China is a Key to Mitigate Global Climate Change

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Abstract

This paper attempts to discuss China's response on the global climate change. China, well known as the world's largest emitter of greenhouse gases, the largest energy consumer and the second largest economy in the world, contributes for a third of the planet's greenhouse gas output and has one of the world's most polluted cities that surpassed United States and India. China's economy growth has changed its perception on how they should cultivate their land, water, and natural resources. This economic expansion which is driven by fossil fuels, has led to dramatic increases in emissions of greenhouse gases (GHGs). The world concerns on environmental problems in China because it influences the world whether pattern, it effects human life and it influences global community market.

Keywords*: Greenhouse Gases, Environmental Problems, Economy Growth*

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As a rapid industrialization country, China has proven that it could not escape from environmental issue. Included as one of the world's largest source of carbon emission,[1] China is responsible for a third of the planet's greenhouse gas output and has one of the world's most polluted cities. The first part of this paper will explain: what climate change is; the issue of greenhouse gases in China which contributed to global climate change; then will argue why this greenhouse gases in China is important, and where it might lead. The second part of this essay will explain actions that has been taken by China to mitigate climate change.

What is Climate Change?

Climate change is a global issue that affects all people in this world. The adverse impact influences environmental, communities and economy. Therefore, it is important to take significant actions to reduce greenhouse gas emission and prepare for the impacts. Climate change can also influence both global and local climate.[2] Thus, it is important to understand the science of climate change before trying to understand politics behind this climate change issue. In the historical overview of climate change science stated that:

> The climate system is a complex, interactive system consisting of the atmosphere land surface, snow and ice, ocean and other bodies of water, and living things. The atmospheric component of the climate system most obviously characterizes climate: climate is often defined as 'average weather'. Climate is usually described in terms of the mean and variability of temperature, precipitation and wind over a period of time, ranging from months to millions of years. The climate system evolves in time under the influence of its own internal dynamics and due to changes in external factors that affect climate change. External forcing include natural phenomena such as volcanic eruptions and solar variations, as well as human-induced changes in atmospheric composition[3].

[1] -, China: Acting on Climate Change, Australian Government, Department of Industry , Innovation, Climate Change, Science, Research and Tertiary Education, http://www.climatechange.gov.au/sites/climatechange/files/files/international/13029WEBchina013May.pdf, consulted on 26 October 2014.

[2] -, What is Climate Change?, Understanding Climate Change Victoria State Government, http://www.climatechange.vic.gov.au/what-is-climate-change, consulted on 17 August 2014.

[3] L. Treut, H. R. Somervillle, U. Cubasch, et all, the Historical Overview of Climate Change Science. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group

It is important to note that the reason of the earth's surface is the presence of greenhouse gases, which protect earth's surface from radiation. This surface is known as the natural greenhouse effect. Water vapour and carbon dioxide are two important elements that cause greenhouse gases, while nitrogen and oxygen have no such effect.[4]

Besides the natural causes of climate change that mentioned above, there is another causes of climate change called "Anthropogenic Climate Change"[5]. The majority of climate change sciences accept that anthropogenic climate change (ACC) explains clearly the causes of the global temperatures. Surprisingly, sceptics accepted the reason as well.[6] The IPCC Fourth Report released in 2007 stated that, most of evidence confirms that natural mechanisms is the primary cause of the rise of greenhouse gases in the post Industrial countries. In other words this anthropogenic climate change is result from human activities.[7] Similarly, the UK Met Office finds the Anthropogenic Global Warming (AGW) which comes from man activities leads to the climate change. It is because the accumulation of man activities have contributed to the long term climate change.[8] In China, the economy booming since 1980s has significantly contributed to the greenhouse gases which contributed to the global climate change.

The Causes Of Climate Change In China

China's economy reform becomes one of the great success stories of the post-industrial ages.[9] This economy reform has led China to fix its capital formation, and inventories which started from 30% of

I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom and New York, 2007, p. 96. http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch1.html, consulted on 17 August 2014.

[4] L. Treut, H. R. Somervillle, U. Cubasch, et all, p. 97.

[5] Anthropogenic climate change refers to the production of greenhouse gases emitted by human activity. By examining the polar ice cores, scientists are convinced that human activity has increased the proportion of greenhouse gases in the atmosphere, which has skyrocketed over the past few hundred years. See -, Global Green House Warming, Anthropogenic Climate Change, http://www.global-greenhouse-warming.com/anthropogenic-climate-change.html, consulted on 17 August 2014.

[6] M. Goot, p. 1.

[7] -, Anthropogenic Climate Change, Global Greenhouse Warming, http://www.global-greenhouse-warming.com/anthropogenic-climate-change.html, consulted on 17 August 2014.

[8] -, Free Critical Thinking, Anthropogenic Global Warming Theory, http://www.freecriticalthinking.org/climate-change/123-anthropogenic-global-warming-theory, consulted on 17 August 2014.

[9] E. C. Economy, The Environmental Challenge to China's Future The River Runs Black, Cornell University Press, London, 2004, p. 60.

GDP in 1980 to around 47.5% in 2010.[10] This made China becomes 'rival' of the United States in term of economy power. This economy growth has changed China's perception on how should their cultivate land, water, and other natural resources in gaining much benefits for their economy growth. In addition, as Judith Shapiro argues, economy expansion which is driven by fossil fuels, has led to dramatic increases in emissions of greenhouse gases (GHGs). Although per person in China produced emission at the global average, in 2007, China surpassed the United Sates as the country producing the most carbon dioxide.[11] According to 2011 data compiled by the Netherlands Environmental Assessment Agency, 'China was on the top of the list with 9697 million tonnes (MT) or 28.6%, it surpassed UK with 5420 MT or 16.0%'.[12] Moreover, China is also known as one of the largest producer of emitter of methane and black carbon, others major contributors to global warming.[13] Therefore, Beina Xu argues that at least there are two major factors that leads to the environmental degradation in China in regards to its massive economic growth: first is coal- coal is the main factor in degradation of the air quality. In addition, Darcy J. Goel argues that air pollution is not only polluted Beijing but all regions in China. Particulate matter is a result of coal-fired, power plants and other sources. Those are suspected to be the primer cause of 'up to 90 percent of air pollution'. It is important to note, other contributors in the air which are dangerous to human health are nitrogen oxide and sulfur dioxide.[14] As the world's largest coal producer, China is responsible for almost half of global consumption, Coal is also the source of as much as 90 per cent of the country's sulfur dioxide emissions and half of its particulate emissions.[15]. Chinese scientists finds that sulfur dioxide emission which caused by coal burning led to the acid rain, which has similar components with nuclear winter, in China .[16] Moreover, according to Journal of

[10] Y. Zhang, China's Economic Growth 'Miracle' and Its Outlook by 2020, 13 November 2011, http://www.voxeu.org/article/china-s-economic-growth-miracle-and-its-outlook-2020, consulted on 28 October 2010.

[11] H. Kan, Climate Change and Human Health in China, *Environmental Health Perspective*, Vol. 119, no. 2001, p. 60.

[12] D. Clark, Which Nations are Most Responsible for Climate Change?, *The Guardian,* 22 April 2011, http://www.theguardian.com/environment/2011/apr/21/countries-responsible-climate-change, consulted on 29 October 2014.

[13] J. Shapiro, China's Environmental Challenges, Polity Press, United Kingdon, 2012, p. 34.

[14] D. J. Goelz, China's Environmental Problems: is a Specialized Court the Solution?, *Pacific Rim Law & Policy Journal Association*, vol. 18, no. 1, p. 159.

[15] B. Xu, China's Environmental Crisis, Council on Foreign Affairs Relations, 25 April 2014, http://www.cfr.org/china/chinas-environmental-crisis/p12608, consulted on 28 October 2014.

[16] J. Kaiman, China's Toxic Air Pollution Resembles Nuclear Winter, Say Scientists, *The Guardian,* 24

Geophysical Research, the amount of sulfur dioxide and nitrogen oxide that contains in the pollution that comes from China has made China's environmental problem as the world problem.[17] This made China as the largest sources of So2 emission in the world. Sulfur dioxide (So2) is a serious problem both nationally and internationally. As a consequence, neighboring countries have blamed China for the worst climate condition which also effected their countries.[18]

And second is water depletion and pollution as the country's biggest environmental hazards. This caused by overusing, contamination, and waste have produced severe shortages. Further, Xu maintains, China has dammed every major river in the Tibetan Plateau. As a consequence, it caused almost 300 to 500 people who lives in that area have lost access to clean water.[19] A report by the government Xinhua News Agency stated that ninety per cent of groundwater aquifers in almost all China's cities are polluted, which seventy-five percent of surface water in urban areas is unsuitable for drinking and fishing. As a consequence, access to clean drinking water became an expensive thing in China for millions of Chinese.[20] With those severe environmental problems which is dangerous to human and all creatures, the world's concern towards the severe environmental crisis in China has its basis.

Why The Environmental Problems In China Matters To The World?

International communities should concern on environmental problems in China as China's domestic severe environmental problems is not only impact nationally but globally. As mentioned that China is known as the world's top emitter greenhouse gases in the world, the implication has been concerned by neighboring countries such as America, and Asian countries. There are several reasons why the world concerns on environmental problems in China: first, it influences the world whether pattern; second is that it affects human life; and third, it influences global community market.

February 2014, http://www.theguardian.com/world/2014/feb/25/china-toxic-air-pollution-nuclear-winter-scientists, consulted on 29 October 2014.

[17] J. Kahn and J. Yardley, As China Roars, Pollution Reaches Deadly Extremes, 26 August 2007, http://www.nytimes.com/2007/08/26/world/asia/26china.html?pagewanted=all&_r=1&, consulted on 30 October 2014.

[18] D. J. Goelz, p. 159.

[19] B. Xu, China's Environmental Crisis, Council on Foreign Affairs Relations, 25 April 2014, http://www.cfr.org/china/chinas-environmental-crisis/p12608, consulted on 28 October 2014.

[20] D. J. Goelz, p. 159.

Changing The World Pattern

Study that conducted by Texas A&M University and NASA's propulsion Laboratory found that extreme air pollution in Asia, particularly from China, is affecting the world's weather and climate patterns. The study showed that pollution that mostly comes from Asia has contributed to make storm or cyclones becoming even stronger. Further, the study had shown that changing of climate pattern, such as cloud formations, precipitation, and storm intensity has led to the climate globally.[21] This study also showed that the major sources of pollution in China and Asian countries mostly come from both coal burning and car emissions.

Another study finding from scientists in the US, which published in the proceedings at the National Academy of Science, found that pollution from Asia, which much comes from China, has altered the weather pattern in the North Pole. The changes contribute to the changing weather pattern in the US.[22] Further, the smog from Asia has worsened the climate condition as it increases the storm's intensity, ice melting, sea level and drought. In addition, the pollution also causes the changing formation of deep convective clouds, from 20-50 percent.[23]

Human life in Danger

Pollution in China becomes the leading source of death. China's Ministry of Health said that severe air pollution in China is blamed for the death of hundreds of thousands of people each year. Respiratory diseases are now causing of Chinese adult's death. A report from the United Nations in 2002 concluded that '23,000 respiratory deaths, 13,000 fatal heart attacks and 15 million cases of bronchitis were directly attributable to air pollution'. The World Health Organization estimates, air pollution kills 656,000 Chinese each year.[24] Moreover, most of Chinese cities is seen wrapped by a toxic gray shroud. Thus, Beijing has a big responsibility to find a concrete solution

[21] K. Randall, R. Zhang and R. Saravanan, Asian Air Pollution Affecting World's Weather, 21 January 2014, http://tamutimes.tamu.edu/2014/01/21/asian-air-pollution-affecting-worlds-weather/, consulted on 29 October 2014.

[22] J. Kaiman, China's Air Pollution Leading to More Erratic Climate for US, Say Scientists, *The Guardian*, 16 April 2014, http://www.theguardian.com/world/2014/apr/15/china-air-pollution-pacific-climate-us-national-academy-sciences, consulted on 30 October 2014.

[23] R. Lewis, Smog in India, China is Changing Weather Patterns in US, Finds Study, 15 April 2014, http://america.aljazeera.com/articles/2014/4/15/asia-pollution-weather.html, consulted on 30 October 2014.

[24] J. Schweitzer, China's Downfall: the Ultimate Impact of Environmental Degradation, Huffington post, 16 February 2009, http://www.huffingtonpost.com/jeff-schweitzer/chinas-downfall-the-ultim_b_158338.html, consulted on 2 November 2014.

that can clear its polluted skies.[25] It is because the severe environmental degradation has brought negative impacts not only to Chinese but also world's population. That is why China now is becoming one of the key countries that could help the world to reduce environmental problems. Besides, for several weeks, the air quality in China was worse than the air quality in an airport smoking lounge. According to the World Health the concentration of particles with a diameter of 2.5 microns or less, hit 900 parts per million—40 times the level, which could be smelled, tasted and choked on it.[26] In addition, World Health Organization reports, the pollution has severe impacts on temperatures cardiovascular and respiratory disease. It is because the rise level of temperatures influence severely human respiratory system as well as causes pollen and other aeroallergen levels that are appear frequently in the extreme heat.[27] Robert, Harvey and Baoshan argues that China's people uses to cook with stoves and burn coal. In fact they do not know that bad cases which produces from stoves and burn coal contributes to bad quality air. As Finkelman, Belkin and Zheng argues, about 3000 people in Guizhou province located in South West China are suffered from severe lung respiratory system. In addition, more than 10 million people in Guizhou province and surrounding areas also suffer both from dental and skeleton fluorosis.[28]

Influence Global Community Market

China is the largest manufacturing companies in the world.[29] Export trade consumption is driving China growing pollution and resources demands. In fact that Chinese consumption per person is very little. It is about 40 per cent of Chinese GDP goes to savings. On the other hand, China is the world's third largest exporter, after the United States

[25] J. Kahn, As China Roars, Pollution Reaches Deadly Extremes, New York Times, 26 August 2007, http://www.nytimes.com/2007/08/26/world/asia/26china.html?pagewanted=all&_r=1&, consulted on 1 November 2014.

[26] -, The East is Grey, The Economist, 10 August 2013, http://www.economist.com/news/briefing/21583245-china-worlds-worst-polluter-largest-investor-green-energy-its-rise-will-have, consulted on 2 November 2014.

[27] -, World Health Organization, Climate Change and Health, August 2014, http://www.who.int/mediacentre/factsheets/fs266/en/, consulted on 1 November 2014.

[28] R. B. Finkelman, H. E. Belkin, and B. Zheng, Health Impacts of Domestic Coal Use in China, The National Academy of Science Colloquium, vol. 96, March 1999, p. 3427.

[29] L. H. Phathanothai, Environmental Degradation vs Economy Growth in China, Salterbaxter MSL Group, 2008, http://www.salterbaxter.com/directions-2008-environmental-degradation-vs-economic-growth-in-chin/, consulted on 1 October 2014.

and Germany.[30] Significantly, most of China's exports are primary goods or manufactured products that create heavy pollution and require intensive resources uses. 40 per cent of China's energy use goes into its exports. As a consequence of the tighter environmental regulation in the west, many manufacturing companies shifted their goods to China in regarding to the energy intensive.[31] As a result, all goods that are cheaper produced in China, while China at the same time absorbs the pollution and environmental degradation.

Cost of Environmental Degradation

China has spent about US$230 billion in 2010, or 1.54 trillion renminbi is based on costs arising from pollution and damage to ecosystem. That is the price that China had to pay for its rapid industrialization. Alistair Thornton said that

"This cuts to the heart of China's economic challenge: how to transform from the explosive growth of the past 30 years to the sustainable growth of the next 30 years. It is like digging a hole and filling it back in again gives you G.D.P. growth. It doesn't give you economic value. A lot of the activity in China over the last few years has been digging holes to fill them back in again — anything from bailing out failing solar companies to ignoring the 'externalities' of economic growth."[32]

Moreover, China academy for environmental planning calculated that the cost of pollution spills, deteriorating soil, vanishing wetlands, and other impacts surged to 1.3tr yuan (£130bn) in 2008. This was equivalent to 3.9% of the country's GDP. Most of these costs do not appear on corporate balance books or government budgets, but they are accumulating year by year to an environmental deficit that threatens the country's long-term prospects.[33] The central government has increased efforts to clean up the nation's notoriously filthy air and contaminated water, but the report's authors – who are affiliated to the Ministry

[30] L. H. Phathanothai, Environmental Degradation vs Economy Growth in China, Salterbaxter MSL Group, 2008, http://www.salterbaxter.com/directions-2008-environmental-degradation-vs-economic-growth-in-chin/, consulted on 1 October 2014.

[31] L. H. Phathanothai, Environmental Degradation vs Economy Growth in China, Salterbaxter MSL Group, 2008, http://www.salterbaxter.com/directions-2008-environmental-degradation-vs-economic-growth-in-chin/, consulted on 1 October 2014.

[32] E. Wong, Cost of Environmental Damage in China Growing Rapidly Amid Industrialization, New York Times, 29 March 2013, http://www.nytimes.com/2013/03/30/world/asia/cost-of-environmental-degradation-in-china-is-growing.html?_r=0, consulted on 2014.

[33] J. Watts, China Counts US$130 bn Cost of Economic Growth, 29 December 2010, The Guardian, http://www.theguardian.com/world/2010/dec/28/china-130-bn-economic-growth, consulted on 2 November 2014.

of Environmental Protection – say the cost of pollution spills and other environmental damage rose by more than 74.8% in the five years up to 2008.[34] The true figure could be even higher as the authors acknowledge their data is incomplete. A 2007 study by the environment ministry and the World Bank estimated the annual cost of pollution in China at 780bn yuan. This did not fully take into account other forms of environmental degradation, such as loss of biodiversity, desertification and soil decline through over-intensive farming.[35]

China Mitigates Climate Change

As mentioned, the cost of environmental degradation in China has costs China much. Alongside economy growth, China is committed to low-carbon growth. China has identified the need to reduce climate impacts on human health, improve energy, water and resource security, drive technological innovation and move the economy to less carbon intensive service industries.[36] China's central economic planning document, the five year plan, set the country's policy agenda and measure to meet the low carbon commitment. The 12th five year plan for the period 2011-2015 commits China to environmentally responsible economic growth through 'low-carbon development'.[37]

This 12th five year plan (FYP) adopted by Chinese government in March 2011 devotes considerable action to energy and climate change. While some of the targets are largely in line with the status quo, other aspects of the plan represent more dramatic moves to reduce fossil energy consumption, promote low-carbon energy, and restructure China's economy.[38]

According to Joanna Lewis, among the goals is to "gradually establish a carbon trade market". Key target includes (a) a 16 percent reduction in energy intensity (b) increasing non-fossil energy

[34] J. Watts, China Counts US$130 bn Cost of Economic Growth, 29 December 2010, The Guardian, http://www.theguardian.com/world/2010/dec/28/china-130-bn-economic-growth, consulted on 2 November 2014.

[35] J. Watts, China Counts US$130 bn Cost of Economic Growth, 29 December 2010, The Guardian, http://www.theguardian.com/world/2010/dec/28/china-130-bn-economic-growth, consulted on 2 November 2014.

[36] -, China: Acting on Climate Change, Australia Government, http://www.climatechange.gov.au/sites/climatechange/files/files/international/13029WEBchina013May.pdf, consulted on 2 November 2014.

[37] -, China: Acting on Climate Change, Australia Government, http://www.climatechange.gov.au/sites/climatechange/files/files/international/13029WEBchina013May.pdf, consulted on 2 November 2014.

[38] J. Lewis, Energy and Climate Goals of China's 12th five-year Plan, Pew Center on Global Climate Change, March 2011.

to 11.4 percent of total energy use, and (c) a 17 percent reduction in carbon intensity (carbon perunit of GDP).[39]

Moreover, as a part of the Copenhagen climate change summit China's government committed to cut their carbon pollution intensity by 40-45 percent below 2005 level by 2020. In 2012, China was the leading investor in renewable energy, according to Blooming New Energy Finance. The country invested over $66 billion in renewable energy in 2012. And while the totals for this year are not final, it is clear that the pace of clean energy deployment in China continues to surge with recent data showing that China doubled its pace of adding renewable energy capacity in the first 10 months. As a response to their air pollution challenge they have significantly increased their renewable goals in recent months. It is expected even more renewable energy action to be unveiled in the coming months.[40]

China also did cooperation with the United States (US) aim at cutting pollution from vehicles and power stations. The non-binding climate plan will focus on reducing emissions from vehicles, carbon capture and storage technologies, energy efficient buildings, smart grids and greenhouse gas data. The US-China climate change working group, set up in April, will work with the private sector and non-governmental organizations to develop these plans by October. UN Climate Chief, Christiana Figueres said that:

"Concrete policies and actions now to prevent further greenhouse gas emissions and create clean, sustainable economies are the single biggest contribution countries can make to firm up the foundations for a new international climate agreement, for that reason, this new, wide-ranging US-China cooperation to cut emissions from major polluting sources and to boost energy efficiency and renewable energy is both welcome and important."[41]

In addition, there are three key sets of interrelated climate and energy targets in China. The goals and emission mitigation targets stipulated in the 2007 National Climate Change Programme.

[39] J. Lewis, Energy and Climate Goals of China's 12th five-year Plan, Pew Center on Global Climate Change, March 2011.

[40] J. Schmidt, China is Acting on Climate Change and Country Can Do More, 6 December 2013, http://switchboard.nrdc.org/blogs/jschmidt/china_is_acting_on_climate_cha.html, consulted on 2 November 2014.

[41] E. King, US and China Outline 'five actions' to Combat Climate Change, 15 July 2013, Responding to Climate Change (RTCC), 15 July 2014, http://www.rtcc.org/2013/07/11/us-and-china-outline-five-actions-to-combat-climate-change/, consulted on 2 November 2014.

'Targets include the enforcement of mitigation regulations, developing relevant technology and improving energy efficiency and conservation. The successful implementation of the Programme's mitigation targets would, according to the Chinese administration, result in 950 million tonnes of avoided CO2 emissions by 2010. Compulsory energy intensity targets to reduce

Energy intensity by 20 per cent and pollution intensity by 10 per cent within the 11th five-year

Plan (2006–2010). The renewable energy targets for 2010 and 2020 have been set for long-term energy security purposes. The aim is to increase the share of renewable energy in the nation's energy mix to 10 per cent by 2010 and 15 per cent by 2020. China has also set an objective of having 30 per cent or more of its total energy requirements met by renewable sources by 2050'.[42]

During 2009, China overtook the US to become the leading investor in the renewable energy technologies. According to researchers in the Pew Charitable Trusts, China has invested US$34,6bn in clean energy over the year, almost double the US figure.[43] China aims to spend 34 per cent of its US$586 billion stimulus package on Green projects, as well as US$100 billion to upgrade the rail and transmission grid system that one report calls the "backbone of China's clean energy economy.[44]

Conclusion

This paper has discussed that China has recognized the severe impacts of its growing economy. It leads China to take precaution actions to mitigate the impacts through its 12th five years plan for period 2011-2015, and did cooperation with the US in order to cut emission. Through its commitment, China has proven itself as a country that can be counted for a responsibility to mitigate global climate change.

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