

**DETERMINANT OF LEVEL OF CLIMATE CHANGE DISCLOSURE BY  
DEVELOPED AND EMERGING COUNTRIES IN ASIA PACIFIC.**

**By**

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### DECLARATION

I hereby declare that the project is based on my original work except for quotations and citation which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at USM or any other institutions.

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**FAKTOR PENENTU PENYINGKAPAN KEPADA PENDEDAHAN PERUBAHAN  
IKLIM DI NEGARA-NEGARA MEMBANGUN DAN SEDANG  
MEMBANGUN DI ASIA PASIFIK**

**Abstrak**

Kajian ini bertujuan untuk mengkaji bagaimana tiga belas negara yang melibatkan seratus sebelas syarikat dari sepuluh industri yang berbeza pendedahan laporan mengenai perubahan iklim melalui pengurusan pentadbiran firma serta ciri-ciri yang membabitkan sesebuah organisasi. Kajian dijalankan berdasarkan kepada laporan berkaitan dengan perubahan iklim yang diterbitkan dalam laporan kelestarian dan laporan tahunan oleh setiap firma di negara membangun dan sedang membangun di rantau Asia Pasifik bagi tahun 2008. Kajian ini menganalisa isi kandungan dari setiap laporan dalam mengklasifikasikan pendedahan terhadap operasi pembangunan yang dikelolakan. Kajian diperluaskan berdasarkan kepada beberapa kriteria seperti saiz firma, industri yang terbabit, kedudukan sesebuah negara, pensijilan persekitaran, jumlah lembaga pengarah, jumlah eksekutif bebas, struktur kepimpinan ketua pegawai eksekutif dan jantina di pilih dalam menentukan tahap yang mempengaruhi laporan berkaitan perubahan iklim di sesebuah organisasi. Berdasarkan teori agensi kajian ini menunjukkan terdapat persamaan dan perbezaan keputusan berkaitan lembaga pengarah bebas. Keputusan merekodkan tahap pendedahan laporan berkaitan perubahan iklim di sesetengah negara sedang membangun masih terlalu rendah, tetapi pembahagian eksekutif bebas dalam lembaga pengarah dan penggalakan dari jabatan pentadbiran mengasingkan kedudukan ketua pegawai eksekutif selaku lembaga pengarah dalam sesebuah firma serta berusaha mendapat dan mengekalkan taraf pensijilan persekitaran akan dapat meningkatkan prestasi laporan berkaitan perubahan iklim di dalam laporan operasi pembangunan. Selain dari itu, firma yang mempunyai jumlah kelainan jantina dalam kedudukan lembaga pengarah turut meningkatkan kemungkinan elemen yang terdapat dalam

laporan tentang perubahan iklim. Sebaliknya, saiz firma dan jumlah lembaga pengarah gagal menunjukkan sebarang perhubungan yang signifikan dengan tahap pendedahan.

**Kata kunci : Pendedahan perubahan iklim, analisa kandungan, teori agensi, pengurusan pentadbiran, ciri-ciri pentadbiran syarikat, laporan operasi pembangunan berterusan, pemanasan global.**

# **DETERMINANT OF ADOPTION OF CLIMATE CHANGE DISCLOSURE BY DEVELOPED AND EMERGING COUNTRIES IN ASIA PACIFIC.**

## **Abstract**

This study investigates how well 111 firms in ten industries, across thirteen countries, are addressed climate change through corporate governance characteristics and firm attributes. This study is based on climate change disclosures made in the sustainability and annual reports by firms domicile in developed and emerging countries in Asia Pacific for the year 2008. The study uses content analysis to construct weighted and unweighed disclosure indices. Based on the extent literature, several variables namely firm size, industrial membership, country domicile, environment certification, board size, independent non-executives, the CEO duality structure and gender are selected and their influence on the level of climate change disclosure was tested empirically. As for agency theory, this study offers both confirmatory and contradictory results regarding board independence. The result reveal that, in spite of the fact that level of the climate change disclosure in some of emerging countries in Asia Pacific is still low, by increasing proposition of independent non-executives in board of directors, encouragement of firms' practices who separates the CEO-board chair role and firm practices in obtaining and maintaining environment certification would directly increases the climate change disclosure in their sustainability reports. Despite that, firms that demonstrate lack of gender diversity in board would increase the climate change reporting system practices. Surprisingly, firm size and board size failed to show any significant relationship with disclosure level.

**Keywords:** Climate change disclosure; content analysis; agency theory; corporate governance; firm attributes; sustainability report; global warming.

# CHAPTER 1

## INTRODUCTION

### 1. Background of the studies

A series of major atmospheric environment issues face the world. These issues are already affecting human health and well-being. The green cover is rapidly shrinking on planet earth and the pollution levels are rising. Air pollution affects the global warming which has become a major global challenge. Impacts are already evident, and changes in water availability, food security and sea-level rise are projected to dramatically affect millions of people throughout the world. The recent Pakistan floods began in July 2010 following heavy monsoon rains. The monsoon rains has claimed over two thousand people have died and over a million homes have been destroyed since the flooding began. This devastating incident believed exerted from global warming.

Global warming is a term used to describe the increase of average temperature of earth's near surface air and oceans. According to the Intergovernmental Panel on Climate Change (IPCC) observed increase in global average temperature in middle 20<sup>th</sup> century are due to the increased anthropogenic greenhouse concentration (IEA, 2009). The increased concentrations of key greenhouse gases (GHG) are direct consequences of human activities. In simple term, GHG are gases in an atmosphere that absorb and emit radiation within the thermal infrared range. The earth's temperature is controlled by balancing between incoming radiation from the sun and the losses of energy as it bounces back into the space. From the incoming solar radiation, 30% is reflected back into space and the balance 70% is absorbed mostly by land and oceans. Even this 70% of solar radiation would not stay permanently absorbed, otherwise the earth would again continually warm up and life would not be possible. It is re-emitted

primarily as long-wave, infra-red radiation back into space. Thus, some of this re-radiated energy is absorbed by water vapour and by “greenhouse gases” which exist in the atmosphere. The principal greenhouse gas is carbon dioxide, but the principal absorbing agent is water vapour. The effect of this absorption of the reradiated energy is to produce another round of re-radiation, this time back to the earth’s surface, where it is absorbed once again.

This process is the fundamental cause of the greenhouse effect. The main GHG in the earth's atmosphere are water vapor, carbon dioxide, methane, nitrous oxide, and ozone. Scientists believe that a rise in carbon dioxide, methane nor nitrous oxide levels will further aggravate the situation. The greenhouse effect causes the earth’s heat to be trapped in the atmosphere, which results in the increase in temperature. In order to avoid the devastating effects of climate change, global warming should stay well below a 2°Celsius increase compared to pre-industrial temperatures (WWF, 2008).

Continuing emissions of greenhouse gases from human activities are likely to result in significant changes in mean climate and its intraseasonal and interannual variability in the Asian Pacific region. According to IPCC report published in 2001, with the current state of climate general circulation models (GCMs) projections of future regional climate suggest that the area-averaged annual mean warming would be about 3°C in the decade of the 2050s and about 5°C in the decade of the 2080s over the land regions of Asia as a result of future increases in atmospheric concentration of greenhouse gases (Lal, Harasawa, & Murdiyarso, 2001).

For instances, Malaysia has enjoyed one of the least polluted urban environments in Asia. However in the past decade of rapid economic growth and industrialization has caused serious environmental challenges in Malaysia. The most prominent at the moment are considered to be air pollution from industrial emissions and solid waste management. Climate change is considered to be one of the biggest threats facing nature and humanity today. In Malaysia, a significant increase of the mean annual temperature ranging from 0.99 to 3.44°C per 100 years is observed (Wai, Camerlengo, & Wahab, 2005). The mean annual temperature exhibit that the warming trend has greatly increased significantly in the past 30 years, with values ranging from 1.35 to 6.33°C per 100 years (Wai et al., 2005). In big cities like Kuala Lumpur, the rate of increase has been much higher than the global average due to factors such as the heat island effect that is caused by rapid urbanization. For Kuala Lumpur, the temperature has risen 0.4°C each decade in the last 40 years (Li, 2009).

This has increase the public concern on environment and concrete scientific evidence on misleading human activity on environment has lead climate change issues on to political agenda. In 1988, the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO) established the IPCC to provide policymakers with authoritative scientific information (UNEP, 2002). In 1992, IPCC published a report concluding that the growing accumulation of human-made GHG in the atmosphere would “enhance the greenhouse effect, resulting on average in an additional warming of the Earth’s surface in upcoming years if there are no drastic action taken to overcome the problem. United Nations Framework Convention on Climate Change (UNFCCC) established on May 1992, by the United Nations General Assembly to handle the growing environmental issue (UNEP, 2002).

## **1.1 United Nations Framework Convention on Climate Change (UNFCCC)**

In March 1994, UNFCCC has set the ultimate objective, which is:-

Seeks to stabilize atmospheric concentration of greenhouse gases “*at a level that would prevent dangerous anthropogenic (human-induced) interference with the climate system*”.

According to the UNFCCC, climate change is defined as “change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods (UNEP, 2002). The UNFCCC sets no mandatory limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. In that sense, the agreement is considered legally non-binding. Instead, the treaty provides for updates that would set mandatory emission limits (UNEP, 2002). The principal update is the Kyoto Protocol. As of December 2001, the UNFCCC currently has received 186 instruments of ratification (UNEP, 2002). The UNFCCC divides the countries into two groups namely Annex 1 and non-Annex 1 Parties. Annex 1 includes the industrialized countries who have historically contributed the most to climate change whereas, non-Annex I Parties, which includes primarily the developing countries.

## **1.2 Kyoto Protocol**

Kyoto protocol was initially adopted on 11 December 1997. It is a protocol aimed to fight global warming and entered into force on 16 February 2005. In November 2009, 187 states have signed and ratified the protocol (UNEP, 2004). Malaysia signed and ratified the protocol on 4 September 2002. Annex I countries agreed to reduce their collective greenhouse gas emissions by 5.2% from the 1990 level as an average over the period 2008-2012. The

protocol cover six main greenhouse gases namely carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); and sulphur hexafluoride (SF<sub>6</sub>) (PTM, 2006). The Protocol also allows these countries the option of deciding which of the six gases will form part of their national emissions reduction strategy. Some activities in the land-use change and forestry sector, such as afforestation and reforestation, that absorb carbon dioxide from the atmosphere, are covered (PTM, 2006).

The five principal concepts of the Kyoto Protocol are:

- commitments to reduce greenhouse gases that are legally binding for annex I countries, as well as general commitments for all member countries;
- implementation to meet the Protocol objectives, to prepare policies and measures which reduce greenhouse gases; increasing absorption of these gases and use all mechanisms available as described in the protocol,
- minimizing impacts on developing countries by establishing an adaptation fund for climate change;
- accounting, reporting and review to ensure the integrity of the Protocol;
- compliance by establishing a compliance committee to enforce commitment to the Protocol.

The Protocol establishes three cooperative mechanisms designed to help industrialized countries (Annex I Parties) reduce the costs of meeting their emissions targets by achieving emission reductions at lower costs in other countries (UNEP, 2002). The three mechanisms are-

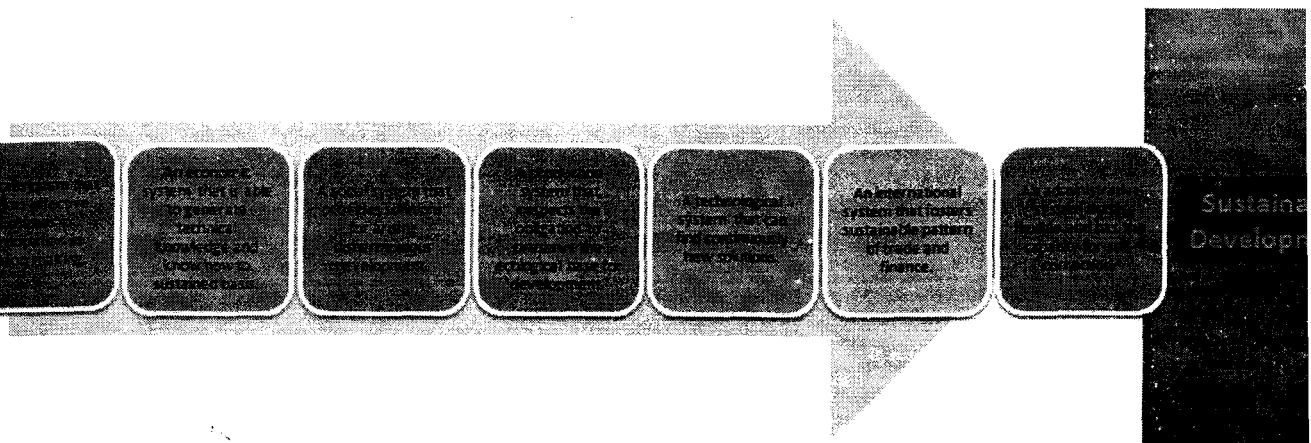
- International Emission Trading permits countries to transfer parts of their 'allowed emissions'.

- Joint Implementation (JI) allows countries to claim credit for emission reductions that arise from investment in other industrialized countries, which result in a transfer of equivalent “emission reduction units” between the countries.
- The Clean Development Mechanism (CDM) allows emission reduction projects that assist in creating sustainable development in developing countries to generate “certified emission reductions (CERs)” for use by the investor.

The mechanisms give opportunities to countries and private sector companies to reduce emissions anywhere in the world. Through emission reduction projects, the mechanisms could stimulate international investment and provide the essential resources for cleaner economic growth in all parts of the world. Among the three flexible mechanisms as illustrated in the Kyoto Protocol, CDM is the only that permits the developing countries like Malaysia, India, China, Thailand, Indonesia and South Korea to participate in global mitigation effect.

### **1.3 Sustainable Development**

Sustainability development is a development that meets the needs of the present without compromising the ability of future generations to meet their needs. In the broadest view, sustainable development aims to promote mutual understanding among human beings and between humanity and nature. Eventually sustainable development requires more in nature as shown in Figure 1. of goals that should underlie national and international action on development, which inter-related to global issues such as poverty, inequality, hunger and environmental degradation (Brundtland, Khalid, Agnelli, Al-Athel, Chidzero, Fadika, Hauff, Lung, Shijun, Botero, Singh, Nogueira-Neto, Okita, Ramphal, Ruckelshaus, Sahnoun, Salim, Shaib, Sokolov, Stanovnik & Strong, 1987)



**Figure 1: Sustainable Development**

Source: Brundtland et al. (19

The concept of sustainable development was popularized by the World Commission on Environment and Development (WCED) in its report “Our Common Future” that published in 1987 and evolved further during World Commission in the Rio Conference in 1992. Sustainable development entails integrating objectives of environmental, social and economic. Asia well endowed with natural resources has undergone rapid economic, social and environmental change, a process that is continuing that caused land and ecosystems degraded, species are threatened and global warming is becoming apparent. To slow the damage caused by human development, it is essential that each country to have an actions to become more sustainable (Brundtland et al., 1987). Asia Pacific region faces formidable environmental and socio-economy challenges in its effort to protect valuable natural resources. Resources are the backbone of every economy. In using resources and transforming them, capital stocks are built up and add wealth of present and future generations. However, land, energy, water and air quality are deteriorating while continued increases in consumptions and associated waste have contributed to the exponential growth in the region’s existing environmental problems (UNFCCC, 2007).

Resources efficiency is essential foundation of sustainability. Communities can significantly reduce environmental impacts and improve the economy by using energy, water and materials more efficiently, and by using better manufacturing techniques that cut pollution, waste and production costs because the correlation between economic activity, energy use, and human development is well established (Kawai & Anbumozhi, 2009). Nowadays more and more communities are realizing the economic and environmental costs of sprawl and inefficient community infrastructure and design. New approaches like planning water, energy, transportation, buildings and community systems offer cost-effective, environmentally sensitive. By using these sustainable approaches, government and residents will preserve the environment for present and future generations.

Developing countries are the most vulnerable to climate change impacts because they have fewer resources to adapt, socially, technologically and financially. Asia Pacific country need international assistance to support the adaptation in the context of national planning for sustainable development, more capacity building and transfer of technology and funds. Furthermore, the region is highly subject to natural hazard, for example the 2004 Indian Ocean Tsunami, the 2005 Pakistan Earthquake and the 2006 landslide in the Philippines. In fact sustainability development is far reaching approach to repair and avoid these problems whereby Asia Pacific region have to understand and adapt what are the forces drive to sustainability which is an ongoing process and something to strive for, rather than a static set of actions as shown in Figure 2 (Bauer & Thant, 2010).



Source: Bauer & Thant (2010)

**Figure 2: Forces Driving Sustainability**

All of these forces as depicted in Figure 2 should be acknowledged for their impacts on and potential opportunities for the community, industry and countries. Properly harnessed, these forces can play important roles in achieving the goals of sustainable development. Climate change has the potential to undermine sustainable development and increase poverty. An effective way to address the impacts of climate change is by integrating adaptation measures into sustainable development strategies to reduce the pressure on natural resources, improve environmental risk management, and increase social well-being of the poor. Most Asia Pacific country is developing countries, and already hardest hit by climate change, have very less human capacity and financial resources. Spending to adapt to climate change will undermine funding for sustainable development, putting strong pressure on countries budget and development assistance. It is therefore vital that ways and means are found to enable developing countries to enhance their efforts to adapt in the context of sustainable development and sustainable development must incorporate adaptations plans.

Sustainable development can resolve successfully many key issues faced in any countries today. Within the context of the good business from social, economic and environmental perspective, sustainable development is especially effective across the country that offered practical solutions to common problems. Sustainable development can enhance a sense of place, reduce crime, mitigate natural hazard, conserve energy and resources, preserve culture and heritage, improve traffic circulation, and reduce waste. Perhaps most important, it can help relate and integrate the many components of a country to achieve a synergistic as a whole.

### **1.4 Climate Change in Brief**

According to the IPCC, for the past few decades, human activities especially in generating energy to drive the global mobility and commerce have influenced the structure of the planet whereby affecting the climate system (IPCC, 2001). Rising human activities in fossil fuel burning and land usage, generates GHG into the earth's atmosphere. Increase in GHG concentration in atmosphere help to entrap heat exerted from sun. Increase in heat leads towards greenhouse effect. This effect drives the climate change. Disruption of climate system has lead towards unpredictable weather condition in all continents. The key characteristic of climate change is, increase in average global temperature which is known as global warming (UNFCCC, 2007).

IPCC defines the climate change as a change in the state of the climate that can be identified by changes in the mean and / or the variability of its properties and that persists for an extended period, typically decades or longer (Bernstein, Bosch, Canziani, Chen, Christ, Davidson, Hare, Huq, Karoly, Kattsov, Kundzewicz, Liu, Lohmann, Manning, Matsuno, Menne, Metz, Mirza, Nicholls, Nurse, Pachauri, Palutikof, Parry, Qin, Ravindranath,

Reisinger, Ren, Riahi, Rosenzweig, Rusticucci, Schneider, Sokona, Solomon, Stott, Stouffer, Sugiyama, Swart, Tirpak, Vogel & Yohe, 2007). Despite that, in the perspective of UNFCCC, climate change is viewed as a side effect of unplanned and unsustainable human activity. UNFCCC describe climate change as a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods (Bernstein et al., 2007).

### **1.5 The Scientific view of Climate Change**

Sun is the main source of energy in universe. Earth absorbs radiation exerted from the sun and circulates the heat with the help of mediums such as atmospheric and ocean. Most of the heat is radiated back to the space via the equilibrium process where incoming solar radiation energy is balanced roughly by the outgoing terrestrial radiation (IPCC, 2001). This process helps to keep the earth warm. If any of these elements in the process of heat distribution are disturbed, the consequence will affect the climate behavior. A change in the net radiative energy available at the atmosphere recognized as radiative forcing<sup>1</sup>. A positive radiating forcing will warm the environment whereas negative radiating forcing tends to cool the environment (Bernstein et al., 2007; IPCC, 2001).

Radiating forcing is positively related to GHG. Higher concentration of GHG in atmosphere will reduce the efficiency of Earth surface radiates to space. Thus, it enhanced the greenhouse effect. The major greenhouse gases are water vapour, carbon dioxide, ozone, methane and nitrous oxide (IPCC, 2001). Other element that helps to increase the negative radiating forcing is anthropogenic aerosols. These elements are a microscopic airborne particles or

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<sup>1</sup> In climate science, radiative forcing is loosely defined as the change in net irradiance at the atmospheric boundary between the troposphere and the stratosphere.

droplets in the troposphere which are commonly found from fossil fuel and biomass burning which help to reflect solar radiation. Besides that, sulphate aerosols which commonly obtained from the volcanic eruption activity, acts as an agent to cool the earth surface. These elements, namely anthropogenic aerosols and sulphate aerosols have much shorter lifetime than most of the greenhouse gases (Bernstein et al., 2007; IPCC, 2001).

Changes in temperature affect numerous aspects of our daily lives and economy. Temperature is one of most frequently used indicators of climate change. Direct measurement of surface temperature been practiced since 19<sup>th</sup> century. Thousand of measurement instruments installed in land and ocean, which are used to record temperatures updates globally. With the aid of these instruments, most of the variables in the equation of global warming are known. These helps to understand and indentify the major contributors towards global warming. Global average temperature<sup>2</sup> is one of the most-cited indicators of global climate change and the temperature has increased since 1861. The average global temperature rise by 0.74°C since 1906 until 2005 in comparison to 0.64°C during the period of 1906 until 2000 (Bernstein et al., 2007; IPCC, 2001; Preston, Suppiah, Macadam, & Bathols, 2006; UNFCCC, 2007). There has been drastic increase in average global temperature between years 2000 to 2005. The temperature increase is spread over the globe but the impact is greater at northern latitude. Over the past 100 years, average arctic temperatures have increased twice the global average temperature rate (UNFCCC, 2007).

Another indicator for climate change is the global mean sea level. Global mean sea level has been rising at an average rate of approximately 1.8 mm per year from 1961 to 2003, which is significantly larger than the rate averaged over the last several thousand years. Since 1993,

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<sup>2</sup> The average of near surface air temperature over land, and sea surface temperature.

global sea level has risen at an accelerating rate of around 3.1 mm per year (Bernstein et al., 2007). From the observation of ocean temperatures for couple of decades, thermal expansion has been contributing consistently towards sea level changes. Deep ocean temperatures changes slowly, therefore thermal expansion would continue for many centuries even if the atmospheric concentrations of greenhouse gases were to stabilize (IPCC, 2001). Besides that, sea level is affected by the mass of seawater changes when ocean water is exchanges with the water stored on land as ice sheet especially in Northern Hemisphere. Scientist belief that thermal expansion of the ocean has contributed around 57% of the total sea level rise. Decrease in glaciers and an ice cap contribute 28% of the sea level rise whereas the balance 15% exerted from losses of polar ice sheets (Bernstein et al., 2007).

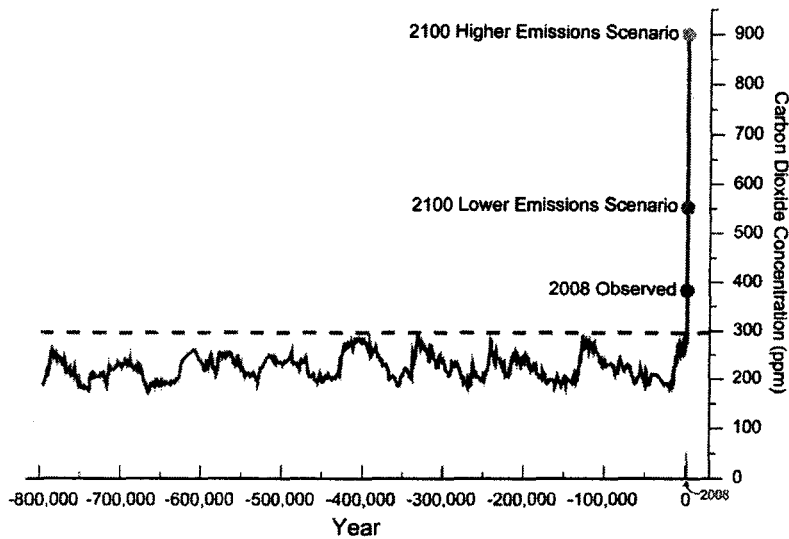
Over the years before the Industrial Era, the atmospheric concentration of GHG remained relatively constant. Since the industrialization culture evolved in human life style, the concentrations of many greenhouse gases have increased directly and indirectly because of human activity. Human activities result in emission of four main greenhouse gases namely carbon dioxide, methane, nitrous oxide and halocarbons<sup>3</sup>. Atmospheric concentrations of greenhouses gases increase when emissions are larger than removal processes.

Seamless time and effort spent in observing and interpreting the past variation and changes in the Earth's climate. These efforts have shown positive results towards identifying the variables influencing the climate system. Most influential driving forces on climate are the increases in the atmospheric concentration of GHG, aerosols and the variation in solar activity (Bernstein et al., 2007; IPCC, 2001). The radiative forcing of the climate system is dominated by the greenhouse gases. Its annual emission have grown between 1970 and 2004 by about 80%, from 21 gigatonnes to 38 gigatonnes (Bernstein et al., 2007). One of the key

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<sup>3</sup> A group of gases containing fluorine, chlorine or bromine.

elements in the GHG is carbon dioxide (CO<sub>2</sub>). In the duration for the past 800 000 years, the CO<sub>2</sub> concentration in the atmospheric is maintained in range between 170ppm and 300ppm (NESDIS, 2010) as depicted in Figure 3.

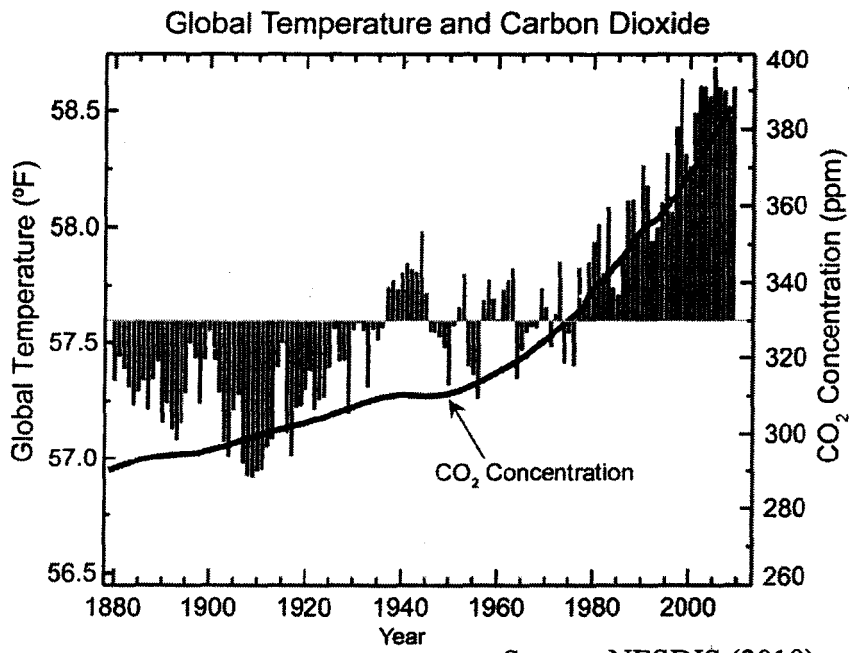


Source: NESDIS (2010)

**Figure 3: 800,000 Year records of Carbon Dioxide (CO<sub>2</sub>) concentrations**

The concentration of CO<sub>2</sub> in the atmosphere has increased by roughly 35 percent since the start of the industrial revolution. In late 1940s drastic increases in GHG in the atmospheric, has directly influenced to increase of global average temperature. Figure 4 clearly shows the direct relationship between carbon dioxide concentration and global average temperature. Middle of year 2010, the CO<sub>2</sub> concentration has reached 380ppm (Bernstein et al., 2007; NESDIS, 2010; Preston et al., 2006). Meanwhile, other contents of GHG namely nitrous oxide (N<sub>2</sub>O) and methane (CH<sub>4</sub>) have increased by 17% and 151% respectively to their concentration prior to the industrial revolution (Preston et al., 2006). As the GHG concentration increases, average global temperature increases proportionately.

Amount of solar energy emitted is another factor influence the global temperature. Total amount of solar energy from sun follows its natural 11 years cycle as shown in Figure 5, which been measured via satellites since 1978. Analysis on the solar life cycle shown there was not any extraordinary behavior recorded. Thus, the net increase of solar energy throughout the observation period is zero (NESDIS, 2010). This indicates that it is extremely unlikely that solar influence has been a significant driver of global temperature change over several decades.



**Figure 4: Global temperature and carbon dioxide**