

MARKET-BASED SOLUTION TO MITIGATE CLIMATE CHANGE : OPTIONS FOR THAILAND'S PARTICIPATION

By

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บทคัดย่อ

การเปลี่ยนแปลงสภาพภูมิอากาศ (Climate change) เป็นปัญหาเร่งด่วน ในขณะที่นักวิทยาศาสตร์ยังหาข้อยุติไม่ได้ว่าการเปลี่ยนแปลงสภาพภูมิอากาศเป็นผลจากการกระทำของมนุษย์ (Anthropogenic) หรือธรรมชาติ แต่ในด้านกฎหมายระหว่างประเทศแล้วประเทศส่วนใหญ่ได้ลงนามในอนุสัญญาสหประชาชาติว่าด้วยการเปลี่ยนแปลงสภาพภูมิอากาศ (The United Nations Framework Convention on Climate Change) รวมถึงพิธีสารเกียวโต (Kyoto Protocol) เพื่อวางกรอบและแผนดำเนินการรักษาระดับก๊าซเรือนกระจก (Greenhouse Gases: GHG) ในชั้นบรรยากาศเพื่อยับยั้งอันตรายที่เกิดขึ้นต่อสภาพภูมิอากาศของโลก

ประเทศไทยได้ร่วมเป็นภาคีทั้ง UNFCCC และ พิธีสารเกียวโต แต่ด้วย “หลักการความรับผิดชอบร่วมกันในระดับที่แตกต่างกัน” (Common but Differentiated Responsibilities) ที่ใช้กำหนดความรับผิดชอบในการปล่อยก๊าซเรือนกระจกของแต่ละประเทศ ส่งผลให้ประเทศไทยยังไม่ผูกพันในการลดปริมาณการปล่อยก๊าซเรือนกระจก อย่างไรก็ตาม ในอนาคตประเทศไทยควรเตรียมความพร้อมเพื่อรับผลของการเจรจาแก้ปัญหาการเปลี่ยนแปลงสภาพภูมิอากาศรอบใหม่ที่จะเกิดขึ้นหลังปีพ.ศ. 2555 วิธีที่มีประสิทธิภาพในการลดก๊าซเรือนกระจกอย่างหนึ่ง ได้แก่ การใช้กลไกทางการตลาด (Market-based solution) ในที่นี้คือ กลไกการค้าก๊าซเรือนกระจก (emission trading or cap-and-trade program) ซึ่งเป็นวิธีการที่แพร่หลายในหลายประเทศ สำหรับประโยชน์ที่ได้นอกจากการลดปริมาณการปล่อยก๊าซเรือนกระจกแล้วกลไกดังกล่าวยังทำให้สามารถใช้พลังงานได้อย่างมีประสิทธิภาพ (energy efficiency) และเกิดการพัฒนาเทคโนโลยีเพื่อช่วยลดปริมาณการปล่อยก๊าซเรือนกระจก ดังนั้นประเทศไทยควรเรียนรู้และเปรียบเทียบประสบการณ์ด้านการค้าก๊าซเรือนกระจกจากนานาประเทศเพื่อให้เห็นถึงแนวทางและรูปแบบในการจัดตั้งตลาดซื้อขายก๊าซเรือนกระจกในประเทศไทย นอกจากนี้แล้วหลักการค้าก๊าซเรือนกระจกยังสามารถนำไปประยุกต์แก้ไขปัญหาการเปลี่ยนแปลงสภาพภูมิอากาศในระดับภูมิภาค เช่น อาเซียน (ASEAN) ได้เช่นกัน

การแก้ไขปัญหาก๊าซเรือนกระจกโดยใช้กลไกทางการตลาดจะมีผลต่อนโยบายด้านเศรษฐกิจการค้า สิ่งแวดล้อม รวมถึงการนิติบัญญัติ ดังนั้นประเทศไทยจะต้องพัฒนาโครงสร้างสำหรับ

กฎหมายรองรับการค้าก๊าซเรือนกระจกโดยต้องพิจารณาหลากหลายปัจจัยเข้าด้วยกันทั้งหลักกฎหมาย เศรษฐศาสตร์ วิทยาศาสตร์ การค้า และสิ่งแวดล้อม จึงเป็นที่แน่นอนว่าประเทศไทยและระบบกฎหมายไทยกำลังเผชิญหน้ากับการท้าทายครั้งสำคัญ



Abstract

Climate change is an emerging problem. One possible cause of climate change is increasing Greenhouse Gases (GHG) in the atmosphere. However, scientists continue to disagree whether anthropogenic or natural forces are the culprit. Without waiting for a final conclusion from scientists, under the principles of international law, the majority of countries in the world have agreed to take measures to stabilize the concentrations of GHG currently in the atmosphere in order to deter hazardous anthropogenic interference with the climate. In doing so, many countries are parties to the United Nations Framework Convention on Climate Change (UNFCCC) and its protocol - the Kyoto Protocol - which establish a framework and action plan to address the issue of climate change.

Thailand is a party to the UNFCCC and Kyoto Protocol, and may not yet be required to meet Kyoto Protocol emission limits under the common but differentiated responsibilities principle. However, the post-Kyoto protocol negotiation round has started to create and implement a plan to address climate change after the year 2012. In order to prepare to implement the results of the post-Kyoto protocol negotiations, Thailand should prepare to ensure the reduction of GHG. Among other measures, a market-based solution is an efficient tool to mitigate climate change, in addition to a cap-and-trade program, which is prevalent among many countries. Aside from leading to a reduction in GHG, a market-based solution will ensure energy efficiency and the development of technology. Therefore, Thailand should learn from and compare emission trading experiences from different emission trading systems and other countries. Engaging in such a study will permit the design of Thailand's emission trading system. Furthermore, the cap-and-trade program can assist in addressing the issue of climate change at the regional level, such as through ASEAN.

Emission trading will create major policy, economic, environmental, and legislative challenges. Therefore, Thailand must develop a formal legal structure for emissions trading that combines legal, economic, scientific, commercial, and environmental principles. It is clear that Thailand and its legal system are facing an exciting challenge and a new era.

KEYWORDS : “Climate Change,” “Mitigation,” “Emission Trading,” “Cap and Trade,” and “Emission Trading in Thailand.”

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INTRODUCTION

Currently, the earth is facing many climatic changes which lead to an increase in the average global air and ocean temperatures, the widespread melting of snow and ice and a rising average global sea level.² Scientists work around the clock to determine the causes and root of the problem. According to some findings of scientists, one of the causes of the change in climate and its effects is global warming.³ Unfortunately, there are still some debates among scientists regarding the causes of global warming. On the one hand, some scientists believe that global warming is caused by increasing Green House Gases (GHG) in the atmosphere, which are primarily caused by anthropogenic or human activities. On the other hand, some scientists argue that the global warming phenomenon occurs through nature. This article does not aim to settle these debates. Rather, this article focuses on the international laws addressing climate change. Since 1992, the United Nations Framework Convention on Climate Change (UNFCCC) established an international framework to begin addressing the problem of climate change. In 1997, the Kyoto Protocol to the United Nations Framework Convention on Climate Change (Kyoto Protocol) created an action plan to implement the UNFCCC with specific GHG emission reduction targets and mechanisms for emission reduction.

¹ The author would like to thanks Professor Nicholas Robinson for his guidance, comment and encouragement.

² Intergovernmental Panel on Climate Change, *Climate Change 2007: Synthesis Report - Summary for Policymakers*, at 2 (2007) [hereinafter IPCC's Fourth Assessment Report], available at http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr_spm.pdf.

³ National Academy of Sciences (NAS), *Understanding and Responding to Climate Change: Highlights of National Academies Report*, at 2 (2005), available at <http://dels.nas.edu/basc/Climate-HIGH.pdf> (Explaining the phrase "climate change" is growing in preferred use to "global warming" because it helps convey that there are changes in addition to rising temperature).

Thailand is a party to both the UNFCCC and the Kyoto Protocol. These treaties do not yet require Thailand to implement a GHG emission reduction target. However, sooner or later, all nations will see the results of the new international negotiation round addressing climate change. There will be limits on emissions, such as those discussed in this article, and there will be goals for the sequestration of CO₂, such as through the photosynthesis of plants, which constitutes a topic for the Convention on Biological Diversity, as well as for the UNFCCC. Thailand and other developing countries will possibly be required to reduce emissions under the new specific GHG emission reduction target. This leads to the question of whether Thailand is prepared for future GHG emission reductions. This article concentrates on the new legal issues of GHG emission reduction for Thailand by focusing on the emission trading aspect. This article will compare selected existing national, regional, and voluntary programs that exist to address emissions. Consequently, this article will discuss which emission trading option is best for Thailand.

This article is divided into four sections. First, although this article does not focus on the climate change debate, this part provides scientific background knowledge about the earth's atmosphere and greenhouse gas emission. Next, this section highlights the anthropogenic and natural forces surrounding the climate change debate.

Second, this article provides the background and principles of international law addressing climate change. It examines the Global Village's agreement to tackle climate change by focusing on the UNFCCC and the Kyoto Protocol.

Third, this article analyzes the global response to emission trading, while surveying and comparing emissions trading programs among the European Union Emission Trading Scheme; the Northeast USA Regional Greenhouse Gas Initiative; the Chicago Climate Exchange; and the Emission Trading Program of China.

Finally, this article focuses on the next steps Thailand should take regarding GHG emission trading within its borders. Why should Thailand focus on emission trading? What can Thailand learn from the emission trading survey? What steps should Thailand take in order to make emission trading work?



A. CLIMATE CHANGE: IS IT A TRUE STORY?

1. The Earth's Atmosphere and Greenhouse Emissions

The Earth's atmosphere is composed of various gases, including Greenhouse Gases (GHG). GHG contain gases such as carbon dioxide, methane, ozone, nitrous oxide, and water vapor in varying amounts. These gases act as a blanket around the Earth's atmosphere, trapping in heat when the sun's energy enters the atmosphere in the form of light waves and heats up the Earth. Some of the energy warms the Earth and then is radiated back into space in the form of infrared radiation waves. The atmosphere will trap and balance the outgoing infrared radiation to maintain a sustainable and comfortable temperature on the Earth. Without the GHG to trap the outgoing infrared, the Earth's surface would have a temperature of approximately zero Fahrenheit or about minus eighteen Celsius.⁴

Some GHG occur through human activities, while others come from both human activities and are naturally produced. Colorfluoro carbons (CFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF₆) are among the class of GHGs generated exclusively through human industrial processes.⁵ Carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O) are naturally occurring GHGs, although certain human activities elevate the levels of these naturally occurring gases.⁶ For instance, CH₄ is created by livestock and other agricultural practices and by the decay of organic waste, as well as during the production and transport of coal, natural gas, and oil.⁷ Similarly, N₂O is emitted during agricultural and individual activities, including the combustion of solid waste and fossil fuels.⁸ CO₂ is released into the atmosphere through changes in land use both naturally such through wild fires; in addition to through human activities such as deforestation and through the burning of solid waste and fossil

⁴ See Kirstin Dow and Thomas E. Downing, *The Atlas of Climate Change: Mapping the World's Greatest Challenge*, at 30 (2006).

⁵ See U.S. Environmental Protection Agency (EPA), *Climate Change: Greenhouse Gas Emissions*, <http://epa.gov/climatechange/emissions/index.html#ggo> (last visited June 12, 08) (The CFCs are banned under The Montreal Protocol and the HFCs will be eliminated under decisions taken in Montreal in 2007 by the states party to the Vienna Convention for the Protection of the ozone layer).

⁶ See *id.*

⁷ See *id.*

⁸ See *id.*

fuels, specifically oil, natural gas and coal.⁹

GHG have an long-term physical impact on the atmosphere, as once GHG is emitted into the atmosphere, it circulates around the globe and remains in the atmosphere for many decades. Consequently, CO₂ emitted over Bangkok has the same effect on global warming as that emitted over New York, Paris, or Beijing.¹⁰

2. Global Warming: Who is the suspect?

There are two main discussions surrounding the occurrence of global warming through anthropogenic forces and natural forces. Some scientists argue that anthropogenic forces are increasing the amount of naturally occurring GHG in the atmosphere at unnatural rates, causing the Earth's atmosphere to change from a thin layer of atmosphere to a layer thickened by huge quantities of greenhouse gases that trap a significant amount of outgoing infrared radiation, which increases the temperature of the Earth's atmosphere. Others argue that global warming occurs naturally through natural occurring processes and phenomenon.

Global Warming: Anthropogenic Force

In 2001, the White House requested that the National Academy of Sciences identify the areas in the science of climate change where there are the greatest certainties and uncertainties. Specifically, one of the questions was “[i]s human activity the cause of increased concentrations of greenhouse gases and other emissions that contribute to climate change?”¹¹ The response from the National Academy of Sciences indicated that “[t]he changes observed over the last several decades are likely mostly due to human activities”¹²

Furthermore, continuous research on climate change is conducted by the Intergovernmental Panel on Climate Change (IPCC). The IPCC was established in 1998 by the United Nations Environment Program and the World Meteorological Organization. The IPCC is the foremost international scientific authority on global climate change. Regularly, the members of the IPCC meet and release reports on the potential effects of global warming caused by GHG. The IPCC's

⁹ See *id.*

¹⁰ See Michael B. Gerrard, “Introduction and Overview,” *Global Climate Change and U.S. Law*, at 5-6 (Michael B. Gerrard ed. 2007).

¹¹ See Committee on the Science of Climate Change, National Research Council, *Climate Change Science: An Analysis of Some Key Questions*, at vii,

<http://www.gcrio.org/OnLnDoc/pdf/ClimateChangeScience.pdf>.

¹² See *id.* at 2.

First Assessment Report was published in 1990.¹³

In 2007, the IPCC released its Fourth Assessment,¹⁴ the latest report which reveals that the “[w]arming of the climate system is unequivocal”¹⁵ and points out that eleven of the last twelve years (1995 -2006) rank among the twelve warmest years in the instrumental record of global surface temperatures. Furthermore, this time period was accompanied by rising temperatures and sea level, and decreasing amounts of snow and ice.¹⁶ Furthermore, the IPCC’s Fourth Assessment indicated with confidence that a significant cause of climate change, or global warming since 1750 was human activity,¹⁷ caused primarily by fossil fuel use, through industries and transportation; and land-use change and agriculture,¹⁸ through which forests are cut down for urbanization, agricultural purposes, or the creation of new roads. These activities can release CO₂ into the atmosphere.

Skeptics of Global Warming

On the other hand, other scientists argue that increased global warming is driven by a natural phenomenon, and not human activities. Dr. S. Fred Singer, an atmospheric physicist at George Mason University, claims that, “[c]limate change is a nature phenomenon. [The] climate keeps changing all the time. The fact that the climate changes is not in itself a threat, because, obviously, in the past human beings have adapted to all kinds of climate changes.”¹⁹ Furthermore, currently over 30,000 American scientists have signed the Global Warming Petition Project,²⁰ to assert that the “human-caused global warming hypothesis is without scientific validity and that government action on the basis of this hypothesis would unnecessarily and counterproductively

¹³ See generally Intergovernmental Panel on Climate Change, *IPCC Reports*, <http://www.ipcc.ch/ipccreports/index.htm>.

¹⁴ The IPCC’s Fourth Assessment is based on the assessment carried out by the three Working Group of the IPCC.

¹⁵ See IPCC’s Fourth Assessment Report, *supra* note 2, at 2.

¹⁶ See *id.*

¹⁷ See *id.* at 5.

¹⁸ See *id.* at 5.

¹⁹ Frontline, *What’s Up with the Weather?*, <http://www.pbs.org/wgbh/warming/debate/singer.html> (last visited June 14, 2008).

²⁰ Global Warming Petition Project, <http://www.petitionproject.org/index.html> (last visited June 14, 2008) (Stating in the petition that [t]here is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gases in causing or will, in the foreseeable future, cause catastrophic heating of the Earth’s atmosphere and disruption of the Earth’s climate. Moreover, there is substantial scientific evidence that increase in atmospheric carbon dioxide produce many beneficial effects upon the natural plant and animal environment of the Earth).

damage both human prosperity and the natural environment of the Earth.”²¹

These are just some examples of scientists’ debate on climate change. The debate ensues, as scientists continue to debate whether human activities are responsible for climate change, or whether global warming is a naturally occurring phenomenon. Nonetheless, climatic skeptics do not deny that ice caps are melting and sea levels are rising. Furthermore, climate change and global warming has more than an environmental impact. Climate change has direct and indirect consequences on the economic and socio-cultural aspects of society, such as the tourism sector, the agricultural sector, and human health. Therefore, adaptation and mitigation to the phenomenon is required.

3. Global Warming and its Economic Aspects

The Stern Review on the Economic of Climate Change, or the Stern Report, addressing the economic aspects of climate change, published in October 2006 by Sir Nicholas Stern, confirms that climate change is a serious problem that has “serious impacts on world output, on human life, and on the environment.”²² The current level of greenhouse gas levels is 430 parts per million (ppm) CO₂ equivalent (CO₂e). If we start taking action now to stabilize greenhouse gas emissions at a reasonable level, such as 450-550 ppm CO₂e to reduce the worst impacts of climate change, it would prove difficult and costly to stabilize the level at 450 ppm CO₂e. However, if we delay, the opportunity to stabilize at 500-550 ppm CO₂e may be lost. Moreover, if no action is taken to reduce emissions, the global average temperature could rise by more than 2 degrees Celsius by 2035, as compared with pre-industrial levels. Therefore, the review concludes that the benefits of strong and early action far outweigh the economic costs of not acting. Furthermore, the review estimates that action now would cost around 1 percent of global gross domestic product (GDP) each year, whereas doing nothing now and handling with the result of climate change later would cost between 5 to 20 percent or more of annual GDP. The rich countries must support the less affluent countries in addressing climate change by providing them with better information, and improving planning and climate-resilient crops and infrastructure,

²¹ Global Warming Petition Project, *Purpose of Petition*,

http://www.petitionproject.org/gwdatabase/GWPP/Purpose_Of_Petition.html (last visited June 14, 2008).

²² Her Majesty’s Treasury, *Stern Review: The economic of Climate Change, Summary of Conclusion*, at vii (2006), available at

http://www.hm-treasury.gov.uk/media/9/9/CLOSED_SHORT_executive_summary.pdf.

even though adaptation will cost tens of billions of dollars a year in developing countries.²³ Stern's view is that in solving and addressing global warming, countries must act sooner than later.

However, many critics of the Stern Review, such as Robert Mendelsohn, Yale economist, challenge the scientific foundation of the Stern Review and argue the Stern Review may be missing some key parts in its analysis. Furthermore, critics argue that the adaptation sector overestimates damage, and that humans can adapt to climate change. Therefore, the policymaker should fully consider all aspects of the report before significantly investing in abatement measures.²⁴

B. THE INTERNATIONAL RESPONSE TO CLIMATE CHANGE: INTERNATIONAL FRAMEWORK

Although scientists have not reached a consensus regarding the causes of climate change, the majority of nations have agreed to take action in addressing climate change. Many nations have signed and ratified the United Framework Convention on Climate Change and the Kyoto Protocol, which currently have 192 and 182 parties, respectively. The main purpose of these agreements is to guide and require international cooperation to reduce GHG in the atmosphere. Therefore, this part will present the principles of both treaties.

1. United Nations Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change²⁵ (UNFCCC) was opened for signature in 1992 at the United Nations Conference on Environment and Development in Rio de Janeiro.²⁶ The objective of UNFCCC is to achieve the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interfer-

²³ See *id.* at vi-ix.

²⁴ Robert O Mendelsohn, *A Critique of the Stern Report*, 29 Regulation 44 at 44-46 (2007), available at <http://www.cato.org/pubs/regulation/regv29n4/v29n4-5.pdf>.

²⁵ United Nations Framework Convention on Climate Change, May. 9, 1992, 31 I.L.M. 849 (1992) [hereinafter UNFCCC] available at <http://unfccc.int/resource/docs/convkp/conveng.pdf>.

²⁶ See *id.* at art. 20 (UNFCCC was opened for signature by State Members of the United Nations or any of its specialized agencies, or Parties to the Statute of the International Court of Justice and by regional economic integration organizations at Rio de Janeiro, during the United Nations Conference on Environment and Development (between June 3-14, 1992), and thereafter at United Nations Headquarters in New York from 20 June 1992 to 19 June 1993).

ence with the climate system.”²⁷ The UNFCCC went into force in 1994 when a sufficient number of parties have ratified the UNFCCC.

The UNFCCC divides participating countries into two main categories: developed countries²⁸ and developing countries as Annex I and non-Annex I respectively. The countries were divided into categories because of the UNFCCC views that developed countries bear a greater historical responsibility for the accumulation of GHG emission,²⁹ and the differing ability of states to respond to it. Consequently, Article 3 sets forth one of the foundations regarding developing nations’ responsibility toward climate change; the idea of “common but differentiated responsibilities and respective capabilities,”³⁰ combined with the notion that developed countries should take the lead in fighting climate change. The developed countries listed in Annex I to the Convention take greater responsibility than developing countries in creating policies and measures aimed at stabilizing GHG emissions at 1990 levels by 2000.³¹

The Convention constitutes a mechanism to hold regular meetings to draft concrete measures, under which a series of meetings, known as the Conference of the Parties (COP), have been and continue to be held. The COP is the supreme body of the UNFCCC; it is the highest decision-making authority and is an association of all the countries that are parties to the Convention. The COP consists of all of the governments that are parties to the Framework Convention. It has responsibilities for reviewing the implementation of the UNFCCC.³² The COP also can adopt amendments or new protocols to the Framework Conventions.³³

2. The Kyoto Protocol to the United Nations Framework Convention on Climate Change

The Kyoto Protocol to the United Nations Framework Convention on Climate Change³⁴ (Kyoto Protocol) was adopted in 1997 at the third annual Conference of the Parties (COP-3) in

²⁷ See *id.* at art. 2.

²⁸ See *id.* at art. Annex I.

²⁹ See *id.* at pmb1 (stating “the largest share of historical and current global emissions of greenhouse gases has originated in developed countries, that per capita emissions in developing countries are still relatively low and that the share of global emissions originating in developing countries will grow to meet their social and development needs”).

³⁰ See *id.* at art. 3(1) - (2) and art. 4(1)(a)-(j) (recognizing differentiated responsibilities of developed and developing nations).

³¹ See *id.* at art. 4(2)(b).

³² See *id.* at art. 7.

³³ See *id.* at art. 15 - art. 17.

³⁴ Kyoto Protocol to the United Nations Framework Convention on Climate Change, Dec. 10, 1997, 37 I.L.M. 22 (1998) [hereinafter Kyoto Protocol], available at http://unfccc.int/kyoto_protocol/items/2830.php.

Kyoto, Japan. The Kyoto Protocol established the legal framework within which GHG³⁵ and mechanism reduction would take place by maintaining the concept of differentiated responsibilities established by the UNFCCC. The Kyoto Protocol aimed at reducing emissions of GHG to stabilize “greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system,”³⁶ by establishing legally binding agreements by industrializing countries³⁷ (Annex I parties) committed to limit their specific individualized emission targets, listed in Annex B of the Kyoto Protocol.³⁸ It has an overall goal of reducing greenhouse gas emissions to 5.2% below 1990 levels by 2008-2012 (“Kyoto Commitment Period” or “First Commitment Period”).

However, these goals are far from being attained. The Kyoto Protocol took a long time before coming into force. A precondition for the Protocol to take effect was ratification by fifty-five member signatures, representing at least 55% of total climate change emissions.³⁹ Therefore, the Kyoto Protocol did not come into force until February 2005, after Russia added itself to the list of 141 ratifying countries in November 2004.

The Kyoto Protocol also provides “flexible mechanisms”, including emission trading under which Annex I Parties are enabled to achieve their emission reduction goal at the lowest economic cost. The flexible mechanisms offer market-based approaches for achieving emission reductions across borders. The key features of these flexible mechanisms are:

(a) Joint Implementation (JI)⁴⁰: allows an Annex I country to receive Emission Reduction Units (ERUs) credits for implementing a carbon emission-reducing project in another Annex I country, and these ERUs can be traded.

(b) Clean Development Mechanism (CDM)⁴¹: this allows Annex I Parties to implement the long-term, measurable benefits of emission reduction projects in non-Annex I Parties in order

³⁵ See *id.* at Annex A (listing carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, and sulfur hexafluoride as greenhouse gases).

³⁶ See UNFCCC, *supra* note 25, at art. 2.

³⁷ See *id.* at Annex I.

³⁸ See Kyoto Protocol, *supra* note 34, at Annex B.

³⁹ See *id.* at art. 25 (1).

⁴⁰ See *id.* at art. 6; See also UNFCCC, *Joint Implementation*, http://unfccc.int/kyoto_protocol/mechanisms/joint_implementation/items/1674.php (last visited June 15, 2008).

⁴¹ See Kyoto Protocol, *supra* note 34, at art. 12; See also UNFCCC, *Clean Development Mechanism*, http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php (last visited June 15, 2008).

to generate a Certified Emission Reductions (CERs) with the CDM Executive Board (EB)⁴² under the certain circumstances.⁴³ The host country must have an established Designated National Authority (DNA), which decides whether the proposed CDM project promotes the country's sustainable development goal.⁴⁴ The CERs approved and registered can be used to meet emission reduction commitments by trading.⁴⁵

(c) Emission trading⁴⁶: this involves the Annex I Party setting an overall cap on emission allowances (EUAs) that can be allocated to the affected national industry participants, each allowance representing a ton of CO₂ equivalent (CO₂e). Emissions trading allows companies to emit in excess of their allocated allowances by purchasing allowances from other participants with surplus allowances within a market trading structure. Not only can Annex 1 parties trade allotted credits, they can also trade any credits they receive through the other CDM and JI mechanisms.⁴⁷ To understand more rules and guidelines under the Kyoto Protocol see the Marrakech Accords, or the production from the seventh annual Conference of the Parties (COP-7), held in Marrakech. COP-7 addressed trading mechanisms, compliance systems, and other key elements of the Kyoto Protocol.⁴⁸

C. CURRENT EMISSION TRADING SYSTEMS

As the Kyoto Commitment Period will finish in 2012, in December 2007, the COP meeting in Bali established a negotiation to prepare a post-Kyoto Legal Framework. After the UNFCCC Bali Action Plan negotiations conclude, all current emission trading systems will need to apply the new treaty commitment and be amended quickly. So, the existing models of trading will be modified. Meanwhile, negotiations are examining the existing models as possible foundations for the new emission -trading regime. Therefore, the following models are the actual

⁴² See Kyoto Protocol, *supra* note 34, at art. 12(4).

⁴³ See *id.* at art. 12 (5)(a)-(c).

⁴⁴ See generally Report of the Conference of the Parties on its Seventh Session, Held at Marrakesh from 29 October to 10 November 2001, U.N. Framework Convention on Climate Change, 7th Sess., 8th plen. Mtg. Addendum, Vol. II, Decision 17/CP.7, U.N. Doc. FCCC/CP/2001/13/Add.2 (2002), available at http://cdm.unfccc.int/Reference/COPMOP/decisions_17_CP.7.pdf [hereinafter Marrakesh Accords].

⁴⁵ See Kyoto Protocol, *supra* note 34, at art. 12 (3)(b).

⁴⁶ See *id.* at art. 17.

⁴⁷ See *id.* at art. 6 and art.17.

⁴⁸ See Generally Marrakesh Accords, *supra* note 44.

experiences that form the basis for the new international framework - under the UNFCCC.

This part will survey four different models of emission trading: the European Union Emission Trading Scheme; the Northeast USA Regional Greenhouse Gas Initiative; the Chicago Climate Exchange; and Emissions Trading Program of China. While each program differs in detail, each program shares the common goal which is reducing GHG emission by using market-based solutions.

1. Market-Based Solutions to Climate Change: Cap-and-Trade Program

The theory behind the market-based solution or emission trading is to implement the “polluter pays” principle and fix a price for each CO₂ equivalent (CO₂e) unit of GHG emissions. Cap or emission quota is the amount of pollution that can be produced by industrial source, such as power plants and other factories. The cap-and-trade program generally includes the following basic components: First, the environmental authorities determine the emissions sources to be covered by the cap. Second, the environmental authorities establish the total amount of emissions to be allowed from all of the sources, commonly referred to as the “emissions cap.” Third, each environmental authority issues one allowance for each ton of emissions, up to the amount of the cap, and those allowances are distributed to the generators and the market.

In practice, if a generator emits at levels below the cap, it may bank the excess quota for future use, or trade with other emitters who are unable to meet the cap. On the other hand, if a generator emits at levels higher the cap, it may either reduce its emissions or purchase additional credits. Generators must apply a cost analysis approach to determine the most efficient solution available. Thus, sellers of credits recover at least a portion of the cost of their environmental protection efforts, and purchasers have an expanded emission quota beyond the pollution targets established by the environmental protection authorities.

Therefore, the benefits of emission trading are a reduction in GHG emission; energy efficiency; and the creation of new technologies. Since the GHG has a market value, generators might find it most beneficial to reduce their emissions and earn profit by selling credits from emission reduction on the market. One of the key factors of reducing GHG is determining how to use energy efficiency. Most energy sources come from fossil fuel, which is the main cause of GHG. Therefore, greater energy efficiency means less GHG emissions. Furthermore, the market mechanism of emission trading motivates generators to create the new technologies to reduce and store GHG from their production process.

2. EU Emission Trading Scheme

The EU Emissions Trading Scheme⁴⁹ (EU ETS) was established under directive 2003/87/EC. The EU ETS began operating on January 1, 2005. The goal of EU ETS is to assist member states in meeting their reduction target levels under the Kyoto Protocol. The EU ETS is the largest multi-national, greenhouse gas emissions trading system in the world, with all twenty-five member states of the European Union participating.

The EU ETS sets a mandatory “cap and trade” scheme for GHG emission allowance and divides their operations in phases: Phase I runs from 2005 to the end of 2007 and phase II from 2008 to 2012. During Phase I, the EU ETS allocates 2.2 billion tons of emission allowances trading from around 10,000 large energy-intensive installations across the EU member nations per year. During Phase II, the EU Commission is proposing to reduce the allowances by 6% and to add additional facilities into the allowance system.⁵⁰

Each EU state must create and implement a National Allocation Plan (NAP), which specifically states the number of credits to issue and the division of credits among individual companies throughout the state. Each state's NAP must be approved by the EU Commission.⁵¹ Then, the member state must oversee and enforce its NAP, verifying that each entity emitting GHG has an allowance and the authority to do so⁵² in the form of GHG emission permits.⁵³ By April 30 of each year, installations must surrender an actual number of allowances⁵⁴ Under the Directive, the excess emission penalty must be fined EUR 100 per ton of carbon dioxide over the limit. However, the payment of the excess emission penalty shall not relieve the operator from the obligation of surrendering an amount of allowances equal to those excess emissions when

⁴⁹ The European Parliament and the Council of the European Union, *Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a Scheme for Greenhouse Gas Emission Allowance Trading within the Community and Amending Council Directive 96/61/EC*, 2003 O.J. (L275) 32-46, available at http://ec.europa.eu/environment/climat/emission/implementation_en.htm [hereinafter EU ETS].

⁵⁰ See generally Commission of the European Communities, *The Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC so as to improve and extend the greenhouse gas emission allowance trading system of the community*, available at http://ec.europa.eu/environment/climat/emission/pdf/com_2008_16_en.pdf (last visited June 25, 2008).

⁵¹ See EU ETS, *supra* note 49, at art. 9.

⁵² See *id.* at art. 4.

⁵³ See *id.* at art. 5 - 6.

⁵⁴ See *id.* at art. 12(3).

surrendering allowances in relation to the following calendar year. The penalty is one of the keys to boosting emission trading, because the company risks surpassing its quota will try to trade by comparing cost-effective and economic efficiency in order to obtain emission credits in order to avoid the penalty. In addition to emissions credits allocated under the EU ETS, companies also can use credits from emission reduction projects under the Kyoto Protocol (Joint Implementation and Clean Development Mechanism) to cover their emissions.⁵⁵

3. Northeast USA Regional Greenhouse Gas Initiative

The United States of America (US) did not sign the Kyoto Protocol, so the US is not obligated to reduce GHG. However, under the US Constitution, individual states have the authority to enact laws aimed at reducing GHG. For example, California and New York enacted their own GHG reduction laws. However, in order to achieve market efficiencies of scale, one of the goals of the emission trading system in the US should be for states to work together to establish regional emissions reduction programs, such as that adopted in the Northeast part of the US.

The Regional Greenhouse Gas Initiative (“RGGI,” pronounced “Reggie”) began in April 2003, when New York Governor George E. Pataki invited the governors of the Northeastern states to participate in the design of a mandatory cap-and-trade program to address power plant emissions. The result of the meeting was the RGGI Memorandum of Understanding (MOU), a historic agreement outlining the program in detail, as well as, the framework for the seven Northeast states⁵⁶ to serve as a role model which addresses climate change while increasing energy efficiency investments and stimulating emerging clean energy technology markets. Currently, the members include Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island and Vermont. The governor of Pennsylvania chose to have the state observe the process.⁵⁷

RGGI will be the first mandatory cap-and-trade program in the United States created to reduce carbon dioxide emissions from electric power plants that have a capacity of at least 25

⁵⁵ See *id* at art. 16(3).

⁵⁶ See generally Regional Greenhouse Gas Initiative, *Memorandum of Understanding*, http://www.rggi.org/docs/mou_12_20_05.pdf [hereinafter RGGI MOU] (The seven Northeast states consist of Connecticut, Delaware, Maine, New Hampshire, New Jersey, New York and Vermont).

⁵⁷ Regional Greenhouse Gas Initiative, *Design Elements for Regional Allowance Auctions under the Regional Greenhouse Gas Initiative*, http://www.rggi.org/docs/20080317auction_design.pdf (last visited June 17, 2008).

MW in the ten Northeastern states of US. Collectively, the member states are such large emitters that they would count as the sixth largest country in the world by volume of GHG emissions in 2000.⁵⁸ After the cap-and-trade program for power plants is implemented, the states may consider expanding the program to other kinds of sources.⁵⁹ RGGI's mandatory emission reduction goals are to be achieved through stabilizing CO₂ emissions at established baseline levels from 2009 through 2014, followed by a 10 percent reduction between 2015 and 2018.⁶⁰

The emissions allowances under RGGI will be distributed to sources, or otherwise into the open emissions market. The states have agreed that at least 25% of the emissions allowances will be allocated to a "consumer benefit or strategic energy purpose,"⁶¹ which means that 25% of the allowances may be auctioned and the revenues used to support energy efficiency, renewable energy, innovative energy technologies or consumer rebates.

4. Chicago Climate Exchange

Chicago Climate Exchange (CCX), launched in 2003, is the world's first and North America's only active voluntary cap-and-trade program. The legally binding program integrated trading systems to reduce emissions of all six major greenhouse gases (GHG),⁶² with offset projects worldwide.⁶³

Implementation of the CCX helps to build and test the institutions and skills needed to cost-effectively manage GHG. The goals of the CCX are to encourage the trading of GHG

⁵⁸ See Eleanor Stein, "Regional Initiatives to Reduce Greenhouse Gas Emissions," *Global Climate Change and U.S. Law*, at 321 (Michael B. Gerrard ed. 2007) (Explaining that "[c]onsidered as a single entity, the original signatory RGGI states emitted 577 million metric tons of CO₂ equivalent in the year 2000. This would place the RGGI states sixth in the world for volume of GHG emissions, after the United States, Japan, Germany, Canada, and the United Kingdom").

⁵⁹ Regional Greenhouse Gas Initiative, *Goals & Guiding Principles*, <http://www.rggi.org/goals.htm> (last visited June 17, 2008).

⁶⁰ See RGGI MOU, *supra* note 56, at para. 2(C) - (D).

⁶¹ See *id.* at para. 2(G)(1).

⁶² See Chicago Climate Exchange, *Keys Features*, <http://www.chicagoclimatex.com/content.jsf?id=25> (last visited June 17, 2008) (Emission of the following six GHGs from facilities owned by CCX Members are covered, as applicable: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulfur hexafluoride (SF₆). Emissions of all non-CO₂ GHGs are converted to metric tons CO₂e using the one-hundred-year Global Warming Potential (GWP) values established by the Intergovernmental Panel on Climate Change).

⁶³ See Chicago Climate Exchange, *About CCX: Overview*, <http://www.chicagoclimatex.com/content.jsf?id=821> (last visited June 17, 2008).

allowances with price transparency, to create the skills and institutions necessary to manage GHG, to initiate measures in the public and private sector which lead to the reduction of GHG, to increase the body of knowledge surrounding GHG reduction, and to inform the public about managing the threats of global climate change.⁶⁴

In 2003, with the 13 entities, the CCX held an initial auction and launched the world's first multi-national, multi-sector market for reducing and trading GHG. By 2004, 2005, and 2007, its members reached 60, 110, and 300 respectively. The members are not only the entities from the U.S., but also from abroad. For example, in 2006, Australia, China and India joined the CCX.⁶⁵ Current CCX emitting members (Members) come from various industrial sectors, as well as, municipalities, states, and universities. Members include Ford Motor Company, DuPont, American Electric Power, Sony Electronics Inc, the Bank of America Corporation, the City of Chicago, the State of New Mexico, the University of Minnesota, and others.⁶⁶

Members make a voluntary albeit legally binding commitment to meet annual GHG emission reduction targets. The emission reduction targets and timetable are divided into phases: Phase I (2003-2006) emission reduction targets were 1% per year, below an average of the baseline period 1998-2001. Phase II parameters extend the reduction period through 2010, with an additional 2% reduction commitment for Phase I Members and a total of a 6% reduction commitment by 2010 for new Members joining in Phase II.⁶⁷

Members are allocated annual emission allowances depending on their emissions baseline and the CCX Emission Reduction Schedule. Members who decrease emissions beyond their allocation have surplus allowances to sell or bank; those who do not meet the targets must comply through purchasing CCX Carbon Financial Instrument (CFI) contracts.⁶⁸ One CFI contract is equal to 100 metric tons of CO₂ equivalent. CFI contracts are comprised of Exchange Allowances and Exchange offsets. Exchange Allowances are issued to emitting Members in accordance with their emission baseline and the CCX emission reduction schedule. Exchange

⁶⁴ See *id.*

⁶⁵ See Chicago Climate Exchange, *CCX Overview Brochure*, http://www.chicagoclimatex.com/about/pdf/CCX_Overview_Brochure.pdf (last visited June 17, 2008).

⁶⁶ See Chicago Climate Exchange, *Current Members of CCX*, <http://www.chicagoclimatex.com/content.jsf?id=64> (last visited June 17, 2008).

⁶⁷ See generally Chicago Climate Exchange, *Emission reduction commitment*, <http://www.chicagoclimatex.com/content.jsf?id=72> (last visited June 18, 2008).

⁶⁸ See Chicago Climate Exchange, *supra* note 63.

Offsets are generated by qualifying offset projects.⁶⁹ All trades take place on the Internet-based CCX Electronic Trading Platform, and are linked directly with the CCX Registry, which consists of Member accounts and is the official holder of record and transfer mechanism for the CCX.⁷⁰ The Financial Industry Regulatory Authority (FINRA) audits and verifies emissions of Members annually, through an established annual reporting system.⁷¹ The FINRA verifies Member Baselines and annual emissions and utilizes state of the art market surveillance technology to monitor CCX trading activity against fraud and manipulation. FINRA also reviews offset verification reports for thoroughness.

5. China's Emissions Trading Program: Sulfur Dioxide (SO₂) emission trading

Under the Kyoto Protocol, China is not obligated to meet the Kyoto Protocol's emission limits. Furthermore, SO₂, a cause of acid rain, is not one of the GHG listed in Annex A of the Kyoto Protocol. However, SO₂ emissions and acid rain are major environmental problems in China due to the nation's heavy reliance on coal and the burning of coal at power plants.⁷² Consequently, the Chinese's government established an SO₂ emission trading mechanism, or cap-and-trade program, as an important tool to reducing SO₂ emissions.

The Chinese government has developed a number of policies to address its SO₂ concerns, including the Total Emissions Control (TEC) policy. The TEC policy imposes a total SO₂ emissions quota in all sectors of the economy, and the government allocates quota to individual sources in the form of an emission target. In September 2000, amendment to the Prevention and Control of Atmospheric Pollution Law⁷³ provided a legal foundation for Total Emissions Control,

⁶⁹ See generally Chicago Climate Exchange, *CCX Offsets Program*,

<http://www.chicagoclimatex.com/content.jsf?id=23> (last visited June, 18, 2008) (CCX has developed standardized rules for eligible Offset project for issuing CFI contracts for the following types of projects: Agricultural methane, Coal mine methane, Landfill methane, Agricultural soil carbon, Rangeland soil carbon management, Forestry, Renewable energy, Ozone depleting substance destruction. Other project types, to be approved on a project-by-project basis, may include: Energy efficiency and fuel switching, Clean Development Mechanism (CDM) eligible projects).

⁷⁰ See Chicago Climate Exchange, *Frequently Asked Questions*,

<http://www.chicagoclimatex.com/content.jsf?id=74> (last visited June 18, 2008).

⁷¹ See *id.*

⁷² Jintian Yang and Jeremy Schreifels, *Implementing SO₂ Emission in China*,

<http://www.oecd.org/dataoecd/11/23/2957744.pdf> (SO₂ created serious impact on human health, visibility, agriculture, forestry, architecture, and cultural resources).

⁷³ *Law of the People's Republic of China on the Prevention and Control of Atmospheric Pollution* (Sep. 1, 2000), available at http://english.sepa.gov.cn/Policies_Regulations/laws/environmental_laws/200710/t20071009_109943.htm.

and TEC policies gained additional political support when they were formally outlined for the first time in the Tenth Five Year Plan (2001-2005).⁷⁴ According to the Tenth Five-Year Plan Period, which established the SO₂ emission reduction target for 2005, the total SO₂ emission should be reduced by 10 percent below the level they were at in 2000.⁷⁵ Therefore, in order to combine the structure of the TEC policy with an emission trading principle which promotes economic development and protects public health and the environment, China established the cap-and-trade program.

China's first SO₂ emissions trading agreement between two plants in different cities came into effect in July 2003.⁷⁶ The seller, Nanjing Jiaguan Power Plant, and the buyer, Taicang Port Huanbao Power Company, are both located in Jiangsu Province. The buyer requires an additional SO₂ emission quota in order to generate more electricity and an additional 2,000 tons of SO₂ to meet local demand. On the other hand, the seller of the state-of-art technology can save 3,000 tons per year with regards to its emission quota. This constitutes a win-win situation for both parties.

One of the keys to successfully operating the SO₂ emission trading pilot project has been the cooperation between China and other countries or organizations, such as United States, Japan, the European Union, the German Development Agency (GTZ) and the Asian Development Bank. These entities have provided the Chinese with technical assistance, training, advising, low interest loans, and other services.⁷⁷

However, despite China's efforts, the State council reports that the project failed to obtain the environmental protection targets of the Tenth Five Year Plan period, and there has effectively been a 27.8% increase in SO₂.⁷⁸ However, the State council still expects that by the year 2010, SO₂ emissions will be under control. The new target will be reduced by 10 percent below the 2005 level, although the SO₂ reduction did not reach its goal in the Tenth Five Year

⁷⁴ U.S. Embassy Beijing, *China's Emissions Trading Pilot Projects* (Dec. 2003), available at <http://www.usembassychina.org.cn/sandt/Emissions-Trading.htm> [hereinafter Pilot Projects].

⁷⁵ China State Council, *The National Tenth Five-Year Plan for Environmental Protection (2001-2005)* (abstract), available at <http://english.sepa.gov.cn/plan/Tenth.htm>.

⁷⁶ *China Trying Emissions Trading to Curb Acid Rain*, People's Daily. Jan. 17, 2003, available at http://english.peopledaily.com.cn/200301/17/eng20030117_110281.shtml (last visited June 20, 2008).

⁷⁷ See Pilot Project, *supra* note 74.

⁷⁸ China State Council, *The National Eleventh Five-Year Plan for Environmental Protection (2006-2010)*, available at http://english.sepa.gov.cn/Plans_Reports/11th_five_year_plan/200803/t20080305_119001_1.htm.

phase. However, the Chinese government has confidence from running the pilot project and already has the basic conditions in place necessary for instituting an emissions quota and trading system. Therefore, China is ready to apply the cap-and-trade program to other sectors.⁷⁹

E. MARKET-BASED SOLUTION TO MITIGATE CLIMATE CHANGE: OPTIONS FOR THAILAND'S PARTICIPATION

1. Overview

Thailand is a party to both UNFCCC⁸⁰ and the Kyoto Protocol.⁸¹ However, Thailand as a non - Annex I party may not yet be required to meet the Kyoto Protocol emission limits under the common but differentiated responsibilities principle. However, Thailand, as many developing countries, can benefit from other countries' technology, foreign and national investments, and the benefit of sustainable development in the host country, as required by CDM project one of the Kyoto Protocol's flexible mechanism.⁸²

Currently, in July 2007, Thailand enacted the Royal Decree to establish the Thai Greenhouse Gas Management Organization (Public Organization)⁸³ (TGO). TGO serves as a secretariat for the Designated National Authority of Clean Development Mechanism (DNA-CDM) office in Thailand, which works on the CDM project.⁸⁴

⁷⁹ Emma Graham-Harrison, *China Eyes Domestic Emissions Trading Scheme*, Thomson Reuters News Service (India), June 9, 2008, available at

<http://in.reuters.com/article/oilRpt/idINPEK31864920080606> (last visited June 20, 2008).

⁸⁰ Thailand signed the UNFCCC in June 1992 and ratified the convention in March 1995.

⁸¹ Thailand signed the Kyoto Protocol in February 1999 and ratified it on August 2002.

⁸² See Kyoto Protocol, *supra* note 34, at art. 12.

⁸³ *The Royal Decree to establish the Thai Greenhouse Gas Management Organization (Public Organization) BE 2550 (2007)*, available at http://www.onep.go.th/green_house_gas/ [hereinafter *The Royal Decree*]; See also Thailand Greenhouse Gas Management Organization (Public Organization), <http://www.tgo.or.th/english/>.

⁸⁴ See *The Royal Decree*, *Supra* note 80, art. 7 (The TGO's Objectives and Duties as following: (1) Analyzing and screening the CDM projects for issuance of the Letter of Approval and monitoring the projects; (2) Promoting CDM projects and CERs Market; (3) To be the National Information Clearing House of Greenhouse Gas; (4) Management all information regarding the approved CDM projects and CERs' value; (5) Enhancing the capacity building of the government and private sectors on greenhouse gas management; (6) Promoting the public outreach regarding greenhouse gas; and (7) Promoting and supporting all activities related to climate change).

In June 2007, the Thai Prime Minister enacted the regulations on Actions toward Climate Change.⁸⁵ The main purpose of the regulations is to set up climate change policies, strategies, plans, and measures, as well as to cooperate with the private sector and the international forum in order to address the climate change problem and to establish the National Climate Change committee.

2. Market-Based Solution: the Next Step to Mitigate Climate Change in Thailand

The previous survey of four different international emission reduction systems demonstrate that an efficient means of reducing GHG emissions is through a market-based solution. A market-based solution not only reduces GHG emissions by market mechanisms, but also leads to energy efficiency and the development of crucial technology.

Regardless of the location where GHG is emitted, its emission into the atmosphere will have an impact on the rest of the world. Consequently, all nations have a duty to care for the common nature. Therefore, Thailand should use a market-based solution to reduce emission in Thailand in order to reduce the effect of global warming as a whole.

In the future, after the conclusion of post-Kyoto, many countries will remain enthusiastic about emission trading. In order to achieve both economic and environmental security and advantages, Thailand must plan for the emerging global emission trading market, because sooner or later, Thailand must have such a market. Therefore, Thailand and its economy must develop and implement a plan for participating in emissions trading.

3. The Option for Thailand's Participation in Emission Trading

Each cap-and-trade program is unique and each has different advantages and disadvantages. This part will analyze each emission trading program and discuss what Thailand's emission trading model can take away from other emission trading programs.

3.1 Creating Thailand's Emission Trading Scheme

Thailand's Emission Trading Scheme (Thailand ETS) can learn from China's emission trading program experience. At the beginning of its emission trading pilot program, China enacted legislation addressing SO₂, even though SO₂ is not a listed GHG and China does not have an emission reduction target under the Kyoto Protocol. China's pilot project focused on SO₂ trading only in specific sectors. China's experience with a trading system is relevant to the climate change negotiations. The other key element to China's success was the cooperation between

⁸⁵ See *The Thai Prime Minister regulation on Actions toward Climate Change BE 2550 (2007)*, available at http://www.onep.go.th/green_house_gas/.

China and other countries, especially the USA, a country engaged in very successful in SO₂ trading since 1980's.⁸⁶ China gained insight and experience from creating and implementing its SO₂ cap-and-trade system. Consequently, the Chinese now have the knowledge and skills to establish a domestic emission trading scheme that could cover emissions ranging from GHG to water pollutants.⁸⁷

Thailand ETS should also analyze RGGI's experience in establishing its model. Similarly to China's model, the RGGI model started with capping certain types of gases in specific sectors prior to expanding to other sectors. One of RGGI's initial goals was to cap CO₂ from electric power plants that have at least 25 MW. After its current program is implemented, RGGI will expand the cap other sources of emissions from other sectors.

If Thailand decides to use national market-based solution in designing the Thai emission trading model, Thailand ETS might consider using the models of China and RGGI as a startup model. Both have successfully started to address emissions by imposing caps in specific industrial sectors on certain gases, such as SO₂ and CO₂ in China's and RGGI's program respectively, and successfully implemented a pilot project cap-and-trade system. In the meantime, China worked with experienced countries. These models will be useful for Thailand in establishing Thailand ETS. After Thailand gains experience, Thailand can create an individualized approach that takes into account Thailand's environment and economy while expanding the trade of other GHGs and imposing caps on additional industrial sectors.

3.2 Creating a Regional ETS - The Association of Southeast Asian Nations Emission Trading Scheme

The Association of Southeast Asian Nations (ASEAN) consists of 10 countries,⁸⁸ which are, for the most part, developing countries, that have no obligations under the Kyoto emission

⁸⁶ See U.S Environmental Protection Agency (EPA), *Clean Air and Energy Projects in China*, <http://www.epa.gov/oia/airandclimate/byregion/chinaair.html> (last visited June 20, 2008) (EPA's Office of Atmospheric Programs is helping the China's Environmental Protection Administration (SEPA) assess opportunities and obstacles to implementing emissions trading programs to control SO₂ emissions. An emissions trading program would allow emission sources to meet their emissions targets at a lower cost. EPA and SEPA have completed a feasibility study that explores many of the obstacles to implementing an emissions trading program and presents possible solutions to these obstacles. The two agencies are currently drafting a policy guide and building the institutions and infrastructure for improved air quality management policies).

⁸⁷ See Emma Graham-Harrison, *supra* note 79.

⁸⁸ ASEAN's members consist of: Brunei Darussalam; Cambodia; Indonesia; Lao PDR; Malaysia; Myanmar; Philippines; Singapore; Thailand; and Vietnam.

reduction target. The ASEAN member states have relatively fast-growing economies, and frequently have a large number of foreign investors, such as Thailand and Vietnam. However, without correct emissions control, development through relationships established in ASEAN can cause climate change problems in countries participating in ASEAN, which will spread to other parts of the world. Clearly, addressing climate change is an emerging issue requiring cooperation and action at the regional level.

Table 1 Top GHG Emitting Countries⁸⁹ (CO₂, CH₄, N₂O, HFCs, PFCs, SF₆) in year 2000

	Country	MtCO ₂ Equivalent	% of World GHGs
1	United States	6,928	20.6
2	China	4,938	14.7
3	EU-25	4,725	14.0
4	Russia	1,915	5.7
5	India	1,884	5.6
6	Japan	1,317	3.9
7	Germany	1,009	3.0
8	Brazil	851	2.5
9	Canada	680	2.0
10	United Kingdom	654	1.09
11	Italy	531	1.6
12	South Korea	521	1.5
13	France	513	1.5
14	Mexico	512	1.5
15	Indonesia	503	1.5
16	Australia	491	1.5
17	Ukraine	482	1.4
18	Iran	480	1.4

⁸⁹ Kevin A. Baumert Et. AL., *Navigating the Numbers: Greenhouse Gas Data and International Climate Policy*, at 12 (World Resource Insitute 2005) available at http://pdf.wri.org/navigating_numbers_chapter2.pdf.

Country	MtCO ₂ Equivalent	% of World GHGs
19 South Africa	417	1.2
20 Spain	381	1.1
21 Poland	381	1.1
22 Turkey	355	1.1
23 Saudi Arabia	341	1.0
24 Argentina	289	0.9
25 Pakistan	285	0.8
Top 25	27,915	83
Rest of world	5,751	17
Developed	17,355	52
Developing	16,310	48

According to table 1, ASEAN's emission rate is not show among the top 25 emitting countries. However, Indonesia, a member of ASEAN, ranks 15 out of the top 25 GHG emitting countries, which emitted 503 Mt CO₂e in 2000. If the emission rates of the other nine ASEAN members are added to that of Indonesia, ASEAN as a whole will rank among the top GHG emitters throughout the world, with an emission rate over 503 Mt CO₂e.

According to the common but differentiated responsibilities principle, as the member of Global village, ASEAN should minimize the amount of emissions it releases and address the issue of climate change. Taking steps to curtail emissions as a group will enhance ASEAN's power in the regional emission reduction negotiations, and will allow ASEAN to benefit from the EU ETS' experience. Setting up a market-based solution like ASEAN ETS can encourage the region to development cost-effective carbon mitigation along with energy efficiency.

3.3 Creating a Voluntary Emission Trading Scheme - Thailand Climate Exchange

Setting up a voluntary program in Thailand, similar to the Chicago Climate Exchange (CCX) will benefit Thailand's companies. For example, emission trading can reduce energy costs; foster positive relations with government agencies and NGOs; enhance their public image; help companies become familiar with clean energy and climate mitigation technologies, and allow Thailand to receive credit and credibility for its activities in future negotiations. Also, a company can obtain experience in emission trading before it conducts business in areas where emission trading is mandatory.

However, in implementing a voluntary program, the Thailand Climate Exchange (TCX) market must ensure that it has a sufficient volume of emissions to trade. Also, since emission trading is a new occurrence in Thailand, it will require cooperation across many professions such as scientists, environmentalist, lawyers, policy makers, financial analysts, and business people.

In addition to reducing emissions, the creating of TCX will also provide incentives for Thailand to enhance public relations and business ethic. In persuading companies to volunteer and join the market, the government will need to offer incentives and benefits to join the program, such as a competitive advantage. This will in turn allow Thailand to develop its public relations.

3.4 Steps to Making Emissions Trading Work in Thailand

While Thailand has already established the Thailand Greenhouse Gas Management Organization (TGO), the main purpose of the TGO is to concentrate on CDM projects to mitigate climate change, while largely focusing on Thailand. In establishing the cap-and-trade system, Thailand will need to focus both on its internal market (either mandatory or voluntary market) and the global environment. It will also need to consider the ASEAN market. Consequently, Thailand will need to examine and analyze the market, in addition to drafting laws and regulations.

In order to make the emission market successful, Thailand will need to outline concrete steps that must be taken. It must consider the scope of its cap-and-trade system. Thailand should prepare and compile: a national inventory database of all GHG emission sources in Thailand; tracking and registration systems; a baseline and time table; a voluntary or mandatory emission trading program; guidelines on the industries to be addressed; an allocation of GHG emission quota, and whether they will be free or auction; and the monitoring and assessment of compliance for the emission trading system. Thailand could also benefit from additional international assistance in the forms of consulting, training, trading documents and trading projects.

Thailand must develop an explicit formal legal structure for emissions trading. The emission trading law is a new challenge and new era for the Thai legal system because it combines legal, economic, science, commerce and environment principles. Emissions trading law is highly technical, covering criteria of trading programs, compliance, monitoring, enforcement and technical measures to control GHG. Numerous questions regarding the principles of the emission trading law in Thailand still remain, such as whether the law should include penalty or what ramifications should exist if companies are unable to obtain their emission reduction baseline.

In the drafting process, learning from and adopting principles from the existing emission trading programs around the world would be a short cut for Thailand. However, the existing laws

and regulations may not apply directly to Thailand, as each program has different roots and goals. Therefore, in drafting the Thai emission trading law, the authority must focus on, for example, on Thai current economic, environment, as well as public health issues to design the right emission trading law and regulations for Thailand. To draft the emission trading law, a working group is highly recommended, in order to obtain various opinions from experts in many fields such as legal environmentalists, economists, scientists and lawyers.

Therefore, it is strongly recommended that Thailand conduct further in-depth study of both the market and legal aspects surrounding emissions trading. Either Thailand should conduct its own study or choose to undertake a cooperative study for the ASEAN Trading region using, for example, an Asian Development Bank (ADB). Additionally, since ASEAN, when including Indonesia, is among the top 25 GHG emitting regions, a study of the market for all of ASEAN would be useful. Finally, the pilot emission trading program would be encouraged.



CONCLUSION

In the first half of 2008, the parties to the UNFCCC began their negotiations to establish a post-2012 GHG regime. One of the key principles for negotiations in the post-Kyoto Protocol is the principle of common but differentiated responsibilities, respective capabilities, and the social and economic conditions principle.⁹⁰ The national GHG emission rates, as found in table 1, shows that in 2000, three developing countries, China, India and Brazil, ranked in the top ten GHG emitting countries. China, India and Brazil, which place second, fifth and eighth in the world, respectively, as well as, the industrialized countries such as US, the number one emitter, did not commit to the Kyoto Protocol. These three developing nations are part of the current negotiations, with Brazil being the chair. This leads to the question of whether the common but differentiated responsibilities principle will still apply in the future to distinguish between Annex I countries and non-Annex I countries regarding the issue of climate change, whether the new negotiations will divide countries in the alternative, or whether the parties will take equal responsibility. Some new formula is probable.

While the options for addressing climate change issues after 2012 are still being negotiated between countries, and we do not yet know what they will look like after 2012, a new set of emission trading rules is likely, at least for the top 25 GHG emitting countries, which would include ASEAN. The emission trading schemes can be a good solution for regional cooperation to develop cost-effective carbon mitigation.

Many of the physical effects of climate change are not yet evident to scientists, and are only now appearing in nature. However, if all the predictions of the IPCC report are likely, countries should not risk high stakes by waiting to ensure that climate change is certain before starting to act. The best solution right now should be preparing and enacting mitigation and adaptation strategies. Therefore, GHG issues will create major policy, economic, legislative, and legal issues. These issues will implicate environmental, energy, legal and corporate sectors.

Therefore, in order to prepare to implement the results of the post-Kyoto protocol negotiations, Thailand should learn from and compare emission trading experiences from many

⁹⁰ United Nations, *Bali Action Plan (Decision -/CP.13)*,

http://unfccc.int/meetings/cop_13/items/4049.php (stating the “Common but Differentiated Responsible” principle).

emission trading systems. Such study will permit design of the Thai's emission trading system. In the meantime, Thailand's national plan and policy must do more to focus on climate change issues and should start with developing a Thai emission trading regime. This will build awareness of climate change among the Thai people. It is not too early to start now.



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