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Short Communication: Global warming – Problem with environmental and economical impacts

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Abstract. *Rai SM. 2013. Short Communication: Global warming – Problem with environmental and economic impacts. Nusantara Bioscience 5: 102-105.* The present article is focused on global warming, which is an important global problem being faced by humankind. The article discusses the causes ofthe global warming, such as greenhouse gases. The earth receives energy from the Sun in the form of solar radiations with small amount of infrared and ultraviolet rays. A part of these radiations is absorbed by greenhouse gases which results in warming of the earth. These radiations increase temperature on the universe and are one of the most important global problems. The efforts from all the countries of the world are required for reduction of emissions of greenhouse gases.

Key words: economy, environment, global warming, green house gases

Abstrak. *Rai SM. 2013. Komunikasi singkat: Pemanasan global – Permasalahan dengan dampak lingkungan dan ekonomi. Nusantara Bioscience 5: 102-105.* Artikel ini difokuskan pada pemanasan global, yang merupakan masalah global penting yang dihadapi oleh umat manusia. Artikel ini membahas tentang penyebab pemanasan global, seperti gas rumah kaca. Bumi menerima energi dari matahari dalam bentuk radiasi surya dengan sejumlah kecil sinar infra merah dan ultraviolet. Sebagian dari radiasi ini diserap oleh gas-gas rumah kaca yang mengakibatkan pemanasan bumi. Radiasi-radiasi ini meningkatkan suhu alam semesta dan merupakan salah satu masalah global yang paling penting. Upaya dari semua negara di dunia diperlukan untuk mengurangi emisi gas rumah kaca.

Kata kunci: ekonomi, lingkungan hidup, pemanasan global, gas rumah kaca

The temperature of the earth is rising with fast pace. Since 1975, the global surface temperature has been increased by 0.5ºC (Hansen et al. 1999; Jones et al. 1999; Mann et al. 1999; Hansen et al. 2000), The main reasons for rise in temperature include greenhouse gases, deforestation, etc. According to the U.S. Environmental Protection Agency (2009): "*Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns*". Global warming can occur from a variety of causes, both natural and human-induced. In common usage, "*global warming*" often refers to the warming that can occur as a result of increased emissions of greenhouse gases from human activities." In fact, due to global warming sea-level is rising and has become a great puzzle (Woodworth 1990; Douglas and Peltier 2002; Woodworth and Player 2003; Holgate and Woodworth 2004).

The basic cause of global warming is increase in temperature due to the greenhouse gases. A certain amount of these greenhouse gases maintain the earth's climate congenial to live but it has been observed that over the years these gases have increased and do not allow the solar heat to escape into space keeping the earth's temperature warmer than needed and allowing the polar caps to melt a little more each year causing a rise in the oceans. Agriculture is the main occupation across the globe with 1.2-1.5 billion hectares as cropland and 3.5 billion as a grassland (Howden et al. 2007; Thangarajan et al. 2013). Agriculture contributes up to 10-12% of the total emissions of green house gas emissions (IPCC 2007). The higher input of the modern chemical fertilizers has created problems like degradation of quality of soil, loss of biodiversity and contamination of groundwater. Excessive irrigation is also the cause of climate change and global warming (Puma and Cook 2010).

According to a survey, in the past three decades, global warming is 0.6°C and 0.8°C in the past century. It is not appropriate to claim that ''*most global warming took place before 1940*". Up to 1975, there was slow global warming, with large fluctuations, over the century up to 1975, followed by rapid warming at a rate of 0.2°C per decade. Global warming was 0.7°C between the late 19th century (the earliest time at which global mean temperature can be accurately defined) and 2000, and continued warming in the first half decade of the 21st century is consistent with the recent rate of 0.2°C per decade (Hansen et al. 2000). Around the areas of ocean, quite away from the anthropogenic activities warming occurs.

The gradual rise in earth temperature is a matter of great concern. General public, politicians, and environmentalists are interested to solve this issue at global

level. There are various reports of efforts made to solve this problem all over the world. There have been public awareness and a great concern towards the problem of global warming and it is realized that it should be tackled meticulously in order to save mankind.

This article is aimed to discuss the global warming problem, its causes and pragmatic approach to solve this problem.

Causes of global warming

There are many greenhouse gases (GHGs) responsible for warming. Due to the anthropogenic activities, the gases are emitted in different ways. Most of these gases are produced by modern agricultural practices, from the combustion of fossil fuels in industries, cars, and by generation of electricity. The most important among these gases is carbon dioxide. The carbon dioxide (about 20 %) produced due to the anthropogenic activities remains in the environment for thousands of years. Other gas which contributes a major part includes methane released from land and agriculture, nitrous oxide from fertilizers, gases used in refrigerators and freezers. There has been much deforestation which is really a cause of worry because these forests are responsible for binding carbon-dioxide.

There are ten primary greenhouse gases including water vapor, carbon dioxide, methane, and nitrous oxide which occur naturally. Perfluorocarbon, hydrofluorocarbons, and sulfur hexafluoride are found in the atmosphere due to emissions from different kind of industries. Among these, water vapor is the most abundant kind of greenhouse gases present in the atmosphere. Carbon-dioxide is the primary anthropogenic greenhouse gas, accounting for 77% of the human contribution to the greenhouse effect.

It is estimated that from 10,000 years ago until 150 years ago, atmospheric concentrations of carbon dioxide, methane, and nitrogen-dioxide were relatively stable. Unfortunately, during the last 150 years, concentrations of methane and nitrogen dioxide increased by 148% and 18%, respectively. There are various sources of Greenhouse Gas Emissions. Due to human activities (anthropogenic source) carbon-dioxide is emitted from burning fossil fuels, cement industries and due to rapid deforestation. Methane and nitrogen dioxides emissions are both man-made and natural. Agriculture accounts for major contribution of methane and nitrous dioxide gases. Many hydrofluorocarbons used in refrigeration, cooling, and as solvents in place of ozone-depleting chlorofluorocarbons.

There are different heat-trapping abilities of the greenhouse gases. It is worthy of note that a molecule of methane gas produces more than 20 times the warming of a molecule of carbon dioxide. Another example is nitrous oxide, which is 300 times more powerful than carbon dioxide. There are other gases also which include chlorofluorocarbons. These have been banned in most of the countries of the world because they are responsible for degradation of the ozone layer. This ozone layer has heat-trapping capacity -thousands of times greater than carbon dioxide. There are various reports, which provide evidence that carbon dioxide is a major contributor to global warming.

There was no concrete decision in Copenhagen in December 2009 to reach to final conclusion to extend and broaden the Kyoto Protocol raises the prospect that attempts to limit atmospheric concentrations of carbon dioxide (CO_2) and other greenhouse gases (GHGs), as a consequence of which global temperature increases. It is really difficult politically. Nordhaus (2010) reported improved estimates of the likely trajectories of global output, GHG emissions, climate change, and damages in the coming decades.

Deforestation is a major problem

Forests play a major role in balancing the carbon-dioxide in the atmosphere in several ways. The plants of the forests remove carbon dioxide from the atmosphere and absorb carbon into different parts of the plants, such as wood, leaves, where it can be stored for a large period. However, due to deforestation, stored carbon may be released into the atmosphere, depending in part on how much of the wood is destroyed. For example, forest fires destroy many plants. In addition human also fell trees for timber and other uses. Deforestation is sometimes man-made because for construction purpose cleaning of forests is required. A huge amount of carbon stored in forests worldwide indicates the significant role of forests in climate change and global warming. According to an estimate, the forest trees are estimated to store the equivalent of roughly 760 billion metric tons of carbon-dioxide worldwide over one hundred times the United States' emissions of Carbon-dioxide and other greenhouse gases in 2009.

Ecological effects of global warming

Droughts and floods

Between the ninth and fourteenth centuries (Medieval Warm Period) the global temperatures rose up to 2^{o}C (Acemoglu et al. 2012). Fagan (2008) stated that this brought bounty to some areas, but others suffered from droughts. There will be drastic changes of tropical rainfall on a regional basis (Allen and Ingram 2002) Due to the rise in temperature water evaporates rapidly. This evaporated water will quickly condense to form clouds and fall on the earth as rains.. Unfortunately, this rainfall is not evenly distributed. The rapid evaporation of water may generate several problems particularly in developing countries where availability of water is a great problem. Plant life depends on water from rivers and lakes if water evaporates with faster rate; life is threatened due to drought. The drought will affect indirectly the crops and if there will not be proper crop yield, there will be food problem. On the other hand in wet area, the evaporation would be much higher, and this would cause untimely rainfall and flood. Drought is a main natural cause of agricultural, economic, and environmental damage (Burton et al. 1978; Wilhite and Glantz 1985; Wilhite 1993).

Rising sea level

Constant increase in temperature would be responsible for melting ice in North and South poles (Steffensen et al. 2008). There are various reports concerning sea level rise (Douglas 1991, 1992; Maul and Martin, 1993; Church et al.

2001; Chambers et al. 2002; Douglas and Peltier 2002; Brohan et al 2006). The report of melting ice in Antarctica is a burning example. The surface melting was recorded in ice sheet (Velicogna 2009; Buis and Cole 2012; Vinas 2012) The glaciers melts and causes land-slide as a consequence of which the sea level is rising. It is estimated that in future 1-4 m water level will rise. If the ice sheets of Greenland and Antarctica fully melts, the sea level will rise by 64 m. From 1993 to 2003, there has been loss of 50-100 tons of ice. The low-lying areas in general and coastal areas, in particular, will be flooded and may be submerged. It is really a matter of great concern that 29% of the world's population which lives in coastal areas will be affected. According to Church and White (2006) between 1870 and 2004, global average sea levels rose 195 mm.

The results of the sea-level rise would affect badly particularly coastal flooding and storm damage, eroding shorelines, saltwater contamination of fresh water supplies, flooding of coastal wetlands and barrier islands, and an increase in the salinity of estuaries are all realities of even a small amount of sea level rise (Lambeck and Chappell 2001**)**. There are about 30 countries which would be affected by rising sea level. There is an alarming report by Bennartz et al. (2013) in July 2012, a historically rare melting was recorded across the entire Greenland ice sheet, raising questions about the frequency and spatial extent of such events.

Extreme weather

Climate is the average of many weather events over a span of years (Huber et al. 2011). Climate change can be described in terms of average changes in temperature or precipitation (Karl et al. 2008). After 1880, globally 2005 and 2010 were the warmest year (NCDC-NOAA 2010), both years are known for exceptionally damaging weather events, for example, Hurricane Katrina in 2005 and the deadly Russian heat wave in 2010. The year 2005 has been considered as the warmest year globally, 19 countries set new national high-temperature records. In 2010, global precipitation was also far above normal and it was the wettest year since 1900 (Huber et al. 2011). It was Rio de Janeiro which received the heaviest rainfall in 30 years causing nearly 300 mudslides and killing at least 900 people (Cabral 2010).

There would be a remarkable change in weather owing to temperature rise. The high temperature can increase winds, rains and storms and finally there would change in overall climate of Earth. The climate of the future will be entirely different from the one we are having now. We are already experiencing the change of weather all over the world and it is a matter of discussion among scientists, politicians and common people.

Economic impact

As far as global warming is concerned, it's essential economic elements can be explained in a simple economic model which include four elements: (i) the consumption of the present generation, (ii) the consumption of future generations, (iii) the conventional capital stock resulting from the investment of the current generation, and (iv) the climatological capital stock representing the reduction in the stock of greenhouse gases in the atmosphere due to investments of the current generation in the mitigation of global warming (Foley 2007).

There are severe economic impacts of global warming and climate change. The loss of crops, forests, and animals are most important. Due to the sea-level rise, there will be huge migration of the inhabitants of as low-lying countries which would be affected with flood. Moreover, there will be disruptions to global trade, transport, energy supplies, and labor markets, banking and finance, investment and insurance, would all create havoc on the stability of both developed and developing nations. Consequently, there will be adverse effect on markets by increased volatility.

Due to rise in temperature and change in climatic conditions, several diseases, such as, Malaria, dengue, and viral diseases will spread, which will be responsible for huge economic loss in treatment of the diseases. There will be excessive economic loss due to hurricane, floods, and diseases. The problem will not only be faced by developing countries, but it will be the problem of the developed world also. The main problem in coastal areas particularly would be of potable water, energy, and transportation. These problems would indirectly affect the economy of the people.

Public perception

It is really very important for public to understand that global warming is manmade According to a recent survey in the U.S. by Rabe and Borick (2011) provides evidence that public opinion for the global warming depends mainly on their perceptions of local climate variations.

In 1988, Hansen and his coworkers suggested that by the early 21st century the informed public should be able to recognize that the frequency of unusually warm seasons had increased. In 2011, heat waves in Texas and Oklahoma in the summer raise the question of whether these extreme events are related to the on-going global warming trend, which has been attributed with a high degree of confidence to human-made greenhouse gases.

The change of global temperature may have the greatest practical impact via effects on the water cycle. Indeed climate changes occurring with global warming involve intimate interactions of the energy and water cycles.

The extreme rise in temperature causing heat waves and frequent floods have received public attention. However, the common public has no perception of why global warming is taking place. It is the need of the hour to generate awareness about the environmental problems in general and rise in temperature.

Solutions

Investing in clean energy industries, such as wind and solar, as well as energy efficiency programs, can lead us out of crisis and into a new clean energy economy. We should focus on vehicles which can be run on solar light. It puts about 10,000 miles a year on the car, running it purely on sunlight. The solar panels that provide all the electricity homes also charge the car battery. By using solar energy-based cars, the use of oil can be reduced. Government

should focus on use of solar energy and it should be imperative that new buildings should meet energy-efficiency standards that maximize energy savings. It should be mandatory for new buildings existing and commercial spaces to save energy by installing energy efficient heating, cooling and lighting systems. The garbage should be recycled in order to avoid methane gas production. Garbage should not be burnt because it releases carbon dioxide and hydrocarbons into the atmosphere. There should be plantation program at large scale. There is a greater need to develop non-fossil fuel energy sources. Solar, wind and hydroelectric power, which are the free gift of almighty can reduce greenhouse gases.

It can be concluded that the greenhouse effect is one of the most important global problems. The efforts from all the countries of the world are required for reduction of emissions of greenhouse gases. However, it has been experienced from the past that there are meetings, conventions, and discussions by the scientists and politicians regarding global warming and climate change but the efforts are not focused. The most important is that if reductions are not controlled, we should try to go for mass plantation programs by public participation.

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