Man-made pollution is caused by tons and tons of factors, (probably even some that we haven't realized yet) while natural air pollution is thought to have only a few sources. The burning of fossil fuels, emissions from vehicles, and the clearing of forests are all causes of global warming that can be traced back to humans. Tanneeru, M. (2007, July 12). Global warming: A natural cycle or human result? Retrieved November 15, 2007, from <http://www.cnn.com/2007/TECH/science/07/11/globalwarming.overview/index.html>.

Global warming and cooling trends answer: Q. What are global warming trends and how do they relate to global warming? A. The Earth's temperatures have variability every year. However, sometimes the variation becomes chronic. It is during these times when the Earth continues to get way colder or way warmer over the span of several years that we say the Earth is going through a global warming/cooling trend. The Earth has always naturally gone through these trends. "The Earth is always getting colder and warmer. It's always changing." In fact, this is true of any fluid-covered planet. "It is thought that the global warming we may be experiencing today is actually a product of this natural warming trend." Such is the current debate regarding global warming. Many people think humans are the main cause of the terrible things that are happening to our environment, and many other people think that what we're experiencing is simply a natural thing, that we are going through a natural warming trend. However, it is obvious that only speculation is possible at this time. Tanneeru, M. (2007, July 12). Global warming: A natural cycle or human result? Retrieved November 15, 2007, from <http://www.cnn.com/2007/TECH/science/07/11/globalwarming.overview/index.html>.

Deforestation answers: Q. What is carbon dioxide and what causes it to be released into the atmosphere, contributing to global warming? A. "Fossil fuels such as gasoline, methane, and propane contain mostly carbon. When these fuels are burned, they react with oxygen and produce carbon dioxide." Carbon dioxide is a key component in the depletion of the ozone layer and is a contributor to global warming. As a result of our heavy use of fossil fuels, the amount of carbon dioxide in the atmosphere has been increasing since the Industrial Revolution. In addition, the immense deforestation that has been happening over the past few decades is also contributing to the increase in carbon dioxide. This is because trees use up the carbon dioxide in the atmosphere, but if there aren't as many trees because they've been cut down, then there will obviously be more carbon dioxide. Lansing State Journal. (1994, August 31). How does carbon dioxide cause global warming? Retrieved November 15, 2007, from http://www.pa.msu.edu/sciencet/ask_st/083194.html.

Why are tropical rain forests important and why are they disappearing? A. Tropical rain forests serve a very important role in maintaining the biodiversity that is necessary on this planet. After all, even though they only cover about 7 percent of the Earth's dry land, they are home to about half of all species on Earth. Also, because of the fact that many of these species are very specialized to microhabitats within the forest, they are very susceptible to extinction. Besides the ethical issues that are involved with the extinction of many different kinds of species,

there are also practical problems involved. First, global markets consume rain forest products that depend on sustainable harvesting. Such products include latex, cork, fruit, nuts, timber, fibers, spices, and medicines. In addition, hidden in the genes of plants, animals, fungi, and bacteria that have not even been discovered yet may be cures for cancer and other diseases or the key to improving the yield and nutritional quality of foods. It also can't be forgotten that rain forests are home to millions of native (indigenous) people and that they help the planet maintain a somewhat stable climate. Still, rain forests are rapidly disappearing in order to meet the needs of humans. "We are clearing the natural landscape in order to make room for farms and pastures, to harvest timber for construction and fuel, and to build roads and urban areas." Lindsey, R. (2007, March 30). Tropical Deforestation. Retrieved November 15, 2007, from <http://earthobservatory.nasa.gov/Library/Deforestation/>

Q. Two decades of drought have lasted in the interior of Africa as a result of what? A. Studies have shown that the destruction of rain forests in West African countries like Nigeria, Ghana, and Congo have actually caused two decades of drought in the interior of Africa. This is because of the fact that rain forests help to produce rainfall in areas other than where they are immediately located. National Geographic. (2007). Forest Holocaust. Retrieved November 15, 2007, from <http://www.nationalgeographic.com/eye/deforestation/effect.html>

Q. 11 million acres of land each year is destroyed by deforestation. Why is this necessary and who is responsible for this? A. Deforestation is caused by human demand. The logging industry is fueled by the need for disposable products, such as paper, packaging, and fuel wood. In fact, it has been found that McDonald's needs 800 square miles of trees to make the amount of paper that is required for a year's supply of packaging for them. Stock, J., Rothen, Andy. (1998). The Choice: Doomsday or Arbor Day. Retrieved November 15, 2007, from <http://www.umich.edu/~gs265/society/deforestation.htm>

Q. What is desertification and what are the causes and effects of it? A. Desertification is the process that turns productive land into non-productive desert as a result of poor land-management. Normally, the dense tree cover of the rain forests helps protect the soil below by keeping it rich and moist. In turn, these trees also maintain the water cycle by recycling water vapors back into the atmosphere. However, with all the deforestation that is prevalent, we are losing the trees we need to fill roles such as these. As a result, many of the previously rich, dense, moist rain forest areas could quickly become barren deserts. National Geographic. (2007). Deforestation. Retrieved November 15, 2007, from <http://green.nationalgeographic.com/environment/global-warming/deforestation-overview.html>

Q. Describe how global warming has affected the sea levels. A. The rising sea levels are a huge effect of global warming. They are rising as a result of the melting polar ice caps, which are melting as a result of the warmer temperatures across the entire world. It has been found that it will only take a mere one-meter rise of sea level to flood New York, London, and Bangkok. Also, as a result, 30 percent of the world's cropland will be destroyed. Not only does this mean there will be less land for the world's population to live on, there will also be a lot less land to grow the food that the world's population needs to survive. Scientists agree that the Arctic region is feeling the burn of the rising temperatures more than any other area. After all, the warmer temperatures are melting away the ice and snow, which in turn is revealing the darker, more absorbent, ground layer, which of course ultimately causes more heating and melting to occur. In fact, the sea levels have risen so much in these regions that land is literally falling off into the ocean. For example, the ocean is overtaking an Eskimo village on an island off northwestern Alaska. Villagers of this community were forced to evacuate their homes and are being called one of the first "refugees of global warming" as a result.

Q. Describe how global warming has affected the health of humans all around the world. A. The decline of people's health all over the world is another thing that can be attributed to global warming. For starters, with the average temperatures climbing as drastically as they are, there will be more heat strokes and fatalities due to heat waves. Back in August 2003, at least 20,000 Europeans died from the heat wave that was experienced there. As a matter of fact, the climate change has been expected to be responsible for at least 150,000 extra deaths a year so far. A conservative estimate states that this figure will actually double by the year 2030. In addition, besides the obvious effects that the rising temperatures will have (i.e. heat waves, droughts, bushfires, etc), they will also result in larger mosquito populations at high elevations in the tropics. This drastic increase in mosquito populations would be fatal by contributing to the spread of malaria, dengue, and other infections. However, the increased temperatures won't be the only weather condition contributing to deaths. More prevalent natural disasters such as hurricanes, floods, landslides, and tornados will also cause lots of fatalities. Finally, the physical health of people all around the world isn't all that's at stake. It has been reported that there has been an influx of mental health issues in rural Australia caused by drought conditions and other weather-related problems.

Q. Describe the affect that global warming has had on the animals of the world. A. Humans aren't the only ones suffering from the effects of global warming. Animals all over the world are also having to adapt to the conditions that global warming is presenting. The world's snow cover is obviously in decline and the Spring season conditions are arriving sooner and sooner. As a result, the blossoming of plant life and the breeding of animals is being affected, not to mention that the timing and pattern of bird migrations are also changing. Additionally, with the rising temperatures, some animals are being forced to abandon their current environments and move to different, more livable, conditions. In fact, of the estimated 14 million species of plants and animals that Earth is home to, over 12,000 are predicted to become extinct. A few of the already endangered species that are likely to go extinct are Australia's Boyd's forest dragon, Europe's azure-winged magpie, and Mexico's Jico deer mouse. While 12,000 is a small fraction of 14 million, it is still a large number of plants and animals that shouldn't be forced to extinction because of global warming. More examples of animals that are somewhat in danger for various reasons are the Gray Whales, Emperor Penguins, White Arctic Foxes, Koala Bears, Walruses, and Polar Bears. CBS News. (2003, January 7). Species Face Global Warming Threat. Retrieved October 1, 2007, from <http://www.cbsnews.com/stories/2004/01/07/tech/main591924.shtml>

Q. What are other, less thought about, effects of global warming? A. Besides these three main effects of global warming, there are also other less thought about consequences. For example, Christmas trees and baseball bats may be in danger. The ash trees that baseball bats are made from and pine trees that people use for Christmas trees are in danger of disappearing as a result of global warming and killer beetles. Also, there has been an increase in the amount of brown bear attacks, specifically in Russia. Because of the increased temperatures, bears are apparently finding it harder to hibernate and are getting very "grouchy" and unusually aggressive as a result. Similarly, jellyfish and Giant Squid have been moving closer to the shoreline, creating more attacks on humans. They are accustomed to the warm waters typically out in the open sea, however, with global warming and the rising temperatures of the oceans, the natural temperature barrier between the open sea and the shore has been somewhat erased. Additionally, the Great Barrier Reef is predicted to disappear within decades as warmer, more acidic seas are thought to eventually bleach the coral in the world-famous reef. Another unfortunate effect of global warming is the fact that many of the world's large bodies of waters are beginning to dry up. For example, the Mediterranean Sea is quickly turning into a salty and stagnant sea. Also, the Ganges River in India is beginning to run dry. Not to mention, some African rivers and the five-acre glacial lake in Southern Chile are reportedly "disappearing" as a result of very dry conditions. Center for American Progress. (2007, September 24). The Top 100 Effects of Global Warming. Retrieved October 1, 2007, from http://www.americanprogress.org/issues/2007/09/climate_100.html

Images provided by the following websites: <http://www.sciencemuseum.org.uk/antenna/carboncycle/images/deforestation.jpg>

<http://www.flickoff.org/areweflicked/effects/moremoremore><http://www.cbsnews.com/stories/2004/01/07/tech/main591924.shtml><http://mrbrent.wordpress.com/2007/11/26/uk-to-cut-co2-emissions-by-50-why-wont-the-us-try/>http://www.submergingmarkets.com/submerging_markets/russia/index.htmlhttp://www.dailymail.co.uk/pages/live/articles/technology/technology.html?in_article_id=440869&in_page_id=1965http://morrowwords.blogspot.com/2007_03_01_archive.html<http://www.epa.gov/apti/course422/ap3.html>

Standards

Credits

Other