CLIMATE CHANGE AND ITS IMPACT ON INDONESIAN FOOD SECURITY

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Abstract

The future of the human being is not only on how they survive but also relies on ecosystems and natural life. Environmental issues are becoming very interesting issue to be discussed either among environmental activists, academics or government. Even environmental issues became a global agenda that continues to be discussed.

Climate change is happening around the world is a phenomenon, in which increased the Earth's temperature that is due to increasing emissions of greenhouse gases are released into the air. As a result, the instability of weather or climate change global event occurs, such as El Nano, and La Nina, which was then the domino effect conferring on a variety of natural disasters in the world. On the other hand, climate change has resulted in a decline in food production due to failed harvests caused by floods and drought. Nevertheless, the stability of food production must continue to be safeguarded. This article aims to discuss the phenomenon of climate change impact on food security in Indonesia.

Keywords: Environment, Climate Change, Food Security, Climate Change Impacts

1. Background Problem

Since the onset of the industrial revolution that is changing the pattern of human energy production become energy machine. As the development of technology, turned out to be 'buah simala kama', development of technology on the one hand very efficiently and facilitate the work of man but on the other hand very impact on rising carbon dioxide (CO2) is released into the air. This phenomenon is very influential on the depletion of the ozone layer of the Earth (the effect of greenhouse gases), and

certainly affects temperature rise on the surface of the Earth that domino effect conferring on human life 'human security'.

Basically, greenhouse gases such as carbon dioxide, methane and etc., very useful for Earth because it plays to trap heat in the Earth, because without greenhouse gases, the Earth's temperature will be cooler around 30 degrees Celsius the average temperature of the moment. Problems arise when human activities, especially since the industrial revolution led to an increase in atmospheric concentration of greenhouse gases (GHG) happens with sharp.[1]

Based on the report of the review of the 5th (*5) Assessment Reports Intergovernmental Panel on Climate Change* (IPCC), during the years 1906 to 2005 the temperature of surface of the Earth on average has climbed about 0.74 degrees Celsius, which the Mainland will be warmer than the ocean. The late 1990s and the early 21st century were the warmest years since the existence of modern data archives. Increased warming of 0.2 degrees Celsius projected will happen for any decade in the past two decades in the future. The projection is done with some scenarios that did not include reductions in greenhouse gas emissions. One of the evidence that the continued rise in Earth's temperature, it can be seen from the snow and ice is melting, glaciers are shrinking, and permaforst melt, even occurred also increased the frequency of heat waves and the intensity of precipitation in different regions are not in season, including extreme temperatures and heat waves are becoming a commonplace things that happened since the 1950s. it did have an impact on the phenomenon of drought and forest fires that almost occurred in the territories.[2]

Low level of knowledge, education and economic society that limited became part of the factor in which destruction of ecosystems. On the other hand, the development

[1]A.G. Wibisana,*Pencegahan dan Pengendalian Pencemaran dan Kerusakan Lingkungan*, dalam *Hukum Lingkungan: Teori, Legislasi dan Studi Kasus,* (*n.p.*: USAID, Kemitraan dan the Asia Foundation, *n.t.*), p. 421.

[2] Ismid Hadad, *Perubahan Iklim dan Pembangunan Berkelanjutan: Sebuah Pengantar*, *Jurnal Prisma,* Vol. 29 No. 2, April 2010, p. 4.

and advancement of an increasingly modern technology could unwittingly produce carbon dioxide (CO2) and chlorofluorocarbon (CFCs) that can damage the environment and trigger the effects of greenhouse gases and global warming.

Aware of the damage and rise of the Earth's temperature, the international community gives more attention by creating a buzz. Environmentalists and epistemic community conduct research and publish the results of their research, as performed by International non-governmental organization – *Green Peace* –, or research results from Sherwood Rowland and Mario Molina who publishes results of the research about the depletion of the ozone layer.[3]

From the epistemic communities research results, encourage world leaders to immediately give a concrete step in overcoming environmental degradation and the impact of global warming further. In fact, since the start of the industrial revolution (about 1750), human activities impact against climate is much greater than the impact of the result of processes naturally.[4] The impact of climate change is not only having an impact on the developing countries itself but also have an impact on the countries of the non-tropical form of extreme weather. Such as a prolonged drought in the Southeast Asia, South Australia, and Ecuador, blizzard in the United States, heat waves in Brazil as well as severe flooding in the various countries of the non-tropical.[5]

The development of the issue of climate change is making Indonesia as one of the developing countries into international and regional attention. This is because the high number of damage to forests from year to year due to forest fires. Moreover, Borneo's forest is famous as the lungs of the world. The rampant forest fires occurred in Indonesia ever encourage ASEAN countries to make an agreement on air pollution (*the*

[3] P.M. Hass, 'Banning Cholofourcarbons: Epistemic Community Effort to Protect Strateospheric Zone', International Organization, vol. 46, issue 1, Knowladge power and International Policy Coordinating, 1992, p. 189.

[4] Sutamihardja, *Perubahan Lingkungan Global: Sebuah Antologi Tentang Bumi Kita*, Yayasan Pasir Luhur, Bogor, 2010, p. 25.

[5] BBC Indonesia, '*El Nino Bisa Ganggu Pangan Global*' (*online*), 21 Mei 2015, <http://www.bbc.com/indonesia/majalah/2015/05/150521_iptek_elnino_pangan>, diakses 5 Februari 2016.

ASEAN Agreement on Trans boundary Haze Pollution) on 10 June 2002.[6] This agreement is an agreement that is driven by Singapore and Malaysia; both are countries that suffered heavy losses (especially in the economy).[7] Declining food production due to failed harvests caused by floods and drought are also expected to be more often the case, some areas in the eastern part of Indonesia such as Papua and Nusa Tenggara Timur are the most vulnerable to this threat.[8] Prolonged forest fires and continuously occurring in Indonesia each year, gradually increasing Earth's temperature impact, depletion of the ozone layer, and the disruption of the food world, including in Indonesia. On the other hand, global warming also affects the economy of the community, such as the prolonged drought which resulted in high food prices and decreasing purchasing power.

Upon exposure to the above background, this paper tries to discuss about global climate change and its effects which threaten human survival depends on the availability of foodstuffs in Indonesia.

2. Conceptual Foundation

To assist authors in analyzing and exploring principal problem, the author uses some of the concepts, namely; *green politics*, ecocentrism, and climate change.

2.1. The Green Politics

Environmental problems of the world and the problem is often a concern that became the international agenda. According to Gareth Porter and Janet Wels Brown

[6] Haze Action Online, 'ASEAN Agreement on Transboundary Haze Pollution' (*online*), <http://www.haze.asean.org/asean-agreement-on-transboundary-haze-pollution/>, diakses 8 Maret 2017.

[7] Library of Congres, '*ASEAN; Indonesia: Regional Haze Agreement Ratified*' (*online*), 22 September 2014, <http://www.loc.gov/law/foreign-news/article/asean-indonesia-regional-haze-agreement-ratified/>, diakses 8 Maret 2017

[8] BBC Indonesia, '*PBB: Perubahan Iklim Akibat Ulah Manusia*' (online), <http://www.bbc.com/indonesia/dunia/2013/09/130927_pbb_pemanasan_global_manusia>, diakses tanggal 8 Maret 2017.

that issue of the environment is one of the main issues in the area of third world politics, international security and the global economy.[9] The environmental issues become global issues of concern to the entire world countries both developed countries as well as developed countries, because it is closely related to security, peace, and international order.

According to Owen Green there are several reasons why environmental issues become global issues; *first*, some of the environmental problems are *inherent* or attached are global in scope. Where, CFCs are released or emitted into the air (atmosphere) contribute to the depletion of the ozone layer which resulted in climate change. *Second*, environmental issues related to the exploitation of the resource that is owned collectively (*global commons*), namely; Ocean, atmosphere and space. *Third*, in fact, environmental issues are transnational, related to a country's borders. *Fourth,* although, environmental problems are only at local level but its effects also for neighboring countries (cross-border*). Fifth,* with regard to environmental problems of economic, social and political.[10]

In the context of environmental degradation, the growing world population will indirectly will make the environment increasingly polluted or damaged, the loss of soil fertility, desert formation, species extinct, forests are being denuded, air and water pollution, etc.[11]

According to the characteristics of green Politics pose Eckersley (*Green Politics*), namely ecocentrism, which was a rejection of the view of the world anthropocentric. While according to Dobson has a different explanation. Where, Dobson has two

[9] R. Jackson & R. Sorenson, *Pengantar Studi Hubungan Internasional*, Pustaka Pelajar, Yogyakarta, 2009, p. 324.

[10] O. Green, 2005. 'Enviromental Issue', dalam J. Baylis & S. Smith (ed.). *The Globalization of World Politics: An Introdaction to International Relations*, Oxford University Press, Oxford, pp. 452-453.

[11] R. Jackson & R. Sorenson, p. 342.

explanations about the characteristics of Green Politics, namely; Disclaimer of anthropocentrism and restriction of growth.[12]

In the context of an anthropocentrism, Dobson and Eckersley reject the assumption that the presence of anthropocentrism resulted in the destruction of the environment. In addition, according to Eckersley ecocentrism concentrated approaches the value not only of individual organisms, but also various ecological entities such as pollution, species of life, existence and natural ecosystems.[13] In other words, that all living beings are basically concerned with ecology.[14] Thus, the various human activities cannot be viewed only in terms of human interests alone, but should also see the balance between humans and the ecology.

Ecocentrism has four main characteristics, namely: *First*, to identify all human interests ecocentrism against non-humans; *Second*, ecocentrism identifies the non-human community; *Third*, identify the interests of future generations of humans and non-humans; *The fourth*, ecocentrism applying a holistic perspective and atomistic interpretation – assess populations, species, ecosystems, and the environment as a whole as well as system – organism.[15]

In the context of the environment in Indonesia, various natural damage and environmental degradation is not only looking at how wild forest cutters interests or activities that result in damage to the environment in the interest, but also seen in holistic as a unitary organism are interlinked with each other.

Related to environmental damage, ecocentrism encourages the existence of State involvement, acting regionally and globally by forming the structure of global politics.[16]

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[12] S. Burchill & A. Linklater, *Theories of International Relations*, edisi Bahasa Indonesia *Teori-Teori Hubungan Internasional*, diterjemahkan oleh M. Sobirin, Nusa Media, Bandung, 2014, p.338.

[13] R. Eckersley, *Environtmentalisme and Political Theory: Toward an Ecocentric Approach*, UCL Press, London, 1992, p. 47.

[14] R. Eckersley, p. 49.

[15] R. Eckersley, p. 46.

[16] S. Burchill & A. Linklater, p. 339.

Meanwhile, such a structure may provide a global deal to tackle the problems of global warming and environmental degradation.

2.2 Global Warming

Global warming (*global warming*) is a phenomenon and become international issues even the global agenda. The significance of climate change impacts has dangerous to the survival of mankind. A paradigm shift from traditional about security be made non-traditional International Relations scholars characterize the global warming and climate change as part of human security (*human security*). In this context, the Earth's surface temperature, an average rise of around 0.75 degrees Celsius, in the period between 1906 and 2005.[17]

Climate change and global warming refers to the rise in average global temperature. Various phenomena, natural events and human activity are believed to contribute to the rising temperature of the Earth's surface. This is caused by the increased activities related to the greenhouse effect (*greenhouse*), such as carbon dioxide (CO2).[18]

According to the U.S. Agency – *the National Oceanic and Atmospheric Administration* (NOAA) – there are several indicators of temperature of the Earth, where there are seven indicators that have an increased and three indicators decline,[19] including: *First*, the air temperature on the Mainland (*air temperature over land*), which is currently in

[17] B. Winarno, *Isu-IsuGlobalKontemporer*, CAPS, Yogyakarta, 2011, p. 156.

[18] A. Shah, 'Issue, Climate Change and Global Warming Introduction', *Global Issues* (*online*), 1 Februari 2015, <http://www.globalissues.org/article/233/climate-change-and-global-warming-introduction#WhatisGlobalWarmingandClimateChange>, diakses 20 Februari 2016.

[19] National Oceanic and Atmospheric Administration, *NOAA: Past Decade Warmest on Record According to Scientists in 48 Countries*, 28 Juli 2010, <http://www.noaanews.noaa.gov/stories2010/20100728_stateoftheclimate.html>, diakses 21 Februari 2016.

various parts of Indonesia, temperatures began to rise as does the city of Bandung, the cool and cold, it's been getting hot. *Second*, the surface temperature of the sea water (*sea-surface temperature*). In this case, according to Paul Durack that sea temperature rise since the 1970s up until the mid-2000's above average. Even the sea temperature rise is estimated at around 25 percent.[20] *Third*, the air temperature above of the Ocean. *Fourth*, the sea levels, the increasing sea levels and dwindling land. *Fifth*, the ocean heat content, the content of the ocean and sea water is on the inside of the join to become warm or hot. *Sixth*, *humidity and tropospheric temperature* in "*active-weather*" layer atmosphere the bottom or close to the surface of the Earth. While the other three are down, is; the melting of ice in the Arctic, the presence of ice or river, glister and winter in the northern hemisphere.[21] In the context of the melting of polar ice caps resulted in the loss of the polar bear habitat.[22]

In this context, global warming is impacting holistically to the Earth, including human beings, ecosystems, land and sea. While in Indonesia, global warming has significant impact, such as a prolonged drought and flood in almost all regions in Indonesia.

3. Discussion

3.1. **World Climate Change Conditions**

Symptoms of the Earth's surface temperature rise that occurs at this time, due to a rise in the intensity of greenhouse effect that has been known as global warming,

[20] National Geographic Indonesia, *Peneliti Debatkan Kenaikan Suhu Air Laut* (*online*), 24 Oktober 2014, <http://nationalgeographic.co.id/berita/2014/10/peneliti-debatkan-kenaikan-suhu-air-laut> diakses 21 Februari 2016.

[21] National Oceanic and Atmospheric Administration.

[22] National Geographic Indonesia, *Peneliti:Beruang Kutub Bisa Kelaparan Jika Es Mencair*, 27 November 2014,<http://nationalgeographic.co.id/berita/2014/11/peneliti-beruang-kutub-bisa-kelaparan-jika-es-menipis>, 22 Februari 2016.

climate change has resulted in the world and rising sea levels.[23] Climate change is a condition in which the occurrence of changes in world climate patterns, which result in erratic weather changes. This is due to changes in climate variables, such as temperature and rainfall is continuously changed in a very long time period between 50-100 years and resulted in the frequent occurrence of hurricanes, extreme temperatures, as well as the direction of the wind changed drastically.[24]

The weather is changing all the time, the climate will remain the same if its circulation is not compromised, but life happens at this time humans rely heavily once with the technology, it would result in changes in climate occur much more extreme. The phenomenon of climate change is happening globally is caused by two factors, namely; *First*, internal factors or natural, i.e. the existence of internal change in the climate system by nature, it is a phenomenon that was already supposed to happen on the Earth without an indication that occurs because of an action. *Second*, external factors or man-made, that climate change is happening because of human action, human activity in which an effect on the increase in the concentration of greenhouse gases in particular on gas CO_2 ,[25]one of the factors that contributed to the concentration of these is depletion of trees on Earth due to illegal logging.

The results of studies of the IPCC (IPCC Fifth Assessment Report/AR-5) stated that the role of humans is a major factor as the cause of changes in the system environment, including changes in the climate. According to the experts who are members of *The Working Group1* (WG1) argues that has confidence with the confidence level of 95-100%,

[23] O. Soearwoto, *Ekologi, lingkungan hidup dan Pembangunan*, Jakarta: Djambatan, 1997, p. 143.

[24] Ida Nurul Hidayati, Suryanto. 'Pengaruh Perubahan Iklim Terhadap Produksi Pertanian Dan Strategi Adaptasi Pada Lahan Rawan Kekeringan', Jurnal Ekonomi dan Studi Pembangunan, Volume 16, Nomor 1, April 2015, p. 43

[25] IPCC, Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2013.

if the climate changes that occurred since the 1950s are dominated by human activities. [26] On the other hand, basically natural factors also strongly effect on the an increase in concentration in the atmosphere that GRK can resulted in an increase in the average temperature of the Earth, but the main concern is the increase in concentration in the atmosphere that GRK rise sharply after the industrial revolution due to human activities. [27] (See. Figure 2 and Figure 3)

Figure 1. Glass House Gas (GHG) Concentration in the air (CO_2) prior to the industrial revolution[28]

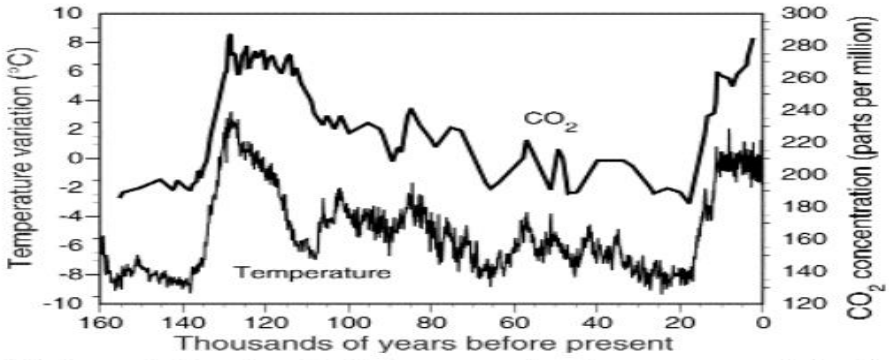


FIGURE 1.6. Atmospheric carbon dioxide (upper curve) and temperature variation (lower curve) over the past 160,000 years, from ice cores taken at Vostok, Antarctica. The record shows long stretches of low temperature (ice ages) separated by brief, warm interglacial periods. The correlation between CO_2 and temperature is quite obvious. Note also the small change, averaging perhaps 6°C, between the present warm climate and the recent ice age. Data do not extend to the present, but stop well before the industrial era. (CO_2 data are from Petit et al., 2000; temperature data from Jouzel et al., 1987, as reproduced in the Carbon Dioxide Information Analysis Center.)

Figure 2. The concentration of GRK (CO_2) after the industrial revolution[29]

[26] IPCC, Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

[27] L. M. Syarif & K. Sarna, "Pencegahan dan Pengendalian Pencemaran dan Kerusakan Lingkungan" dalam *Hukum Lingkungan: Teori, Legislasi dan Studi Kasus,* (*n.p.*: USAID, Kemitraan dan the Asia Foundation, *n.t.*), p. 15.

[28] Intergovernmental Panel on Climate Change (IPCC), 2000: Emission Scenarios: Special Report on Emissions Scenarios, Cambridge, Cambridge University Press.

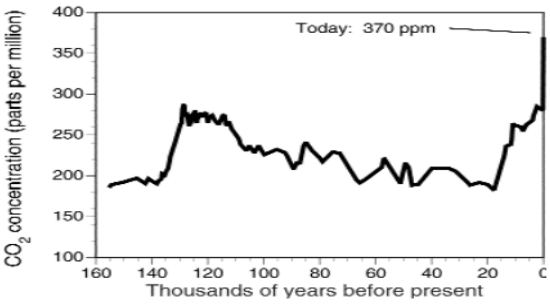


FIGURE 1.7
The CO_2 record of Fig. 1.6, with data to 1999 included. The CO_2 rise of Fig. 1.5 shown here as a dramatic jump to levels not seen on Earth for hundreds of thousands (and probably millions) of years.

Occurs Before the industrial revolution, the concentration of CO_2 for thousands of years has reached a stable point at a rate of about 270 ppm (Parts-Per million). Since the industrial revolution, the concentration rose sharply in 1999, to reach the level of concentration of 370 ppm. [30] In fact, based on the last report of the concentration in the atmosphere has reached GRK 400 ppm. This concentration level never happens during 420,000 years. Then, the acceleration of the increase in concentration as it has never happened during the last 20,000 years.[31] Based on the simulation model of the MERGE[32] (Model for Evaluating the Regional and Global Effects of Greenhouse Gas Reduction Policies), it brings to the conclusion that the concentration would increase global carbon reaches the highest point of 500 ppm by the year 2060, it surely will be greatly impacted against temperature increase on Earth. [33]

The increase in the concentration of the post-industrial revolution that GRK has resulted in an increase in the temperature of the Earth, where in 2001, the global

[29] Intergovernmental Panel on Climate Change (IPCC), 2000: Emission Scenarios: Special Report on Emissions Scenarios.

[30] L. M. Syarif & K. Sarna, p. 15.

[31] A.G. Wibisana, "Pencegahan dan Pengendalian Pencemaran dan Kerusakan Lingkungan" dalam *Hukum Lingkungan: Teori, Legislasi dan Studi Kasus,* (*n.p.*: USAID, Kemitraan dan the Asia Foundation, *n.t.*), p. 422.

[32] Model MERGE merupakan model yang digunakan untuk mengakaji dampak dari perubahan iklim global melalui kebijakan pengurangan emisi GRK, model ini juga telah dikebangkan untuk mengkaji lebih lanjut posisi Indonesia dala kebijakan iklim internasional.

[33] A, S, Manne., R, Richels., & Mendelsohn. "*MERGE – A Model for Evaluating the Regional and Global Effects of Greenhouse Gas Reduction Policies*", Jurnal Energy Policy.Vol 23. 1995. p. 17.

temperature rise since 1901 have reached 0.89 degrees Celsius,[34] even this last three decade respectively conditions are warmer, than one decade earlier, based on scenario modeling[35] it is estimated that at the end of the year 2100, the global temperature will rise approximately 1.8 degrees Celsius up to 4 degrees Celsius in comparison, the average temperature in the year 1980-1999, if compared to the pre-industrial period industry in 1750, the global temperature rise ranging from 2.5 up to 4.1 degrees centigrade degrees Celsius.[36]

Increase in temperature that occurs on an ongoing basis will bring extraordinary impact on various sectors of human life, flora and fauna, as well as other Earth creatures. Besides the threat of drought, forest fires, disruption of ecosystems, availability of water, diversity extinct of Bio resource, a drop in food production, the spread of pests and diseases in plants as well as the danger for human, famine and hunger, social conflict are some of the social, economic and environmental impacts arising from the increase in the Earth's temperature extreme.[37]

Climate change is happening has been bad for global, especially for food security. Extreme weather happens currently making food production went down in the middle of a fixed demand, even up.[38] This phenomenon, becoming the cause of global food crisis causes, such as the occurrence of extreme floods in the country of Thailand, thus

[34] '*Laporan IPCC ke-5, Kelompok Kerja 1*' (online), <http://www.wwf.or.id/?29541/Laporan -IPCC-ke-5-kelompok-kerja-1>, diakses tanggal 14 April 2017.

[35] Pemodelan scenario yang digunakan adalah RCP 8.5 (Representative Concentration Pathway) yaitu sebuah skenario emisi yang digunakan di laporan IPCC ke-5, menggantikan skenario yang dibuat dalam laporan IPCC sebelumnya, yaitu SRES RCP yang merupakan scenario yang lebih meberikan konsentrasi dari emisi, dan tidak secara langsung hanya berdasarkan gabaran mengenai sosial-ekonomi.

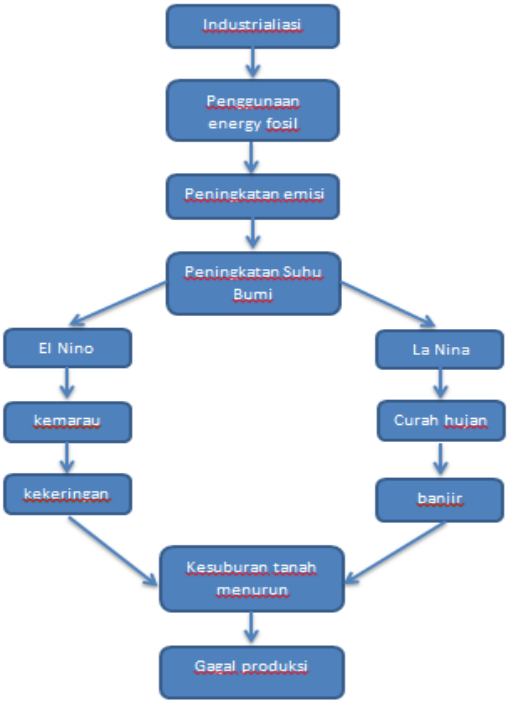
[36] IPCC, Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovenrmental Panel on Climate Change.

[37] Ismi Hadad, p. 4.

[38] Borne Climate Change, '*Perubahan Iklim Picu Krisis Pangan*' (online), 18 Agustus 2011, <http://borneoclimatechange.org/berita-126-perubahan-iklim-picu-krisis-pangan.html>, diakses tanggal 31 Maret 2017.

stopping a while rice exports to other countries and consequently has an impact on the world rice price increase.[39]

Figure 3 Relationship to climate change and food security



The uncertain climate changes that occur when this is mostly caused by humans, one of them a result of the use of fossil fuels in post industrial revolution that has a lot of gas release CO_2 the release of gas into the air, CO_2 in excess to air will result in detention of heat in atmosphere by gas, and will cause damage to the environment and ecosystems on Earth, one of the fatal consequences that occur from increasing CO_2 is the effect a lot on the environment as well as ' human security ' is increasing the Earth's temperature. [40]

[39] Oktavio Nugrayasa, 'Meski Perubahan Iklim, Ketahanan Pangan Harus Tetap Berlanjut' (online), <http://setkab.go.id/meski-iklim-berubah-ketahanan-pangan-harus-tetap-berlanjut/>, diakses tanggal 31 Maret 2017

[40] R, Boer. Ancaman Perubahan Iklim Global terhadap Ketahanan Pangan Indonesia (The Threats of Global Climate Change on Food Security in Indonesia). Jurnal Agrimedia, Vol.15(2), 2010. pp: 16- 21

These circumstances will cause the occurrence of the phenomenon of El Nino and La Nina. El Nino is a phenomenon where rising sea surface temperatures in the Central and Eastern Pacific along the Equator will have an impact on rainfall in some areas will be reduced mainly to the tropics, causing a prolonged drought. Meanwhile, Meanwhile, La Nina, is a natural phenomenon in which the occurrence of sea surface temperature decrease in region East of the Equator in the Pacific Ocean, the phenomenon is the opposite of El Nino, in which will be an increase in rainfall, especially in the tropics, such as Indonesia. Both of these phenomena will certainly very influential towards the destruction of food crops due to a decrease in soil fertility, due to shortage of water due to the occurrence of El Nino, and excess moisture or flooding resulting from the occurrence of La Nina. Both cause a breakdown in the production of food crops, and certainly being a circle of food crisis in Indonesia and the survival of its people.[41]

The State of the global food crisis that is happening at the moment, a result of climate change has become part of the threat *to human security*, in which the State has led to not satisfy quality food when food is one part of the basic necessities of human beings, the situation can lead to starvation is rampant everywhere, and the death rate will begin to rise. Therefore, the current food security into one part of the threat to human security.[42] Evidence that stressed the need for Governments, businesses, and individuals to tackle climate change together, because climate will greatly impact for global food security resulting from damage to the land caused by the erratic temperature changes, it would surely be a threat to the survival of mankind.

As has been stated above that, climate change is also affected by human activity especially in post industrial revolution. Since then the Earth's temperature has increased

[41] "Fenomena El Nino dan La Nina serta dampaknya terhadap Cuaca di Indonesia" (online), <http://oceanservice.noaa.gov/facts/ninonina.html>, diakses tanggal 15 April 2017.

[42] Barry Buzan, *Rethingking Security Afterthe Cold War*, Cooperation and Conflict: The Nordic Journal of International Studies, Vol 32, No 1, p. 5.

continuously which then fatal to the survival of mankind itself. Good damage resulting in natural disasters – floods, storms, landslides, heat waves, and so on – as well as the emergence of plague-disease outbreaks, including food security.

3.2 The world's Efforts in Decreasing Greenhouse Gas emissions

The occurrence of natural disasters, almost continuously throughout the world into his own concern for the epistemic group. Campaign conducted the epistemic and environmental activists are very helpful in encouraging attention to world leaders to take action are clear and significant. Given the importance of environmental issues for the sustainability of the world, various international meetings ever held in particular addressing global climate change, especially for finding solutions how to reduce gas emissions.[43]

The Stockholm Conference in 1972 to become a milestone in addressing the environmental degradation and attempt to build a framework for cooperation between the institutions. The Conference was a response to the environmental issues that appeared after there is research on the ozone layer in the 1960s.[44] The Stockholm Conference became the first biggest Conference produces a range of principles and recommendations, which subsequently became the reference at international meetings, such as the 1985 Vienna Convention, the Montreal Protocol of 1987, the Rio Declaration of 1992 with Agenda 21, the Declaration of the basic forestry and the conventions on climate change and biodiversity.

In addition, 1995 implemented the climate change Convention in Berlin, in the meeting drafted a protocol binding (*legal binding*), which then continued in Kyoto, Japan, and resulted in the Kyoto Protocol of 1997.[45] Although there are already a variety

[43] B. Winarno, *Isu-Isu Global Kontemporer*, Caps, Jakarta, pp. 158-159.
[44] B. Winarno, p. 159.Lihat pula P.M. Hass, p. 189.
[45] B. Winarno, p. 164.

of international agreements, is still not enough to address climate change. This is because there is still a wide difference in the implementation of emission reduction. The Kyoto Protocol is regarded as a milestone in any climate change failed and has been finished in 2012.[46] Although in the end at the climate summit in Doha 2012 about the enactment of the Kyoto Protocol is extended to 2020.

On the other hand, the climate summit in Copenhagen 2009 else fails produce a binding framework. This is due to the reluctance of the developed countries the industries tend to forward and rapidly to reduce emissions, including the United States. In this regard, the developed countries are very influential and played an important role for committed production of greenhouse gas emissions. At the climate summit in Paris, there are a number of commitments and negotiations. As such, the collection of the mobilization of new funding sources starting in 2020 and flows through the mechanism of finance Convention. The SUMMIT deal on climate change or the COP 9 in Paris (*Paris Agreement*) is an agreement that replaces the Kyoto Protocol, which is the commitment of the countries of the world to keep the Earth's temperature rise threshold below 2 degrees Celsius and pressed up to 1.5 degrees Celsius. [47] In addition, the countries of the Paris climate change SUMMIT participants agreed to reduce greenhouse gas emissions as soon as possible by developing technology and absorb carbon. Whereas with regard to the impacts arising from climate change in the form of poverty, sustainable development and agreed collectively by 2025 be 100 billion dollars per year to suppress climate change world.[48]

With global meetings, specifically discussing the world's climate is expected to change the perception of the world in reducing greenhouse gas emissions significantly.

[46] B. Winarno, p. 165

[47] Tempo, *KTT Perubahan Iklim di Paris Berkahir, Berikut Hasil Pembahasan* (*online*), <https://nasional.tempo.co/read/news/2015/12/13/206727284/ktt-perubahan-iklim-di-paris-berakhir-berikut-hasil-pembahasan>, diakses 29 Maret 2017.

[48] Tempo, *KTT Perubahan Iklim di Paris Berkahir, Berikut Hasil Pembahasan* (*online*).

3.3 Global Climate Change Impacts Food Security against Indonesia

The impact of climate change has taken place in all corners of the world. Particularly for Indonesia it in several areas in Indonesia has been experiencing drought and rainfall intensity and frequency is high. Research has shown that in the last 100 years occurred the intensity and frequency of the phenomenon of *El Nino-Southern Oscillation* (ENSO), has affected agricultural production to meet the demand for food in Indonesia.[49] *Indonesia Climate Change Sectorial Roadmap* (ICCSR) shows the projections of temperature and climate variability that will also happen by 2020; an estimated Indonesia will experience changes in precipitation rates, and also change the surface temperature of the sea water. ICCSR estimated sea rise average in Indonesia would be in the range 0.6 cm/year – 0.8 cm/year. While the temperature of the sea is expected to rise to 0.65 degrees Celsius in 2030 to 1.10 degrees Celsius by 2050. ICCSR also provide clean water availability prediction in Indonesia in the year 2030. It is estimated by 2030 Sumatra, Java, Bali, Sulawesi, and Nusa Tenggara will experience a shortage of clean water where water demand will exceed the supply of clean water. This will be affected to food security in Indonesia, both in the farm, as well as the availability of protein that comes from the sea.[50]

Global warming impact on global climate change will lead to a decline in food crop productivity significantly, particularly in the tropics, the global temperature rise over 2 degrees Celsius would increase the frequency and intensity of extreme climate events, it will have an impact on the system of agriculture. Crop failures and loss of production due to climate change extreme events often occur in agriculture, particularly food crops. In Indonesia alone, the prolonged drought which resulted in droughts, often

[49] R, Boer. *Loc Cit.*,

[50] Institute for Essential Service Reform, '*FGD Pemenuhan Kebutuhan Pangan di Indonesia dalam Menghadapi Dampak Perubahan Iklim*' (online),<http://iesr.or.id/2017.01/fgd-pemenuhan-kebutuhan-pangan-di-indonesia-dalam-menghadapi-dampak-perubahan-iklim/>, diakses tanggal 1 April 2017.

associated with the El Nino phenomenon, which is when the phenomenon takes place, the beginning of the rainy season becomes retrograde about 2 months, the incident resulted in the rainy season tends to be shorter, and rainfall during the dry season falls below the normal limit. So, the drought is increasing sharply and the development of pests which resulted in failed harvests. On the other hand, the frequency of occurrence of flooding due to the La Nina phenomenon of, will cause the place flooded paddy fields had a greater experience of pest the pest explosion.

In this context, there are three main factors associated with global climate change that affect the agricultural sector, namely; *First*, changes in rainfall patterns, it is the changes that occur are indicated by the presence of uncertain season; *Second*, the increased precipitation at the time of the rainy season will increase the potential incidence of floods and landslides that can reduce the total area of agricultural land, and *the third*, a drought that occurs when dry season resulted in a decrease in water availability affect the prolonged water supply for urban areas and agriculture.[51]

The increase in the Earth's temperature will also have an impact on the increase in energy consumption as well as the growing threat of famine due to crop production or failed harvest, as a result of excessive evaporation so that water availability is very limited, and later onset of increase in sea levels that have an impact on the widespread inundation of sea water and abrasion in the coastal area as well as the improvement of sea water to the Mainland and threatening food crops that are in the coastal area.[52]

Climate change has led to a decrease in productivity and food crop production due to an increase in air temperature, the intensity of the attacks of pests and diseases, as well as a decrease in the quality of agricultural output. The increase in atmospheric

[51] Hairiah K, Rahayu S, Suprayogo D, Prayogo C,*Perubahan iklim: sebab dan dampaknya terhadap kehidupan*. Bahan Ajar 1. Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Regional Program dan Malang, Indonesia: Universitas Brawijaya, 2016. p. 15.

[52] Hairiah K, Rahayu S, Suprayogo D, Prayogo C,*Perubahan iklim: sebab dan dampaknya terhadap kehidupan*. Bahan Ajar 1. Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Regional Program dan Malang, Indonesia: Universitas Brawijaya, 2016. p. 15.

temperatures by 5 degrees Celsius will be followed by a decrease in the production of corn and soybeans by 40% of 10-30%. Meanwhile, an increase in temperature of 1-3 degrees Celsius from the current state of the rice yield decrease of 6.1-40.2%. This influence is also seen on the plant nuts which indicate the link between decreases in precipitation of 10-40% of the normal condition with decreased production of 2.5-3%. Other data related to the drought provide information that El Nino that occurred in 1997 and 2003 caused declining rice yield of 2-3%. The decline can be more extreme when El Nino coupled with an increase in air temperature. Consortium research and development of climate change (KP3I 2009) Agricultural R & D Agency predicts that climate changes due to El-Nino will expand the acreage of drought that threatened plant.[53]

Food crops mainly rice, are most vulnerable to climate change are the three main factors are related, i.e.; genetic, biophysical and management. It is caused due to food crops is generally annuals are relatively sensitive to excess and shortage of water. Technically, the vulnerability is very closely connected with the system of land use and cropping patterns, soil properties, soil management technologies, water and plants, as well as varieties of plants.[54]

The level of food production in Indonesia is currently threatened in meeting the demand of food consumption. In the last five years, production of rice was grown under 3% per year, while the demand for food is expected to grow at 4.88% per year. Climate change marked by extreme weather such as droughts, floods, and landslides in the central food production in Indonesia has very serious consequences on agriculture production include food security in the country. Climate change is believed to be an

[53] Boer, R dkk.,*Agriculture Sector. Technical Report on Vulnerability and Adaptation Assessment to Climate Change for Indonesia's Second National Communication*, Ministry of Environment and United Nations Development Programme, Jakarta.

[54] Las, I dan E. Surmaini,*Variabilitas Iklim dan Perubahan Iklim dalam system Produksi Pertanian Nasional: Dampak dan Tantangan*. Prosiding Seminar Ilmiah Hasil Penelitian Padi Nasional 2010 (Buku 1). Balai Besar Penelitian Tanaman Padi, Badan Penelitian dan Pengembangan Pertanian, Kementerian Pertanian,2010, p. 11.

important factor in the decline of food production in 2011, where rice production dropped 1.6%, 6%, corn and soybeans a 4% Decrease mostly occurs in the area of Java, where food production is very dependent on agriculture, the quality of infrastructure of irrigation, water management, performance water infiltration, and the management of natural resources in General.[55]

It is not easy to show the empirical evidence about the most significant determining factor of the decline in food production in 2011, whether this decline is caused only by the environmental risks, such as flooding and drought. On the other hand, asserted that the drop in production was caused by the decrease in the widespread harvest of rice, corn, and soybeans. This very significant decline occurred in the province of East Java, Central Java, Yogyakarta, West Java and Banten, where floods and droughts occur in 2013 in the area as the main food production centers in Indonesia. The province also experienced serious problems in agricultural infrastructure, especially irrigation, tissue damage from physical infrastructure and a decrease in the quality of human resources for farmers.[56]

Food crop production systems also face problems such as uneven distribution of land uses and structures, both within the province and the province especially between Java and outside Java. The number of agricultural households in Java increased from 11.7 million in 1993 to become 13.6 million in 2003. The figures for the whole of Indonesia during the same time period increased from 20.8 million to 24.9 million that suggests the addition of more than four million households in agricultural sector for a decade with an average of about 400 thousand new entrants per year. These numbers have serious consequences on the well-being of farmers and rural communities because in general the rice remains the staple food, so each case decreased production will have

[55] Robert A, *Perubahan Iklim Dan Kedaulatan Pangan Di Indonesia. Tinjauan Produksi Dan Kemiskinan*, Sosio Informa Vol. 1, No. 03, September - Desember, Tahun 2015. pp.299-300.

[56] Robert A,p. 300.

implications against poverty.[57] Climate change and its risk on the environment and the continuous land conversion will affect the ability of land resource in Java and rice production will decrease by 5% from the current production capacity by 2025, and continued to decline by 10% in 2050.[58]

More than 76% of households Indonesia are rice consumers and 24 percent of manufacturers. In urban areas, 96% of households are the consumer rice and only 4% are manufacturers of rice; whereas in rural areas, the consumer rice accounted for around 60% of households in rural areas, and 40% of them are producers of rice. The level of consumption of rice in Indonesia currently belong to high with 139 kg/capita/year which consist of direct consumption, used to seed, and rice consumption for the industry. Although the Government is currently in the process of counting the repeated consumption of rice, Indonesia belongs to the Community consumption of rice is high and well above the average world rice consumption (Asia) i.e. 80 kg per capita per year, it would have an impact on rising food prices at the commodity rice, where the decline in national rice production due to drought, so that Indonesia imports rice from outside due to the needs of Indonesia will continue to increase rice , and this is causing the price of rice in Indonesia increase.[59]

Impacts of climate change have been felt by the whole country in any parts of the world, especially for Indonesia itself, the agricultural sector is a very large part to feel the impact of climate change, changes in rainfall patterns resulting from erratic climate change has resulted in time the rainy season and the dry season in Indonesia no longer on its axis, so that the prolonged drought resulting from a longer dry season , and also due to flooding from the monsoon season, has given the impact on the drop in crop production in Indonesia, especially for food crops, its happen because of reduction of

[57] Robert A,p. 300.
[58] Boer, R. Ancaman Perubahan Iklim Global terhadap Ketahanan Pangan Indonesia, p. 17.
[59] Robert A, p. 301.

the planting land, where production continues decline, while demand continues to rise. One of the most important in food crops are rice, rice is the staple food in this community but any rice, Indonesia is one of the food plants are most vulnerable to climate change, continues to decline in production of rice while Indonesia's rice request will continue to rise, making Indonesia more dependent not only on the production of rice in the country, but rather to start importing rice from other countries. This scarcity has resulted in the price of rice in Indonesia continue to rise sharply, and also resulted in the onset of the food crisis in Indonesia. It would have threatened human life, because their needs will not be delayed, food while production levels continue to decline.

4. Conclusion

Climate change has become a threat for all the countries in the world; this is evidenced from various natural disasters that occur nearly throughout parts of the world. Desert flooding in the Middle East, the melting of glister, until the heat wave that was occurred, encourage the epistemic, environmental activist groups, even Governments of developed as well as developing good looking for a workable solution together. In addition, a significant impact for human survival (*human security*), including Indonesia, when climate change is happening. This is because climate change is happening very contributing for the failed harvest, which then leads to scarcity and expensive groceries in the market.

Even so, the issue of climate change is not a problem country, but rather a problem of the whole community and society must contribute reducing greenhouse gas emissions. There are a few things to do good government or community; First, the Government should be made the program of save energy and restrictions on the use of energy from fossil fuels; Second, the Government should make regulations related to

electronic or technology that has Indonesia, environmental standards and penalize companies that do not obey regulations; Third, the need for socializing in all walks of life associated with the formulation of the accepted environmental community

5. Resources

A.G. Wibisana,*Pencegahan dan Pengendalian Pencemaran dan Kerusakan Lingkungan*, dalam *Hukum Lingkungan: Teori, Legislasi dan Studi Kasus*, (*n.p.*: USAID, Kemitraan dan the Asia Foundation, *n.t.*).

A. Shah, 'Issue, Climate Change and Global Warming Introduction', *Global Issues* (*online*), 1 Februari 2015, <http://www.globalissues.org/article/233/climate-change-and-global-warming-introduction#WhatisGlobalWarmingandClimateChange>, diakses 20 Februari 2016

A, S, Manne., R, Richels., & Mendelsohn. "*MERGE – A Model for Evaluating the Regional and Global Effects of Greenhouse Gas Reduction Policies*", Jurnal Energy Policy.Vol 23. 1995..

B. Winarno, *Isu-IsuGlobalKontemporer*, CAPS, Yogyakarta, 2011.

Barry Buzan, *Rethingking Security After the Cold War*, Cooperation and Conflict: The Nordic Journal of International Studies, Vol 32, No 1,

BBC Indonesia, '*El Nino Bisa Ganggu Pangan Global'* (*online*), 21 Mei 2015, <http://www.bbc.com/indonesia/majalah/2015/05/150521_iptek_elnino_pangan>, diakses 5 Februari 2016.

BBC Indonesia, '*PBB: Perubahan Iklim Akibat Ulah Manusia*' (online), <http://www.bbc.com/indonesia/dunia/2013/09/130927_pbb_pemanasan_global_manusia> , diakses tanggal 8 Maret 2017.

Boer, R dkk.,*Agriculture Sector. Technical Report on Vulnerability and Adaptation Assessment to Climate Change for Indonesia's Second National Communication*, Ministry of Environment and United Nations Development Programme, Jakarta.

Borne Climate Change, '*Perubahan Iklim Picu Krisis Pangan*' (online), 18 Agustus 2011, <http://borneoclimatechange.org/berita-126-perubahan-iklim-picu-krisis-pangan.html>, diakses tanggal 31 Maret 2017.

Hairiah K, Rahayu S, Suprayogo D, Prayogo C, *Perubahan iklim: sebab dan dampaknya terhadap kehidupan*. Bahan Ajar 1. Bogor, Indonesia: World Agroforestry Centre (ICRAF) Southeast Asia Regional Program dan Malang, Indonesia: Universitas Brawijaya, 2016.

Haze Action Online, 'ASEAN Agreement on Transboundary Haze Pollution' (*online*), <http://www.haze.asean.org/asean-agreement-on-transboundary-haze-pollution/>, diakses 8 Maret 2017.

Ida Nurul Hidayati, Suryanto. 'Pengaruh Perubahan Iklim Terhadap Produksi Pertanian Dan Strategi Adaptasi Pada Lahan Rawan Kekeringan', Jurnal Ekonomi dan Studi Pembangunan, Volume 16, Nomor 1, April 2015.

Institute for Essential Service Reform, '*FGD Pemenuhan Kebutuhan Pangan di Indonesia dalam Menghadapi Dampak Perubahan Iklim*' (online),<http://iesr.or.id/2017.01/fgd-pemenuhan-kebutuhan-pangan-di-indonesia-dalam-menghadapi-dampak-perubahan-iklim/>, diakses tanggal 1 April 2017.

Intergovernmental Panel on Climate Change (IPCC), 2000: Emission Scenarios: Special Report on Emissions Scenarios, Cambridge, Cambridge University Press.

IPCC, Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the Intergovenrmental Panel on Climate Change. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2013.

Ismid Hadad, *Perubahan Iklim dan Pembangunan Berkelanjutan: Sebuah Pengantar*, *Jurnal Prisma*, Vol. 29 No. 2, April 2010

Laporan IPCC ke-5, Kelompok Kerja 1 (online), <http://www.wwf.or.id/?29541/Laporan -IPCC-ke-5-kelompok-kerja-1>, diakses tanggal 14 April 2017.

Library of Congres, '*ASEAN; Indonesia: Regional Haze Agreement Ratified*' (*online*), 22 September 2014, <http://www.loc.gov/law/foreign-news/article/asean-indonesia-regional-haze-agreement-ratified/>, diakses 8 Maret 2017

Las, I dan E. Surmaini,*Variabilitas Iklim dan Perubahan Iklim dalam system Produksi Pertanian Nasional: Dampak dan Tantangan*. Prosiding Seminar Ilmiah Hasil Penelitian Padi Nasional 2010 (Buku 1). Balai Besar Penelitian Tanaman Padi, Badan Penelitian dan Pengembangan Pertanian, Kementerian Pertanian,2010,

L. M. Syarif & K. Sarna, "Pencegahan dan Pengendalian Pencemaran dan Kerusakan Lingkungan" dalam *Hukum Lingkungan: Teori, Legislasi dan Studi Kasus*, (*n.p.*: USAID, Kemitraan dan the Asia Foundation, *n.t.*).

National Geographic Indonesia, *Peneliti Debatkan Kenaikan Suhu Air Laut* (*online*), 24 Oktober 2014, <http://nationalgeographic.co.id/berita/2014/10/peneliti-debatkan-kenaikan-suhu-air-laut> diakses 21 Februari 2016.

National Geographic Indonesia, *Peneliti:Beruang Kutub Bisa Kelaparan Jika Es Mencair*, 27 November 2014,<http://nationalgeographic.co.id/berita/2014/11/peneliti-beruang-kutub-bisa-kelaparan-jika-es-menipis>, 22 Februari 2016.

National Oceanic and Atmospheric Administration, *NOAA: Past Decade Warmest on Record According to Scientists in 48 Countries*, 28 Juli 2010, <http://www.noaanews.noaa.gov/stories2010/20100728_stateoftheclimate.html>, diakses 21 Februari 2016.

O. Green, 2005. 'Enviromental Issue', dalam J. Baylis & S. Smith (ed.). *The Globalization of World Politics: An Introdaction to International Relations*, Oxford University Press, Oxford, pp. 452-453.

Oktavio Nugrayasa, 'Meski Perubahan Iklim, Ketahanan Pangan Harus Tetap Berlanjut' (online), <http://setkab.go.id/meski-iklim-berubah-ketahanan-pangan-harus-tetap-berlanjut/>, diakses tanggal 31 Maret 2017

P.M. Hass, 'Banning Cholofourcarbons: Epistemic Community Effort to Protect Strateospheric Zone', International Organization, vol. 46, issue 1, Knowladge power and International Policy Coordinating, 1992.

R, Boer. Ancaman Perubahan Iklim Global terhadap Ketahanan Pangan Indonesia (The Threats of Global Climate Change on Food Security in Indonesia). Jurnal Agrimedia, Vol.15(2), 2010.

R. Eckersley, *Environtmentalisme and Political Theory: Toward an Ecocentric Approach*, UCL,Press, London, 1992

R. Jackson & R. Sorenson, *Pengantar Studi Hubungan Internasional*, Pustaka Pelajar, Yogyakarta, 2009

Robert A, *Perubahan Iklim Dan Kedaulatan Pangan Di Indonesia. Tinjauan Produksi Dan Kemiskinan*, Sosio Informa Vol. 1, No. 03, September - Desember, Tahun 2015

S. Burchill & A. Linklater, *Theories of International Relations*, edisi Bahasa Indonesia *Teori-Teori Hubungan Internasional*, diterjemahkan oleh M. Sobirin, Nusa Media, Bandung, 2014

Soearwoto, *Ekologi, lingkungan hidup dan Pembangunan*, Jakarta: Djambatan, 1997.

Sutamihardja, *Perubahan Lingkungan Global: Sebuah Antologi Tentang Bumi Kita*, Yayasan Pasir Luhur, Bogor, 2010.

Tempo, *KTT Perubahan Iklim di Paris Berkahir, Berikut Hasil Pembahasan* (*online*), <https://nasional.tempo.co/read/news/2015/12/13/206727284/ktt-perubahan-iklim-di-paris-berakhir-berikut-hasil-pembahasan>, diakses 29 Maret 2017.