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ENVIRONMENTAL IMPACT OF ENERGY

*Deded Chandra[1 2], Eri Barlian[1], Ali Amran[1]

[1]Doctoral Program of Environmental Sciences, Postgraduate - Universitas Negeri Padang
[2]Department of Geography, Universitas Negeri Padang
Email: dededchandra@yahoo.com

*Corresponding Author, Received: Agust 12, 2020, Revised: Nov, 18, 2020, Accepted: Dec, 01, 2020

ABSTRACT

The problems of energy, environment, and, global warming are becoming increasingly prominent in the era of globalization. Where the use of energy can pollute the environment due to the presence of solid waste, liquid waste, and pollutants due to emissions. Energy can change from one form to another, the changes often affect the environment and the air we breathe in various ways. Chemical energy in fossil fuels is converted into heat, mechanical, or electricity through combustion and this is the largest pollutant producer. And thus power plants, motor vehicles, and stoves are the main causes of air pollution. Issued pollutants are usually grouped into hydrocarbons (HC), nitrogen oxides (NO_x), and carbon monoxide (CO). Pollutants produced in fossil burning are the biggest factors for smoke, acid rain, global warming, and climate change. If the situation cannot be managed properly, it will adversely affect the environment and also the survival of its inhabitants.

Keywords: *energy, environment, pollutants*

INTRODUCTION

The energy sector is important because in addition to the driver of economic growth as well as export commodities. But this economic growth can also bring a negative impact on natural resources such as water, air, and soil. The negative impact can be the waste of pollution as a result of energy use. Energy use can be polluting the environment due to solid, liquid, and pollutant emissions due to particle combustion emission, SO_2, NO_x, and Carbon Dioxide (CO_2) (Young and Roger, 2000; Perera, 2018). A metropolitan city is usually characterized by many high rise buildings, many shopping centres, numerous apartments, and is certainly followed by a dense population, examples of metropolitan cities such as the cities of Jakarta, Tokyo, New York, Moscow, Berlin, London, etc. To meet the needs of energy in the metropolitan city usually built power plants with various sources of the turbine drive such as nuclear power plant, PLTU, PLTD, PLTA. PLTU usually use coal to produce steam drive turbine.

Similarly, the PLTD uses fossil fuels as its turbines locomotion. Both of these produce exhaust gases released into the air, as well as residues, thrown into the environment. There is also another characteristic of a metropolitan city that is downstream transportation means such as bicycle motor, bus transportation, trains, etc. for 24 hours. The use of this transport tool mostly uses fossil fuels, resulting in a lot of exhaust gases with various particles. In Jakarta seldom seen the sky above it clean from the morning until the afternoon. This indicates high levels of air pollution. In the use of automobiles, motorcycles, and others that use fossil fuels, here actually occurs changes in chemical energy into mechanical and hot energy (Edward and Anderson, 1994).

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METHOD

From the background above can be taken the problem of whether the impact of change in energy (fossil fuel) to the environment? Energy is defined as the ability to do work. Energy is also a magnitude that can change from one form to another. As in motorcycles, chemical energy changes occur in mechanical and thermal energy. This energy is eternal as stated in the law of I thermodynamics:

$$Q = U + W$$

Law 1 thermodynamics better known by the Law of Energy Eternity:

Q = Large heat absorbed or received system, (J)
W = Large work done or absorbed system, (J)
U = expressed energy change in, (J)

Similarly, in the case of changes in chemical energy to heat to increase the temperature can be calculated by the formula:

$$Q = m.\ c.\ T$$

Q = large heat that is absorbed or removed by an object, (J)
m = Mass of objects, (kg)
T = temperature change, (K)

From this, you can imagine how the atmospheric temperature rises in the burning of fossil fuel every day (Yoesgiantoro, 2017). Usually, people depend on how the environment surrounding it is natural resources that can support daily life. The natural resources that are main to humans are land, water, and air. The land is a place of human beings to do various activities. Water is indispensable to humans as the largest component of the human body. To maintain balance, water is needed with a considerable amount and has good quality. Besides, the air is a natural source of oxygen for human respiration. A healthy environment will be realized when people and their environment are in good condition. The environment in Indonesia needs to be handled due to several factors influencing it, one of which is about environmental conditions such as slump or degradation occurring in various regions. The environmental components are broadly divided into three groups, namely the biotic Group (land and Water flora and fauna), abiotic groups (rice fields, water, and air), and cultural groups (economics, social, culture, and public health) (Swing, 2019).

RESULT AND DISCUSSION

Fossil Fuel Change

The change of energy from one form to another in various ways often affects the environment and the air we breathe, and thus the learning of energy is incomplete without considering its impact on the environment. Fossil fuels such as coal, petroleum, and natural gas have motivated the development of the industry and the modern life facilities we enjoy

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around the early 19th century, but these were not without any unwanted side effects. From the land we planted and the water, we drink until the air we breathe, the environment has received a huge impact on all that. The pollutants produced on fossil burning are the biggest factors of smoke, acid rain, and global warming and climate change. Environmental pollution has exceeded the threshold of being a serious threat to plants, wildlife, and human health. Air pollution has been the cause of various health problems including asthma and cancer. It is estimated that more than 60,000 people in the United States died annually due to heart and lung diseases related to air pollution (Zhang *et al.*, 2020).

Hundreds of elements and compounds, such as benzene and formaldehyde are known to be emission on the combustion of coal, petroleum, natural gas, and timber in power plants, vehicle engines, combustion furnaces, and even fireplaces. Some compounds are added to liquefied fuels for various reasons (such as MTBE or methyl tertiary butyl ether used to increase octane figures on fuels and also oxygenation of the fuel in the winter to reduce urban smoke), which can interfere with eye health and breathing. The largest source of air pollution is from motor vehicles, and pollutants issued by vehicles are usually grouped as hydrocarbons (HC), nitrogen oxides (NO_x), and carbon monoxide (CO) (Fig. 1). HC emissions are a large component of the emission of organic volatile compounds (VOCs), and these are commonly used interchangeably for the emission of motor vehicles. Most of the VOC or HC emissions are caused by evaporation at the time of refuelling or spills when the spit back or by evaporation of the gas tank due to a cover that is not tightly sealed. Solvents, incendiary materials, and cleaning products for households containing benzene, butane, or other HC products are also an important source of HC emissions (Akhadi, 2009).

Fig 1. Motor vehicles are the largest source of air pollution

Children are very vulnerable to the impacts produced by air pollution because their organs are still in the development period. They are also exposed to more pollution because they are more active and breathe faster. People who have problems with the heart and lungs, especially asthma, the biggest factor is caused by air pollution. This becomes apparent if the level of air pollution in their environment reaches a very high level (Ashmore, 2009).

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Pollutants Generated on the Burning of Fossil Fuels

Smoke and Ozon

The number of the world's population continues to increase every year, so increasing energy needs are inevitable. Nowadays, almost all human energy needs are derived from the conversion of fossil energy sources, such as power generation and transportation tools that use fossil energy as its source of energy. Directly or indirectly, this results in a negative impact on the environment and the health of living creatures because the residual burning of this fossil energy produces harmful pollutants. Air pollution, especially in large cities, has caused a decline in air quality so that disrupting environmental comfort has even caused the occurrence of health disorders.

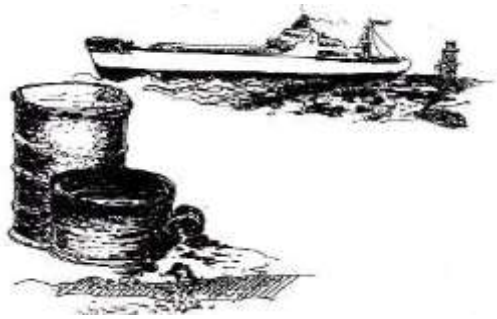

Fig 2. Impact on air and climate

The decrease in air quality is mainly due to the use of uncontrolled and inefficient fossil fuels in transportation and industrial means which are generally centralized in large cities, in addition to household activities and forest fires. The results of the research in several major cities (Jakarta, Bandung, Semarang, and Surabaya) showed that motor vehicles are the main source of air pollution. The results of the research in Jakarta showed that motor vehicles contribute CO-pollution of 98.80%, NO_x by 73.40%, and HC by 88.90% (Kosanka and Khandar, 2014).

Acid Rain

Acid rain is caused by the formation of acid in the air as it meets the water vapour with acid-forming gases. Usually occurs due to air pollution around the factory environment. The usual Gas is the cause of acid rain i.e. the first is CO_2 or carbon dioxide and CO or carbon monoxide, which is derived from combustion results, pollution of motor vehicles, etc. Those, when met with moisture, will form H_2CO_3 or carbonic acid which is included one of the weakest acids. The second is H_2S or hydrogen sulfide and SO_2 or sulfur dioxide, which is derived from the warming of sulfur. Commonly encountered in heavy industrial areas. Those, when met with moisture, will form H_2SO_4 or sulfuric acid which is included one of the powerful acids. According to the Indonesian measuring instrument to detect gas leakage should use gas detector tools, because this tool is the most accurate tool to detect gas.

The acidity of the acid rain depends on the acidic concentrations in the air indirectly, meaning equal to the degree of air pollution in the air. In normal conditions, the rain is acidic

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because of the existence of CO_2 in the air. But the pH is not less than 7. However, in areas with heavy air pollution, aviation will be lower. There is a direct connection between acid rain and corrosion. Corrosion is a metal weathering by oxidizing substances. Acid is a substance that can oxidize with metals. So when the acid rain occurs, it will be corrosive to the metal exposed to the rainwater. Acid rain is clarified as a variety of rain with a pH of less than 5.6. Naturally, the rain is acidic because carbon dioxide (CO_2) in the air that dissolves with rainwater has a form of weak acids.

This type of acid in the rain is very useful because it helps dissolve the minerals on the soil needed by plants and also animals. Acid rain caused by sulfur which includes impurities on fossil fuels as well as nitrogen in the air that reacts with oxygen forms sulfur dioxide and nitrogen oxide. This substance diffuses into the atmosphere and reacts with water to form sulfuric acid and also forms an easily soluble nitric acid that falls along with rainwater. The acidic rainwater will experience elevated levels of soil acidity and surface water harmful to fish and crop life. The term acid rain was first introduced by Angus Smith as he wrote about industrial pollution in the UK. But the term acid rain is not precise, which is the correct deposition of acid. The acid deposition is two, i.e. dry deposition and also wet deposition. Dry deposition is the most famous event of objects and creatures living by the acids in the air. This can occur in urban areas due to air pollution due to vehicles or smoke mills. Besides, dry deposition can also occur in the hilly regions affected by wind and the wind carries air containing acids.

The Greenhouse Effect of Global Warming and Climate Change

Many young people who are on the highway using a motorcycle or a car, if there is no work. Such habits will cause the greenhouse effect to become worse because the smoke produced by vehicles will make the Earth increasingly hot due to the burning of CO2 gas results from the combustion of motor vehicles. Consequently, an excess amount of gas can interfere with climate balance.

Impact of Environmental Energy Change

Impact on Water

Fossil burning such as Motor vehicle smoke can damage and pollute water as well as petroleum exploitation, in particular the way the shelter and transport of unfeasible petroleum, for example, the leaking of tanker oil or other accidents will cause the spill of oil (to the sea, river or groundwater) can cause water pollution. The pollution is caused by human error.

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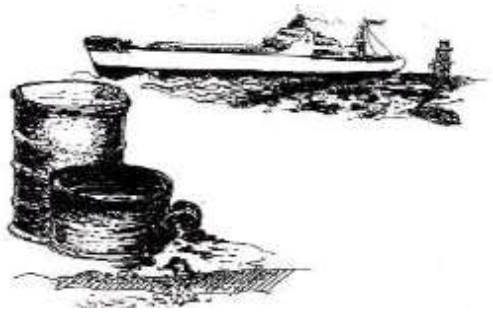

Fig 3. The impact of fossil burning on water

Impact on Land

The impact of energy use on soils can be known, e.g. from coal mines and excessive fossil burning produces substances that can cause soils to become infertile. Problems related to soil coating appear mainly in open Pit mining. This mining requires very wide land. Please note that the coal lining is found in fertile soil, so that if the land is used for coal mining then the land cannot be utilized for farming or forest during a certain time (Allen *et al*., 2012).

CONCLUSION

From the results of the discussion can be concluded chemical energy in fossil fuels converted into heat energy, mechanical, or electricity through combustion. Thus the power plant of motor vehicles and stoves, factories are the main cause of air pollution. Secreted pollutants are usually grouped into hydrocarbons (HC), Nitrogen oxide (NOx), and carbon monoxide (CO). The pollutants produced on fossil burning are the biggest factors of smoke, acid rain, global warming, and climate change. This can be solved by utilizing renewable energy such as solar power, wind energy, seawater waves to create a blue sky.

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