A STUDY ON SECTORAL APPROACHES TO CLIMATE CHANGE MITIGATION FOR UPSTREAM OIL AND GAS INDUSTRY IN THAILAND

A Thesis

by

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ABSTRACT

The upstream oil and gas industry, those who explores and produces petroleum, is one of the most powerful and global actors; especially multinational oil and gas corporations which have operations across countries. As a result, understanding corporate responses to climate change and what factors can be influential to trigger the change of their climate change strategies is crucial for policy-makers at national and international level.

At the very beginning, climate change mitigation, which represents efforts to reduce man-made greenhouse gases, was considered as a threat to the oil and gas industry since its products were a direct cause of climate change. After the adoption of Kyoto Protocol, the disparity of oil and gas industry began to start due to some European-based multinational oil and gas corporations changed their climate strategies to be more friendly to global climate change mitigation; while their US-based counterparts still acted against the effort. However, as the issue has matured, the recent trend in the literatures is reflecting an increasing convergence of corporate responses in the positive manner in which they respond to climate change mitigation.

Although many have studied the increasing proactive climate strategies of the oil and gas industry, those efforts are still at the individual company level and focused on the headquarters of major European and US-based multinational oil and gas corporations. As a result, the study aims to fill in the gaps in existing literatures by shedding light on the sectoral approaches which are a collective action to mitigate GHG emissions among companies in the given industry. Sectoral approaches activities include an elaboration and intensification of individual climate change mitigation efforts. If well-established, they have potentials in addressing competitiveness distortion as well as carbon leakages, which are resulted from uneven GHG emission reduction responsibility of developed and developing countries under Kyoto Protocol. Also they could

enhance global climate change mitigation efforts by targeting the potential sectors which have large GHG emissions and high concentration of companies in the sector.

The upstream oil and gas industry is the focus of this study, because it has released relatively higher GHG emissions than the midstream and downstream industry. Moreover, it had a 6.3% share in the global greenhouse gas emission which is more than other emission-intensive industries such as cement (3.8%), iron and steel (3.2%), and aluminum (1.4%). The cement, iron and steel, and aluminum industry have long established sectoral approaches, but not yet the upstream oil and gas industry. Thailand is chosen as a case study since there are a number of multinational and national oil and gas companies operating in upstream industry. Thus it offers the examination of climate change strategies of local branches of major multinational oil and gas companies with a comparison to Thailand national company. As non-Annex I party to Kyoto Protocol, Thailand also offers a specific political and social context in the study of climate change mitigation.

Due to the sectoral approach is an unprecedented activity in the upstream oil and gas industry, the research set two main questions and three sub questions to study its establishment possibility. For the main questions, the research aims at finding out 1) what factors have an influence on upstream oil and gas companies towards setting up the sectoral approach to climate change mitigation in Thailand and 2) what is the content of sectoral approach that the companies are willing to conduct. These main research questions are followed by three sub questions aiming to examine 1) the potential type of sectoral approach that is likely to be established, 2) the activities of sectoral approach that the companies are willing to participate, and 3) the suitable role of Thai government in the sectoral approach.

The study applied an analytical framework comprising of three models to investigate factors that can encourage or influence the upstream oil and gas industry to set up sectoral approaches in Thailand. Three models, offering a different set of factors, are 1) Corporate Actor model, 2) Domestic Politics model and 3) International Relations model.The first model purposes that the company specific features determine the behavior of corporate. The government policy supply and social demand from civil society are determining factors according to the second model. And the third model considers international association of industry and other companies in the industry has normative power to influence the corporate behavior. Online questionnaire and semi-structured interviews are main research approaches applied to collect data from stakeholders which in this study are categorized into two groups: company group which is the upstream oil and gas companies and non-company group consisting of government authorities, NGOs and scholars.

The findings from online questionnaire and semi-structured interviews with company and non-company respondents concluded that Thai government is the most influential actor and should take an initiative in establishing sectoral approaches in the upstream oil and gas industry. Company respondents pointed out that they were willing to comply with the government policy and preferred to a sectoral agreement with Thai government. The study has drawn several policy suggestions to the Thai government. First of all, the government should include the sectors which have potential in GHG reduction into the state climate change mitigation policy; rather than strictly focusing on high-GHG emissions sectors. Secondly, because companies answered the online questionnaire stating that they were concerned of free riders, the study thus suggests the Thai government consider implementing sectoral approaches as a legally-binding regulation so that all companies have to participate. Lastly, the government should provide the common

guideline for measuring and reporting GHG emissions which suits the unique operational requirements of this sector, as well as assist in Measurement, Reporting and Verification system (MRV) in order to develop industry GHG database, which is the fundamental requirement of sectoral approaches.

Nevertheless, there are some rooms for further investigation on sectoral approaches to climate change mitigation in the upstream oil and gas industry. The study suggests several issues for furture research. The expansion of number of company respondents as well as the data collection from their headquaters are recommended for future research in order to re-examine the currents findings especially on the factors in International Relations model, which has not been much raised. Changing an area of study from Thailand to other developing countries is another potential research direction. Whether or not the governments of other developing countries are considered as a main determinant for upstream oil and gas companies are worth examining. Lastly the transnational sectoral apporaches among companies across countries such as in Southeast Asian region could be an attractive research topic. Due to the fact that the region is going to establish ASEAN Economic Community (AEC) in 2015, transnational sectoral approaches establishment could be more likely to take place.

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Chapter 1: Introduction

The development of global climate change mitigation

Climate change, defined in Article 1 of UNFCCC as "a 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", is a reality. The Intergovernmental Panel on Climate Change's Fourth Assessment Report (IPCC 4AR) published in 2007 has clearly pointed out that the global modest temperature increases are "very likely due to the observed increase in anthropogenic greenhouse gas concentrations" [IPCC, 2007]. In addition, the world is expecting to have further warming between 2 and 4 Celsius in the twenty-first century [IPCC, 2007].

Global warming in fact has both negative and positive impacts. On the one hand, it is beneficial as it keeps the planet warm allowing life to flourish; on the other hand the high human-made greenhouse gas concentrations, mostly from fossil fuel combustion since the industrial revolution, has brought about severe effects which can be felt by everyone and in everywhere of the planet. Some major impacts include the change in freshwater resources due to severe flooding and droughts, the loss of biodiversity and extinction of species, decrease of food productivity due to the natural disaster and pests and disease outbreak, and last but not least sea level rise and an increase in tropical storms intensity, affecting the life of people in coastal zones and low-lying areas [Mimura, 2011]. In this regard, climate change can be obviously considered as a truly global challenge.

As a global environmental problem, climate change requires global responsibility and action. The United Nations Framework Convention on Climate Change (UNFCCC), an

international response to such a global concern, entered into forced on 21 March 1994 with the prime objective "to stabilize greenhouse gas concentrations at a level that would prevent dangerous anthropogenic (human induced) interference with the climate system" (Article2 UNFCCC). It is widely accepted that since the industrial revolution humanity has been releasing carbon dioxide (CO_2), one of major greenhouse gases,[i] into the atmosphere through mostly fossil fuels combustion (oil, gas, coal). ***Climate change mitigation,*** defined as "an anthropogenic intervention to reduce the sources or enhance the sinks of greenhouse gases" [IPCC, 2001a], is a vital type of countermeasures against climate change. The other type of countermeasures are ***climate change adaptation,*** defined as an "adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities" [IPCC, 2001a]. Although both climate mitigation and adaptation are closely intertwined and should be combined to be fully effective, the mitigation work in cutting down greenhouse gas emission has been so far solely the responsibility of developed countries.

The unequal responsibility in greenhouse gas reduction is based on the claim that the developed countries are historically responsible for most past and current greenhouse gas emissions. As Hoffmann sharply stated, the international response to climate change in the last 20 years has been all about negotiating emission reduction-who should reduce emission, how far to reduce, when to achieve reductions and how to pay the costs of reductions [Hoffmann, 2013].[ii] Climate change negotiations reflect the deep disparity between the developed and developing countries. Apparently, the developing countries successfully made their voice heard. The principle of common but differentiated responsibility was written clearly in Article 3 of UNFCCC.

(1) The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof.

(2) The specific needs and special circumstances of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change, and of those Parties, especially developing country Parties, that would have to bear a disproportionate or abnormal burden under the Convention, should be given full consideration.

The principle of common but differentiated responsibility has divided the global community into two main groups: Annex I Parties and non-Annex I parties. Industrialized countries, called Annex I Parties and belonging to the Organization for Economic Cooperation and Development (OECD), have been given the responsibility to cut down greenhouse emission and provide financial and technology assistance to developing countries, called non-Annex I Parties. UNFCCC set a voluntary goal of reducing emissions from developed counties to 1990 levels by 2000.

Nevertheless, it is not surprising that UNFCCC's voluntary greenhouse gas reduction goal have not been met. In 1997, Parties to UNFCCC met at the third annual Conference of Parties 3 (COP3) and agreed that stronger action for climate change mitigation was needed. As a result, participant countries negotiated the 1997 Kyoto Protocol, which set legal binding targets on Annex I parties to reduce emissions 5.2 percent below 1990 levels by 2012. European countries, and particularly the EU, have been the most committed actor in emission reduction in the Kyoto Protocol; while the USA, large developing countries such as China, India and Brazil and oil-producing countries have been consistently opposing the process due to fear that their economic growth will be affected [Hoffmann, 2013, p.9]. It is worth noting that both the UNFCCC and Kyoto Protocol put a heavier burden on developed countries than developing countries. According to Kyoto Protocol, Annex I parties comprised of 41 developed countries

have legal binging obligation to cut down greenhouse gas emission both within their countries or under the flexible mechanisms (such as Clean Development Mechanism (CDM) and Joint Implementation (JI)); while the rest Parties in total of 150 developing countries called non-Annex I Parties have no emission reduction obligations.

Developing countries and climate change mitigation: The (re)emergence of sectoral approaches

The principle of Common but Differentiated Responsibility (CBDR) under the Kyoto Protocol has created some problems when put into practice. Among those is 'carbon leakage', or leakage of emissions, which comes about by the relocation of carbon-intensive industry from countries with emission commitments to non-participating countries or non-Annex I parties.

As a result, developing countries start to increase their emissions, by producing products for industrialized countries. Climate scientists and research institutes have been studied the emission scenarios to assess the Kyoto reduction framework. By comparing the emissions of developed and developing countries under the uncontrolled or Business-as-Usual (or BAU) scenario and the Kyoto scenario, the studies unfortunately have confirmed increasing emissions in developing countries. Hamasaki and Saijo concluded from their climate model study that the emissions of developing countries exceed those of developed countries in 2007 under the BAU scenario and will increase compared to the baseline due to carbon leakage under the Kyoto scenario [Hamasaki Saijo, 2011]. The Kyoto protocol, which asks only for a commitment from developed countries, is thus not sufficient to help stabilize global temperature to maximum rise of 2 degrees Celsius above pre-industrial level and thus it is necessary that developing countries also reduce their emissions.

In the thirteenth Conference of Parties (COP13) which took place in Bali 2007, developing countries were eventually obliged to contribute in climate change mitigation. Through the Bali Action Plan, national and international climate change mitigation could be enhanced by including "Nationally Appropriate Mitigation Actions (NAMAs) by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner"(Decision 1/CP.13, p.3). Before the emergence of NAMAs, developing countries participated in climate change mitigation by selling the reduced GHG emission to developed countries through CDM projects or REDD+ mechanism. But with the occurrence of NAMAs, developing countries are encouraged to contribute in emission reduction by designing the suitable emission mitigation approaches themselves.

One of the possible NAMAs for developing countries to pursue is the so-called "sectoral approaches". It is crucial to note that in that same COP13 participants opened discussion on these **sectoral approaches,** which attempt to conduct climate change mitigation in a particular industrial sector, rather than country-wide emission targets set in the Kyoto Protocol [Wooders, 2011]. Sectoral approaches were a prominent subject during the global climate change negotiation in Bali, which can be seen from Bali Action Plan, which included a specific reference to sectoral approaches:

> "*…under 1.(b) (iv) the consideration of "cooperative sectoral approaches and sector-specific actions, in order to enhance implementation of Article 4, paragraph 1(c), of the Convention*[iii]*... The first meeting of Ad-hoc Working Group on Long-term Cooperative Action (AWGLCA), in Bangkok, Thailand, from 31 March to 4 April 2008, which established the work plan for implementing the Bali Action Plan, agreed to hold a workshop on cooperative sectoral approaches and sector-specific actions during the third meeting of the AWGLCA."* [Egenhofer, Fujiwara, Stigson, 2008, p.8]

However, the idea of sectoral approaches to greenhouse gas emission reduction is not new, as it first emerged as an international issue when climate change first started to became a concern in late 1980s [Bodansky, 2007]. The policy question on how to address climate change has thus been either to conduct a comprehensive approach or to do it on a sector-by-sector basis. The UNFCCC and Kyoto Protocol have followed the comprehensive or nation-wide approaches. Annex I parties opted to cut down greenhouse gas emissions to achieve an economy-wide target covering six major greenhouse gases rather than having separate protocols on energy, transportation, forestry, etc.

After implementing the Kyoto Protocol on country-wide reduction target and common but differentiated responsibility basis, there has been an urgent call to address the detrimental consequences of climate policy. Trade-exposed and emission intensive industries have appealed against the competitive distortion arising from the introduction of CO_2 policy mitigation costs in some parts of the world and not in others [Baron, Reinaud, Genasci, Philibert, 2007]; while at the same time the possibility of carbon leakage has been increasingly observed by climate scientists, as mentioned earlier. Together with the urge for more inclusive participation of developing countries to enhance the effectiveness of climate mitigation and the demand to alleviate competitiveness concerns, the sectoral approaches has thus gained renewed attention [Roy, 2010, p.5].

Recently, sectoral approaches have gained even more momentum as a potential option proposed for post-2012 climate change mitigation effort. Parties in the nineteenth Conference of Parties (COP19) held in Warsaw, Poland in 2013 agreed that pre-2020 mitigation commitments under the Kyoto Protocol's second commitment period is lacking in both number of countries (participation) or amount of GHG emissions reduction (stringency)[iv]. The global climate regime

seems to show poor performance when attempting wide multilateral agreements. The Kyoto Protocol has been prolonged from 2013-2020, but key parties have decided to leave it. Under such circumstances, sectoral approaches are considered among the topics relevant to the architecture of future commitment [Bodansky, 2007].

The oil and gas industry and global climate change mitigation

The climate change mitigation, an effort to greenhouse gases emissions which has major cause from fossil fuels combustion, has caused controversy in the industries that rely on fossil fuels. Among them is the oil and gas industry, which is allegedly "one of the most powerful and global business sectors today and its activities and products are directly linked with rising greenhouse gas emission" [van den Hove, Le Menestrel, & de Bettignies, 2002, p.3]. Since the beginning of the GHG abatement effort, it has been widely considered that climate change is a threat to the oil and gas industry [Climate Change Poses Threat to Oil, Gas Industry, 2009]. Thus the hostile responses of the industry to climate change is not far from expectation.

The anti-climate change corporate resposnes can be traced back in the period leading to Kyoto Protocol. In 1989 major oil and gas companies in the USA formed the 'Global Climate Coalition', a lobbyist organiation aimed at lobbying US Congress not to pass the regulation on greenhouse gas emissions reduction [Kolk & Levy, 2001]. The Global Climate Coalition(GCC) together with American Petroleum Institute (API) acted against mandatory climaet change policy at the US and international community by applying two attacking stargeties: "raising questions about and undercutting the prevailling scientific wisdom on climate change in order to cast doubts in the mind of the public and policy-makers on the existence of a problem, and attacking the policy proposals on economic grounds" [van den Hove, Le Menestrel, & de Bettignies, 2002,

p.5]. These two lobbying groups were part of what McCright and Dunlap called ‘American conservative movement’, which they argued that it was a major reason why the USA did not ratify Kyoto Protocol [McCright & Dunlap, 2003].

The GCC started to lose its lobbying power when some of its members decided to leave the group. British Petroleum (BP) was the first company who withdrew from the GCC in 1996, followed by Royal Dutch Shell in 1998; while US-based major oil companies such as ExxonMobil still participated until the end of GCC in 2002 [Kolk & Levy, 2001]. After the adoption of Kyoto Protocol in 1997, the world has witnessed an increasing divergence of corporate responses to climate change of European and American multinational oil corporations, forming the ‘Trans-Atlantic divide’ as Rowlands pointed out in his article titled “Beauty and the Beast? BP’ and Exxon’s position on global climate change” [Rowlands, 2000].

A number of literatures have been investigating what causes the change of corporate responses of one particular company over time, and why and how the climate strategies are divergent among companies in the industry; namely European oil and gas multinational corporations have taken proactive, American counterparts have applied reactive, and at the middle of two extremes some other major companies have chosen ‘wait-and-see’ stance on global climate change [Sethi & Elango, 1999][Rondinelli & Berry, 2000] [Stonham, 2000] [Levy & Ans, 2002] [van den Hove, Le Menestrel, & de Bettignies, 2002] [Kolk & Levy, 2003] [Kolk & Pinkse, 2005] [Pulver, 2007b] [Kolk, 2008][Kolk, Levy, & Pinkse,2008] [Skjærseth & Skodvin, 2009]. In these literatures, a wide range of factors that could shape corporate behavior have been debated, i.e. nationality of company’s home country, company specifc-features, enviroenmental movements in their home country, international association of industry, and etc. Additionally, various climate change mitigation activties conducted by major multinational oil

and gas corporations have been studied. The activties are ranking from voluntary individual programs such as GHG emissions measuring and reporting, process and technology improvements, Research and & Developemnt on 'Green products', and renewable ernegry investment, to participation in emission trading which has both compulsory scheme such as EU-ETS (European Emissions Trading System) and voluntary program such as Chicago Climate Exchange [Kolk, 2008] [Kolk, Levy, & Pinkse, 2008].

Problem statement, objectives and overview of research methodologies

As described earlier, a wide range of literatures have been discussed on changes of corporate responses to climate change mitigation from hostile to supportive strategies. However, there are some gaps in those existing literatures. Firstly, they allegedly focus mostly on climate change strategies of an individual oil and gas company; while a collective action among companies in the industry in climate change mitigation has not yet been discussed. Secondly, most of the literatures have studied major multinational oil and gas corporations from the US and European countries; while only some have discussed on climate strategies of multinational oil and gas corporations whose countries of origin are developing countries or emerging economics [Sathaye & Ravindranath, 1998][Pulver, 2007a][Eberlein & Matten, 2009]. Thirdly, the literatures study the climate change policy of the companies at their headquarters and argue that "a multinational company (unlike states) can require its branch offices in various countries to comply with corporate policy--which is likely to reflect the policy of its home country" [Skjærseth & Skodvin, 2001, p.61]. However, the argument or assumption on local branches of those major oil and gas companies in other countries; especially developing countries have not yet been well-examined.

As a result, this research aims to fill in the gaps by examining the possibility of sectoral approaches establishment, a collective action of companies in the oil and gas industry to climate change mitigation. The upstream oil and gas industry, those who explores and produces petroleum, is a target of the study. This is because the industry has released relatively higher GHG emissions than the midstream and downstream industry (see section 2.2 in Chapter 2). Moreover, the upstream oil and gas industry had a 6.3% share in the global greenhouse gas emission which is more than other emission-intensive industries such as cement (3.8%), iron and steel (3.2%), and aluminum (1.4%) [World Resources Insititute, 2005]. The cement, iron and steel, and aluminum industry have long established sectoral approaches (see section 2.1.4 in Chapter 2), but not yet the upstream oil and gas industry.

In addition, Thailand is chosen as a case study since there are a number of multinational and national oil and gas companies operating in upstream industry. Thus Thailand case offers the examination of climate change strategies of local branches of major multinational oil and gas companies with a comparison to Thailand national company. As non-Annex I party to Kyoto Protocol, Thailand also offers a specific political and social context in the study of climate change mitigation.

Due to the sectoral approach is an unprecedented activity in the upstream oil and gas industry, the research set two main questions and three sub questions. For the main questions, the research aims at finding out 1) what factors have an influence on upstream oil and gas companies towards setting up sectoral approaches to climate change mitigation in Thailand and 2) what is the content of sectoral approaches that the companies are willing to conduct. These main research questions are followed by three sub questions aiming to examine 1) the potential type of sectoral approach that is likely to be established in Thailand, 2) the activities of sectoral approach

that the companies are willing to participate, and 3) the suitable role of Thai government in the sectoral approaches.

Understanding factors that can be influential to the upstream oil and gas industry toward sectoral approaches establishment is necessary for the right policies or incentives to be implemented. The research applies an analytical framework comprising of three models to investigate factors that can encourage or influence the industry to set up sectoral approaches. Three models, offering a different set of factors, are 1) Corporate Actor model, 2) Domestic Politics model and 3) International Relations model [Skjaerseth & Skodvin, 2009]. The first model purposes that the company specific features determine the behavior of corporate. The government policy supply and social demand from civil society are determining factors according to the second model. And the third model considers international association of industry and other companies in the industry has normative power to influence the corporate behavior.

Online questionnaire and semi-structured interviews are main research approaches applied to collect data from stakeholders: In this study, there are two groups of stakeholders: company group which is the upstream oil and gas companies and non-company group consisting of government authorities, NGOs and scholars. The semi-structured interviews were conducted two rounds in August 2013 and March 2014 respectively. In each round the key informants from companies, NGOs, government authorities and academics were interviewed. Online questionnaires were designed differently and distributed to respondents in company group and non-company group. Some questions in the online questionnaires were asked specifically to each group; while the rest of questions were ask identically to both groups. Responses from online questionnaires are the main focus of analysis. Findings from semi-structure interviews are

extracted for qualitative data to elaborate the findings and eventually draw a policy suggestion from all findings.

The research is divided into six chapters. Chapter 1 is the introductory part explaining the background of global climate change mitigation, the emergence of sectoral approaches, problem statement as well as objectives of the study. Chapter 2 reviews main literatures on sectoral approaches conducted by dominant international organizations and research institutes, describes the existing sectoral approaches in cement, iron and steel and aluminum industry, and presents the important information of the upstream oil and gas industry. Chapter 3 explains an analytical framework which comprised of three models and research methodologies applied in this research. Chapter 4 presents the results from the semi-structured interviews and the online questionnaires. Discussions on the findings as well as the policy suggestion are provided in Chapter 5. Lastly Chapter 6 concludes the entire thesis and draws important issues for future research.

Chapter 2: Sectoral approaches and the upstream oil and gas industry

2.1 Philosophy on sectoral approaches

2.1.1 Main literatures on sectoral approaches

Though holding the promise to enhance global climate change mitigation, the field of sectoral approaches can be very broad, thus leading to a variety of definitions, scopes and methods. In fact, there is no official definition of sectoral approaches, unlike other social abstracts such as human rights or sustainable development, which have official and widely-cited definitions provided by the United Nations. In the present research, the author chose to review the main publications on sectoral approaches conducted by well-known research institutes. The synopsis provided below aims to outline current philosophy on sectoral approaches.

- **World Resources Institutes (WRI)**

The World Resources Institutes (WRI) is "a global research organization that works closely with leaders to turn big ideas into action to sustain a healthy environment—the foundation of economic opportunity and human well-being" [World Resources Institute, n.d.]. The focus areas of WRI are currently climate, energy, food, forest, water, cities & transport, governance, business and finance. As an attempt to address climate change, WRI cooperated with the World Business Council for Sustainable Development (WBCSD) to develop 'The Greenhouse Gas Protocol (GHG Protocol)', which is a widely used international accounting tool for government and business leaders to measure and report their greenhouse gas emissions. After the first edition of The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard or so-called 'Corporate Standard' published in 2001, WRI and WBCSD have continued advancing the Greenhouse gas Protocol until it was adopted in 2006 by the

International Organization for Standardization (ISO) as the basis for its ISO 14064-I: Specification with Guidance at the Organization Level for Quantification and Reporting of Greenhouse Gas Emissions and Removals. This achievement renders the Greenhouse Gas Protocol to be an "international standard for corporate and organizational GHG accounting and reporting" [About the GHG Protocol, 2012]. In December 2007, WRI published "Slicing the pie: Sector-based approaches to international climate agreements" which aimed to help policymakers understand more easily the potential and the limitations of sectoral approaches to climate policy. The report examines the form that sectoral approaches might take, analyses which sectors are best suited to sectoral approaches to greenhouse gas emission reduction, and evaluates several models of how sectoral agreement might be integrated into broader climate regime. Slicing the pie is the outcome of WRI observations on the shortcomings of Kyoto Protocol's economy-wide greenhouse gas reduction commitments, which fails to include all of the world's major emitters as well as a number of emerging economies. The WRI argued that the focus has increasingly turned towards dividing the mitigation challenges into more manageable pieces by focusing on action within key greenhouse gas generating sectors.

Despite recognizing the changing focus to sector-by-sector climate mitigation, the report illustrated three concerns regarding how to put sectoral approaches into practice. The first point of caution is placed on information asymmetry between governments and sector representatives, making the negotiation on appropriate targets difficult. The second issue is that sectoral approaches may weaken competition between products. They could increase the cost of emission abatement to high intensive-emission industries and relieve the pressure on relatively less intensive-emission industries. And lastly, sectoral approaches greatly rely on selecting the suitable business sectors to reduce greenhouse gas emissions. Thus, the implementation of

sectoral approaches according to WRI may distort the "political imperative to see the climate process driven primarily by the environmental goal of keeping climate change at acceptable level" [Bradley, Baumert, Childs, Herzog, Pershing, 2007, p.4]

In conclusion, the attitude of WRI toward sectoral approaches could be clearly presented in the report's foreword written by Jonathan Lash, WRI President at that time,

> *"Sectoral approaches will always remain a second-best solution to a comprehensive climate policy. But with so much at stake no options should be left off the table. Sectoral approaches could be used to complement, but not to supplant, a global climate arrangement".*

- **Climate Strategies**

"Climate Strategies is a not-for-profit organisation that provides world-class, independent policy and economic research input to European and international climate policy. Climate Strategies works with an international network of experts to bridge the gap between research and policy, and provides unrivalled analysis for international decision-makers in the fields of climate change and energy policy. Climate Strategies is supported by broad spectrum of national governments, businesses and foundations" [About us, n.d.]. Since its establishment in 2006, Climate Strategies has been working to make a contribution to the debate about Phase III EU ETS, competitiveness and carbon leakage and international Kyoto project mechanisms. Its major work on sectoral approaches is the study of international sectoral approaches and agreements on the steel sector in Japan, China and India, which all together represent over 50% of world steel production and consumption [Wooders, 2011]. The project started in 2009 and was finished 18 months later. The project team was comprised of a number of scholars from three

countries, who were responsible for writing reports on the steel sector in their respective countries.

Within the project, the report entitled "Exploding the myths of sectoral approaches", by Peter Wooders was designed to critically discuss the notion of sectoral approaches by basing arguments on the practical evidence from the national policies on the steel sector in China, Japan and India. The key messages from the report include,

- *Renaming the sectoral approaches to Sectoral Approaches, Agreements and Measures (SAAMs) is strongly advised. The term 'sectoral approach' is allegedly a pejorative term to some important stakeholders* [Wooders, 2011, p.1].
- *There is no strong momentum behind SAAMs. If they are to be implemented, they need further defining, selling and promoting, firstly at the domestic level and them at the international one* [Ibid].
- *Despite the main objective of SAAMs in enhancing the participation of developed and developing countries. It seems clear that national SAAMs would be more likely to be implemented than international ones. These national schemes could be recognized under the UNFCCC as NAMAs* [Ibid, p.7].
- *Whilst opportunities for SAAMs are strong in the energy-intensive sectors with internationally-traded products, notably steel and cement, there are also good opportunities for SAAMs in other sectors, including those that have little or no trade of products. Proposals for SAAMs have been made for sectors where trade is either very low or not the central issue, such as electricity generation and forestry and land use* [Ibid].

- **The Pew Center on Global Climate Change** (currently as the Center for Climate and Energy Solutions or 'C2ES')

The Pew Center on Global Climate Change was established by the Pew Charitable Trusts in 1998, "as a nonprofit, nonpartisan and independent organization. It produced credible information, straight answers and innovative solutions to address global climate change" [Our

work detail, n.d.]. One special characteristic of the Center is that it brings together business leaders, policy makers (members of the United States Congress and administration officials), scientists, and other experts to cooperatively develop critical scientific, economic and technological expertise to the global climate change regime.

In May 2007, the Center published the working paper on sectoral approaches entitled 'International Sectoral Agreements in Post-2012 Climate Framework'. The paper focuses on one particular type of sectoral approaches- inter-governmental sectoral agreements, in which "governments commit to actions intended to moderate or reduce greenhouse gas emissions from a given sector" [Bodansky, 2007, p.3]. The report promotes this particular type of sectoral approaches since it views that developing countries are highly unlikely to assume binding economy-wide emission reduction targets. Generally the report's content explains the important contributions of sectoral approaches and the factors for evaluating which sector is best suited for sectoral approaches. Nevertheless, the main argument of the paper is that the international sectoral agreements could contribute to the post-2012 climate effort by;

1) negotiating one or more sectoral agreements that stand independent of one another, or

2) linking the series of sectoral agreements in an overarching framework, with overlapping but not necessarily identical groupings of countries participating in each, or

3) incorporating sectoral agreements in a comprehensive framework alongside with other commitments. This is for example, countries with economy-wide emission targets set up the sectoral agreement within a given sector with the countries which do not have economy-wide targets.

Furthermore, the report suggests that sectors such as cement and aluminum, where the industry is well organized internationally and companies face competitive distortion, may have an incentive to initiate a sectoral approach which could be the foundation for inter-government agreement. In other sectors without the same motivation, but where there are potentials for sectoral approaches, the government should take the initiative if sectoral agreements are to take place.

- **International Energy Agency (IEA)**

"The IEA is an autonomous organization which works to ensure reliable, affordable and clean energy for its 28 member countries and beyond. The IEA's four main areas of focus are: energy security, economic development, environmental awareness, and engagement worldwide" [What we do, 2014]. Perhaps IEA's most well-known publication is its annual World Energy Outlook (WEO) which is now "the world's most authoritative source of energy market analysis and projections, providing critical analytical insights into trends in energy demand and supply and what they mean for energy security, environmental protection and economic development" [World Energy Outlook, 2014].

In the regard of sectoral approaches, the IEA has produces numerous research paper on sector-related subjects. To name a few, they are the paper on "Sectoral Approaches to Greenhouse Gas Mitigation: Exploring Issues for Heavy Industry [Baron, Reinaud, Genasci, Philibert, 2007]," "Options for Integrating Sectoral Approaches into the UNFCCC (2008)," "Sectoral Approaches and the Carbon Market (2009)","Sectoral Approaches in Electricity: Building Brides to a Safe Climate (2009)", and "Sectoral Market Mechanisms: Issues for

Negotiation and Domestic Implementation (2009)". The author would focus only on the first paper because it provides general and comprehensive ideas on sectoral approaches.

Sectoral approaches, according to the paper "Sectoral Approaches to Greenhouse Gas Mitigation: Exploring Issues for Heavy Industry", is regarded as a new set of options to enhance the effectiveness of greenhouse gas reduction efforts and to engage emerging economies on international climate change mitigation. Addressing competitiveness concerns arising from implementing greenhouse gas emission reduction policy in some parts of the world and not in others, and alleviating the carbon leakage from developed to developing countries are two main contributions of sectoral approaches. The emphasis is given on sectoral approaches in trade-exposed, greenhouse-gas intensive industries – cement, iron & steel and aluminum, in which the report reviews the ongoing greenhouse gas reduction conducted by these three sectors on a voluntary basis. The data gathering for industry to understand overall environmental performance and energy efficiency is the priority and these three heavy industries have already developed greenhouse gas emission measurement protocols; thus serving as a model for sectoral approaches in other potential candidates such as power generation and transport sectors.

To provide a comprehensive picture of sectoral approaches the report also identifies three types of challenges facing sectoral approaches:

1) Technical challenges: The basic requirement of sectoral approaches is the energy emission data as well as technology standpoints. This may be easily acquired by companies in developed countries, but more difficult for those in emerging economies.

2) Institutional challenges: some institutional bodies and instruments need to be established. However, developing countries may have limited capacity to design and implement broad-based environmental policies.

3) Political challenges:international climate negotiations have been characterized by North and South disputes. It still remains to be seen whether developing countries will consider some forms of sectoral approaches or not.

- **Centre for European Policy Studies (CEPS)**

"Founded in Brussels in 1983, the Centre for European Policy Studies (CEPS) is among the most experienced and authoritative think tanks operating in the European Union today. CEPS serves as a leading forum for debate on EU affairs, but its most distinguishing feature lies in its strong in-house research capacity, complemented by an extensive network of partner institutes throughout the world." [About CEPS, n.d.]. Its research areas are, for instance, economic policy, energy & climate change, EU Foreign policy, food security and development policy and trade development policy.

Prominent works by CPES on sectoral approaches include CEPS Task Force on Global Sectoral Industry Approaches, Economic and Social Research Institute Project, and Technical Workshop on sectoral approaches. In the research, the author woill focus inclusively on the CEPS Task Force since it discusses the fundamental concepts on sectoral approaches.

CEPS Task Force on Global Sectoral Industry Approaches released in 2008 a report entitled "Global Sectoral Industry Approaches to Climate Change: The Way Forward". The report is based on multi-stakeholders discussion, supported by the Cement Sustainability Initiative of the World Business Council for Sustainable Development. The content of the report

comprises of an overview of the status of sectoral approaches within the global climate change regime, the typology of sectoral approaches as well as the core common features, some preconditions for successful implementation and the way forward to enhance the effectiveness of sectoral approaches.

While acknowledging the diverse forms of sectoral approaches (sector-wide transnational approaches, bottom-up country commitments, and top-down sectoral crediting), the CEPS Task Force Report focuses explicitly on global sectoral industry approaches- "transnational industry-focused initiatives that aim to engage a sector on a broad international basis They include industry-led initiatives (i.e. aluminum, cement and steel) and public-private partnerships (e.g. the Asia-Pacific Partnership on Clean Development and Climate or APP)" [Egenhofer, Fujiwara, Stigson, 2008, p.2]. The reason of its exclusive focus on transnational industry-focused initiatives is that they are the original means through which progress on sectoral approaches is currently being established.

However, in the section "The Way Forward", the report proposes that governments, industries as well as international bodies should partner with each other in undertaking pilot projects in key sectors, harmonizing emission data and so forth, so that sectoral approaches could play a meaningful role in post-2012 climate framework (pp.46-48). Again, the perception of CEPS Task Force on sectoral approaches has been well portrayed in the first paragraph of "The Way Forward",

> "*global sectoral industry approaches have potential. This has been demonstrated (in the report). On the other hand, they are no panacea. Whether global sectoral industry approaches will ultimately emerge as a central pillar of a post-2012 framework remains uncertain and depends on whether the concept of global sectoral approaches will be able to meet the four challenges we have specified; data definition, collection and use, avoiding anti-competitive behavior, engaging*

emerging economies and governance. And even if they do, it is unclear at this moment whether they will ever become a substitute for legally binding commitment at the party level. Still, global sectoral industry approaches can become an important complement to existing national, regional or international policies and activities" (p.46).

2.1.2 Types of sectoral approaches

The International Energy Agency (IEA) and CEPS Task Force supported by the Cement Sustainability Initiative (CSI) of the World Business Council for Sustainable Development (WBCSD), reviewed existing sectoral approaches and categorized them into three outstanding models which are,

1) sector-wide transnational approaches, e.g. transnational industry-led approaches that aim to engage companies in the sector across countries. The Cement Sustainability Initiative under the auspice of World Business Council for Sustainable Development and International Aluminum Institute are famous examples.

2) bottom-up country commitments, e.g. sectoral agreement between host government and the companies in the sector

3) top-down sectoral crediting as an incentive mechanism, e.g. a sectoral Clean Development Mechanism (CDM)

Apart from these three models, the project on international sectoral approaches and agreements on steel sector conducted by Climate strategies [Wooders, 2011], divides the sectoral approaches by referring to two key variables- the Parties to the Agreement and the Target Type. The table below shows twelve possibilities for categories of Sectoral Approaches, Agreements and Measures which are distinguishes by these two variables.

Table 1 Potential types of sectoral approaches [Wooders, 2011,p.4]

Parties to the agreement	Target Type			
	Emissions (CO2/other GHGs)		Indirect	
Multilateral(governments) ["Top Down"]	Absolute	Intensity	Technology	Other
International (industry led) ["Transnational SAAMs"]				
National ["Bottom up"]				

In addition, the table shows two main types of target of sectoral approaches. They are the direct target which is an emission reduction of CO_2 or sometimes other greenhouse gases, and the indirect target which is typically technology transfer and also financial or other commitments. The emission targets are separated further to either absolute or intensity targets. The latter one is more common in sectoral approaches. The intensity target would "depend on the level of output and require an improvement in the average emissions per unit of production. Importantly, intensity targets do not act as a constraint on output" [Wooders, 2011, p.4].

2.1.3 Contributions and caveats of sectoral approaches

- **Contributions**

Sectoral approaches are considered to offer a number of positive benefits to global climate change mitigation, including those outlined below, as claimed by the literature reviewed earlier in section 2.1.1.

1) Enhancing more participation: The sectoral approaches can be a reliable option for developing countries which are not yet prepared to take on economy-wide emission reduction targets. By focusing on the potential sectors where emission trends are well understood and can be forecasted, developing countries can contribute to the global climate change mitigation without trading off their economic development [Egenhofer, Fujiwara, Stigson, 2008] [Baron, Reinaud, Genasci, Philibert, 2007] [Bradley, Baumert, Childs, Herzog, Pershing, 2007].

2) Addressing competitiveness distortion and minimizing carbon leakage: The international sectoral approaches could help ensure that all global competitors in a given sector undertake emission mitigation efforts. In this regard, companies in developed countries would have fewer incentives to move their operations to developing countries. This contribution of sectoral approach is especially applicable to globally traded energy intensive industries such as cement, aluminum and iron & steel [Baron, Reinaud, Genasci, Philibert, 2007] [Bodansky, 2007] [Bradley, Baumert, Childs, Herzog, Pershing, 2007] [Egenhofer, Fujiwara, Stigson, 2008].

3) Bringing greater equity: It is increasingly seen that in some industries when it comes to energy performance, the frontier between companies in developing and developed countries become blurred. Some companies operating in an emerging economy such as China are equally or more energy efficient than those in Annex I parties. As a result, sectoral approaches may be a fairer way to reduce greenhouse gas emissions than the comprehensive approaches proposed by Kyoto Protocol [UNEP, 2009].

4) Simplifying negotiations: In sectors which are highly concentrated in term of both companies and countries, the negotiations among a small number of parties with commonality of interests and products, would be more likely to succeed [Bodansky, 2007].

5) Promoting financial and technology transfer: Companies gathering to set up sectoral approach in their given sector would benefit from the financial assistance and technology transfer. The best practice or best performance will be spread among member companies leading to the improving performance of the least efficient companies [UNEP, 2009] [Egenhofer, Fujiwara, Stigson, 2008].

- **Caveats**

Notwithstanding the major contributions of sectoral approaches, there are some challenges associated with sector-based approaches [Baron, Reinaud, Genasci, Philibert, 2007] [Bodansky, 2007].

1) Carbon havens: sectors which have marginal costs of reduction smaller than other sectors would be a target of reduction policy. As a result, there is a risk that sectoral approach "would end up protecting certain activities from mitigation costs" [Baron, Reinaud, Genasci, Philibert, 2007, p.21].

2) Integration to the national climate change policy: wherever policy instruments are already implemented, changing the course of policies would have a cost, which must be calculated with the expected benefits of a new approach. The policymakers thus have to consider whether sectoral approaches are an improvement in terms of cost-effectiveness or not.

3) Information asymmetry: governments usually do not have a full understanding or knowledge of technical details of industrial activities, especially the heavy industries where operations are so complex and specific. The sectoral agreement between government and industry requires that both sides have a good understanding of each other so that ambitious and efficient policy designs can take place.

2.1.4 Factors for identifying the sectors conducive for sectoral approaches

There are a good number of potential candidates for sectoral approaches. Identifiable sectors which are related to climate change include:

- Electricity (generation, industrial and/or residential consumption);
- Transport (automotive, aviation, shipping);
- Manufacturing (chemical and petrochemical; iron and steel; cement; aluminum; glass);
- Buildings (residential; commercial);
- Consumer goods (energy-intensive appliances);
- Land use (agriculture; forestry);
- Construction;
- Extraction (minerals; oil and gas)

To evaluate which sectors present the best candidates for sectoral approaches, Bodansky studied three groups of factors that can serve as criteria. The first group is **environmental factors,** which is in turn comprised of four sub-factors [Bodansky, 2007].

1) Share of global (or national) GHG emissions

2) Rate of emission increase

3) Potential for emission reductions

4) Environmental and developmental co-benefits (whether the sectoral approach in this sector would lead to reduction of environmental problems such as air pollutions or contribute to other development goals.)

The second group is **economic factors** which are comprised of three-sub factors.

1) Adjustment cost (whether the sector has relatively cheaper reduction cost than other sectors)

2) Capital lock-in (whether the sector is going to have the significant capital investment)

3) International exposure (whether the sector produces the international traded goods which can be vulnerable to competitive imbalance and to the risk of emission leakage)

The third group is **negotiability and participation factors,** which is comprised of six sub-factors.

1) Concentration (whether a small group of companies in the sector represent the majority of production and emissions or not)

2) Tipping and network efforts (whether a small group of actors in the sector can have an impact on the other actors to implement the same approach or not)

3) Receptivity of business (the intangible factors and ad hoc factors concerning companies, such as the culture of companies or the view of CEOs)

4) Homogeneity (whether the sector has uniform products and/or process)

5) Ease of monitoring and administration (whether the sector has reliable emission data or common regulatory approaches)

6) Unique sector-specific features (the sector such as international bunker has to take sectoral approaches because of difficulty of assigning emission from aviation or maritime transport to particular countries)

The factors mentioned above aim to evaluate which sectors present the best candidates for sectoral approaches, though environmental factors seem to dominate the others since they are more tangible. Policymakers use GHG Inventories to develop emission reduction policies. However, other factors are also important and different sectors are seen to be likelier candidates on different perspectives For example, while from the perspective of competitiveness, highly concentrated and homogenous energy-intensive sectors such as cement, aluminum and iron&steel are seen to be good candidates; the international aviation and shipping, which is relatively lower concentrated, is also suitable for sectoral approaches because its business operation is across national borders and release emission throughout its transnational routes.

2.1.5 Existing sectoral approaches in some heavy industries

- **Cement Industry**

Currently, the cement industry has emitted greenhouse gas that account for about 3.8% of world emissions [WRI,2005]. Since cement is a crucial element for residential and commercial

buildings and infrastructures such as roads, hospital and airports, the demand for cement is expected to increase continuously, especially in the emerging economies. In 1999, ten major cement companies, members of the World Business Council for Sustainable Development (WBCSD), established the Cement Sustainability Initiative (CSI), a voluntary business initiative, to "help industry leaders understand and manage the impacts of their products and processes – with a strong emphasis on dealing with climate change" [A Sectoral Approach: Greenhouse gas mitigation in the cement industry, n.d.].

Nowadays, CSI's members comprise "24 major cement producers with operations in more than 100 countries who believe there is a strong business case for the pursuit of sustainable development. Collectively these companies account for around 30% of the world's cement production and range in size from very large multinationals to smaller local producers" [A Sectoral Approach: Greenhouse gas mitigation in the cement industry, n.d.].

The attempt to address climate change in the cement industry could be seen for the first time in the "Agenda for Action", published in 2002. Within this agenda, various joint projects "on which a group of companies will work together to tackle a specific environmental or social issue; and individual actions, which will be implemented by each company in its own operations (including target setting and performance reporting), applying both innovation and best practice" [Ten Years of Progress-Moving on the next decade, 2012], had been introduced voluntarily.

Key joints projects and individual company actions include;

- Developing a common CO_2 measurement and reporting protocol which is now referred to as the "Cement CO_2 and Energy Protocol". Today, this protocol is the most relevant guidance document for the measurement and reporting of CO_2 emissions in the cement industry worldwide,

used by most international cement firms. The protocol, based on the Greenhouse gas Protocol by WRI/WBCSD, provides a "harmonized methodology for calculating CO_2 emissions, with a view to reporting these emissions transparently. It addresses all direct and the main indirect sources of CO_2 emissions related to the cement manufacturing process, in absolute as well as in specific or unit-based terms" [CO_2 Accounting and Reporting Standard for the Cement Industy, 2012]. Developing a global database on CO_2 and energy performance for the sector which is called Getting the Numbers Right (GNR), to allow analysis and benchmarking of industry performance. The number of cement companies worldwide reporting to GNR has increased from 724 in 1990 to 930 in 2010.

- Individually, companies use Cement CO_2 and Energy protocol to measure and report annually on CO_2 emission, as well as use the tools set out in the protocol to define and make public their baseline emissions

- Individually, companies make emissions data publicly available and accessible to stakeholders by 2006 and set emissions targets on relevant materials and report publicly on progress.

- In 2006, the CSI started the development of global cement industry sectoral approach aimed at addressing its direct emissions. The main priority of this initiative is to monitor, report, verify and mitigate CO_2 emissions from the global cement industry in a consistent and fair manner, hopefully to contribute to global climate change mitigation efforts. This move by the CSI was devoted to offering new emerging economies to participate in CO_2 emission reduction. Emerging economies are expected to account for about 80% of cement industry CO_2 emissions [Egenhofer, Fujiwara, Stigson, 2008]. The CSI promoted sectoral approaches arguing that it could make it possible to accelerate CO_2 reduction by "identifying the most efficient mitigation

approaches and therefore allowing the whole sector to reach a performance target more quickly, and requiring engagement with a smaller number of key industry players and countries, compared to a global climate agreement, and it would provide a model that is transferable to other industries ”[UNEP, 2009, p.57]. The recent work of CSI on sectoral approaches is ‘Modeling exercise’, an economic and policy modeling to assess the potential benefitdisadvantages of sectoral approaches. The report on Modeling exercise, published in 2009, features eight world regions and six different climate mitigation policy scenarios, as seen in the figure below. [A Sectoral Approach: Greenhouse gas mitigation in the cement industry, n.d.]

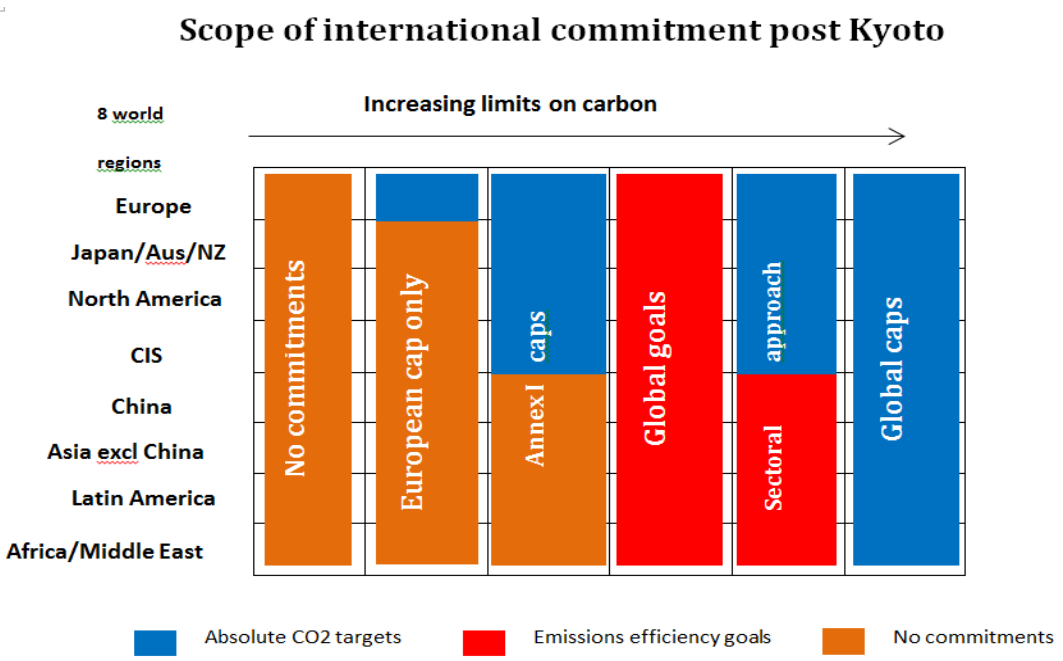


Figure 1 Eight world regions and six different climate mitigation policy scenarios according to CSI model exercise. [A Sectoral Approach: Greenhouse gas mitigation in the cement industry, n.d.]

The model indicated that;

- "A sectoral approach could reduce cement sector emissions significantly compared to the base case 'No commitment'.

- While regional difference exists, a sectoral approach could significantly increase access to the major greenhouse gas mitigation levers available to the sector by proper design of national polices.

- Exploiting full potential of sectoral approach requires supporting government policies in the participating countries, covering cements standards, building codes and waste management practices among other areas" [UNEP, 2009, p.58].

Last but not least, the CSI considers that sectoral approaches could improve the effectiveness of the industry's GHG emission reduction and offer incentives to both developing countries and business However, it acknowledges the need to work with governments in the host countries to further the effectiveness of sectoral approaches. The CSI concludes that it has expressed its willingness to assist governments in defining the basic requirements for a sectoral approach to be established (i.e. sector emission and energy data, measuring and reporting protocol, measuring/reporting/verifying process) and identifying effective policy measures at national level to help reduce cement CO_2 emissions (i.e cement product standards, green building policy, use of alternative fuels).

- **Aluminum industry**

The aluminum industry in many respects appears to be one of the most conducive sectors to sectoral approaches. According to statistics from the World Resources Institute (WRI), the aluminum industry was in 2005 responsible for 1.4% of world emissions and these emissions are

concentrated in a few countries and companies. The main industry association of the sector is the "International Aluminum Institute" (IAI), established in 1972 and now has 28 members companies which currently represents over 60% of global bauxite, alumina and aluminum production [The Institute , 2014].

The IAI has launched a sustainability initiative called "Aluminum for Future Generations", which is "an example of a voluntary global industry sectoral approach aimed at improving industry performance globally, covering greenhouse emissions, energy and other key performance indicators" [Knapp, 2009]. All IAI member companies have agreed on Aluminum for Future Generations' thirteen voluntary objectives which include "direct emission reduction, the promotion of greater energy efficiency, metal recovery, and recycling involving government and local community support as well as product responsibility with respect to transport light weighting and energy saving potential in construction and packaging" [UNEP, 2009,p.53].

Some objectives related to greenhouse gas emission reduction by the sector are the following;

- An 80% reduction in per fluorocarbons (PFCS) per tonne of production by 2010 as compared to 1990 levels. This was the first voluntary objective by the Aluminum for Future Initiative. The industry met this objective in 2006, where PFCS emission had been reduced by 83% per tonne of product between 1990 and 2006 (IAI Sustainability Performance 2006). (PFCS are potent and long-lasting greenhouse gases, produced during brief upset conditions in the aluminum smelting process known as anode effects.) [Egenhofer, Fujiwara, & Stigson, 2008,p.55].

- A 10% reduction in average smelting energy usage by IAI member companies per tonne of aluminum produced by 2010 versus 1990. This objective was also met as "the energy efficiency of the electrolytic process has improved by 5% between 1990 and 2005, with indirect emissions from electricity production being reduced by 8% per tonne of aluminum produced between 2000 and 2005" [UNEP, 2009, p.55].

- A 10% reduction in alumina refining energy per tonne by 2020. The promotion of recycling of used products. The objective was met as the production of aluminum from recycled products worldwide rose from 13 to 15 million tonnes per year between 2000 and 2005 [Egenhofer, Fujiwara, & Stigson, 2008,p.57].

The main element of sectoral approach of the aluminum sector is that it has common measurement and greenhouse gas emissions calculation methodologies for all primary aluminum production processes, based on IPCC national GHG inventory guidelines, ISO GHG management and lifecycle standards and the WBCSD/WRI Greenhouse gas Protocol. It should be noted that all IAI member companies submit data to the IAI, and a number of non-member companies also submit annual GHG-related data. Nevertheless, the IAI would rather see the success of sectoral approach in aluminum sector as a transitional step towards a comprehensive global solution on a voluntary basis, not for introducing some form of obligatory intergovernmental sectoral agreement [UNEP, 2009, p.56].

- **Iron and Steel industry**

The iron and steel industry was responsible for 3.2% of global greenhouse gas emissions [WRI, 2005]. Without abatement measures, its share in global emissions is projected to grow by 3.2% annually through 2030 [UNEP, 2009]. Iron and steel companies around the world gather

together under the "World Steel Association", which was established in 1967 (as the International Iron and Steel Institute: IISI) and at the present membership has increased to include "approximately 170 steel producers (including 17 of the world's 20 largest steel companies), national and regional steel industry associations, and steel-research institutes. World Steel members represent around 85% of world steel production" [Membership, n.d.]. It is estimated that around 40% of steel is internationally traded. Considering its projected increasing greenhouse gas emissions and its trade-exposed nature, the iron and steel industry is one of the most conducive sectors for sectoral approaches.

As the World Steel Association clearly stated in its website that "Climate change is the biggest issue for the steel industry in the 21st century", the association has committed itself to greenhouse gas emission reductions by various actions, for example, "expanding the use of current efficient technologies, widely used in modern steelmaking sites to minimise the generation of carbon dioxide, undertaking research and development for new technology to radically reduce the level of CO_2 emissions into the atmosphere for each tonne of steel produced, optimizing and maximizing recycling of steel scrap and adopting a global sector-specific approach [Ibid, p.62].

Later in 2007, the iron and steel industry thus announced formally its global steel sectoral approach at its 41st annual conference in Berlin. The main proponents of the industry's sectoral approach are comprised of four elements;

1) A common database for industry worldwide. Companies in the industry have agreed a common way of measuring CO_2 emissions and initiated a database to encourage companies to submit data on a confidential basis. The methodology used for the measuring has been published as "International standard, ISO 14404:2013 – The

Calculation method of carbon dioxide emission intensity from iron and steel production consists of two parts: Part 1: Steel plant with blast furnace and Part 2: Steel plant with electric arc furnace (EAF)" [CO_2 emissions data collection, n.d.].

2) Best practice amongst iron and steel companies worldwide

3) Research and development to develop radically new ways of steel-making

4) Promotion of the usage of steel as a key component of a greener world

[UNEP,2009, p.62]

In conclusion, the World Steel Association has advocated for sectoral approach on a voluntary basis since it views that the principle of common but differentiated responsibility making a single agreement for the whole iron and steel industry is unrealistic objective. UNEP interviewed Ian Christmas, the Director General World Steel[v] and his speech emphasizes the stand of World Steel Association,

> "*we do not see any prospect for a specific sectoral agreement for steel in the short and medium term. We are advocating a global sectoral approach that seeks engagement of all the major steel producers around the world, and that focuses on the central issue of reducing global CO_2 emissions in the steel industry. We do not support the concept of sectoral crediting if it implies significant transfer payment between competitors within the steel industry. In our industry it is not a question of developing VS industrialized countries; some of the most modern and best performing steel plants in the world in terms of CO_2 emissions are in developing countries. Our approach is to encourage every steel company to identify where they are today and the scope for improvement in their operations"* [Ibid, p.62].

2.2 Information on the upstream oil and gas industry

2.2.1 Subdivisions of the oil and gas industry and their definitions

The target group in the study is upstream oil and gas industry which is one of three subdivisions of oil and gas industry. The other two subdivisions are midstream and downstream industry. The reason on focusing only the upstream industry is because it has released greenhouse gas emissions during exploration and production process in a larger amount than the other two subdivisions [Greenhouse gas emissions, 2014]. The study quoted the definitions of these three categories from Trencome [Petroleum Industry, n.d.]

> ***Upstream:*** *The upstream oil sector is a term commonly used to refer to the exploration, development and production for and the recovery and production of crude oil and natural gas. The upstream oil sector is also known as the exploration and production (E&P) sector. The upstream sector includes the exploration for potential underground or underwater oil and gas fields, drilling of exploratory wells, and subsequently operating the wells that recover and bring the crude oil and/or raw natural gas to the surface.*
>
> ***Midstream:*** *The midstream industry processes, stores, markets and transports commodities such as crude oil, natural gas, natural gas liquids (LNGs, mainly ethane, propane and butane) and sulphur.*
>
> ***Downstream:*** *The downstream oil sector is a term commonly used to refer to the refining of crude oil, and the selling and distribution of natural gas and products derived from crude oil. Such products include liquefied petroleum gas (LPG), gasoline or petrol, jet fuel, diesel oil, other fuel oils, asphalt and petroleum coke. The downstream sector includes oil tankers, oil refineries, petrochemical plants, petroleum products & their distribution, retailers & retail outlets and natural gas distribution companies. The downstream industry includes consumers through thousands of refined petroleum products such as oil, diesel, jet fuel, heating oil, asphalt, lubricants, synthetic rubber, plastics, fertilizers, antifreeze, pesticides, pharmaceuticals, natural gas and propane.*

Source : http://www.trencome.com/petroleumindustry.htm accessed on April 30, 2014

2.2.2 The upstream oil and gas industry in Thailand

Upstream oil and gas companies operating in Thailand are comprised of multinational corporates and a national petroleum company. The first company operating in petroleum exploration and production in Thailand is the US-based multinational corporation which has operated since 1970s [Thailand Fact Sheet, 2013]. Until 1985, Thailand national petroleum exploration and production Company was established [About PTTEP, n.d.]. At the present, Thailand national company has the second highest production volume, after the aforementioned US-based multinational corporation [Department of Mineral Fuels:Ministry of Energy of Thailand, 2011]. All companies are required to be grant concession rights from Thai authority[vi] in order to conduct exploration and production operations in Thailand. They are obliged to do so by Article 23 of Petroleum Act B.E. 2514 (1971),

> **"***Petroleum belongs to the State; and no person shall explore for or produce petroleum in any area, whether such area is owned by him or by other persons, except by virtue of a concession. The application for concessions shall be in accordance with the rules, procedures and conditions prescribed in the Ministerial Regulation. The form of the concession shall be as prescribed in the Ministerial Regulation.."* [Ibid]

By the end of 2011, Thailand had 63 concessions granting the right to explore and produce petroleum in 79 blocks over the total area of 225,893 square kilometers. The concession areas are divided into three main zones.

- 104,690 sq km in 36 blocks of 29 concessions in the Gulf of Thailand
- 76,681 sq km in 40 blocks of 33 concessions onshore
- 44,521 sq km in 3 blocks of 1 concession in the Andaman Sea [Ibid]

2.2.3 GHG Emissions sources of the upstream oil and gas industry

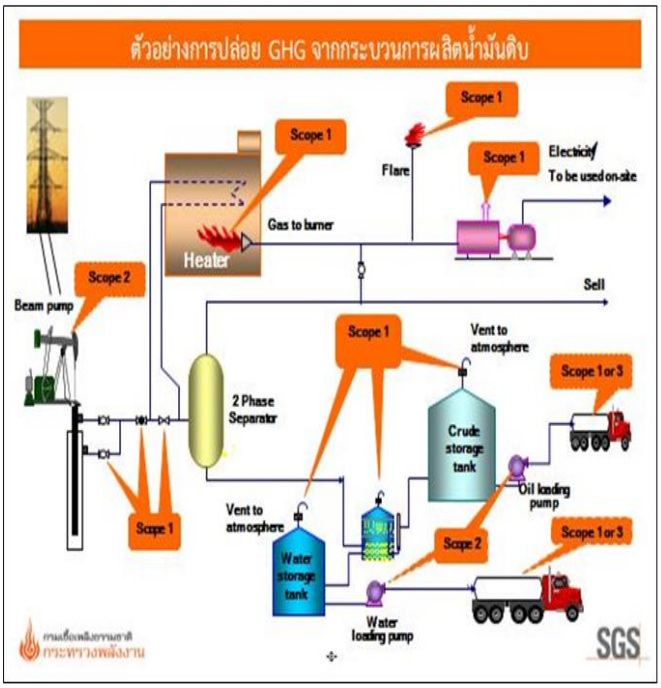
According to the Petroleum Industry Guidelines for Reporting Greenhouse gas Emission established by IPIECA (The global oil and gas industry association for environmental and social issues) and the Compendium for GHG Emission Estimation Methodologies for the Oil and Gas Industry (API Compendium) developed by American Petroleum Institute (API), the sources of greenhouse gas emissions (including all six greenhouse gases recognized by Kyoto Protocols) released by upstream oil and gas industry are categorized into three scopes: Scope 1 Direct GHG emissions, Scope 2 Energy Indirect GHG emission and Scope 3 Other Indirect GHG Emissions.

Scope 1 – Direct GHG Emissions: GHG emissions from all activities under operational control of the oil and gas companies are included in this scope. Scope 1 emissions are further divided into three sub divisions.

- Emission from Fuel Combustion: from stationary combustion such as boiler, heater, and electricity-generating machine (diesel engine).
- Process and Vented Emission: Glycol Dehydrator Process release GHG emission. This includes also emission vented from crude and produced water storage tanks, from crude loading activity and from exploratory drilling.
- Fugitive Emission. The emission refused from equipment leak through valves, flange and other devices. CH_4 released from anaerobic waste-water ponds.

Scope 2- Energy Indirect GHG Emissions: Scope 2 includes GHG emissions which are resulted by the usage of energy that is generated from outsiders such as electricity, stream, heat and cooling water.

Scope 3- Other Indirect GHG Emissions: Scope 3 includes other indirect emissions which is apart from those included in Scope2 and emissions which are released from activities in which oil and gas companies do not have an operational control. The activities are for example, the dangerous waste management which the oil and gas companies outsource to another company, the traveling in duty of employees by plane, the travelling of employees from their residents to the office, and so on.



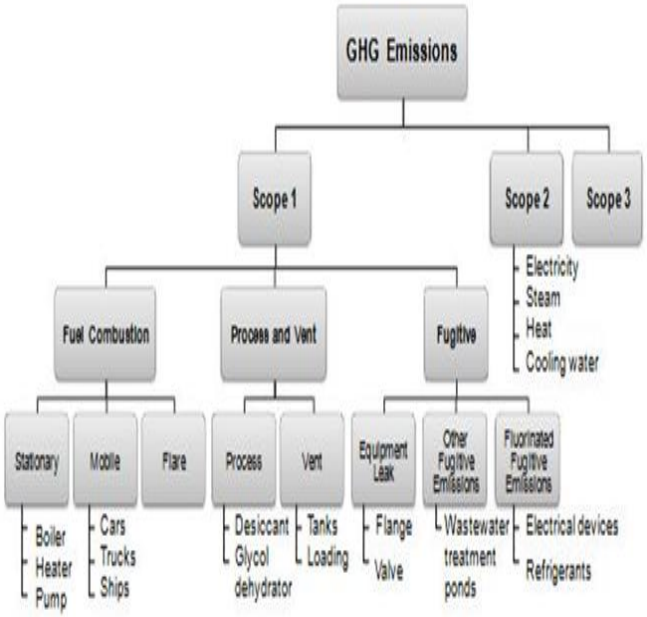


Figure 2 GHG emissions released through crude oil exploration and production operation
Figure 3 GHG emissions sources of upstream oil and gas industry
Source (both figures): Document in the Seminar on Guideline for GHG emissions for Exploration and Production sector, reproduced under permission from Department of Mineral Fuels, Ministry of Energy, Thailand

2.2.4 Current emissions from upstream oil and gas industry in Thailand and at global level

As shown in section 2.2.3, the upstream oil and gas industry release direct greenhouse gas emissions through fuel combustion, process and vented Emission and fugitive emissions. The other two emissions sources are indirectly produced by the upstream oil and gas industry. However, when developing GHG emissions inventory, emissions from all three sources will be included to present the emissions from the sector.

At national level, the amount of GHG emissions from the upstream oil and gas, which is mostly comprised of methane gas (CH_4), were gathered and presented in 'Energy sector' in Thailand National Greenhouse Gas Inventory. At the present, Thailand has developed three National GHG Inventories: Initial National Communication and National Greenhouse Gas Inventory 1994, Second National Communication and National Greenhouse Gas Inventory 1994, and Second National Communication and National Greenhouse Gas Inventory 2000 [GHG Inventory, n.d.].

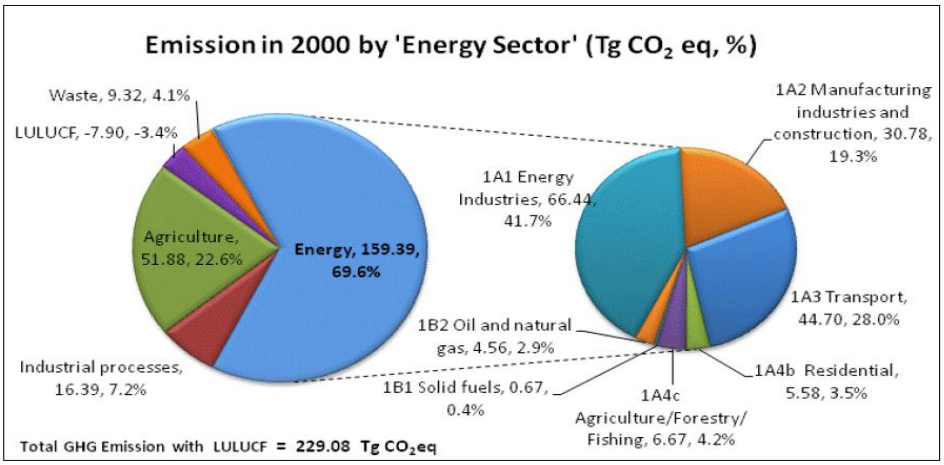


Figure 4 Thailand Emissions in 2000 by Energy Sector
Source: Reproduced under Thailand Second Communication and National Greenhouse gas Inventory 2000

From emissions data in Figure 4, emissions from upstream oil and gas industry was 4.56 tg CO_2 eq, which was accounted for 2.9% of emissions from Energy sector. Although its share in national greenhouse gas emissions was relatively much smaller compared to other sectors, the emissions of upstream oil and gas industry was relatively large at global level. Figure 5 below shows the world GHG emissions by Sector in 2005 which is adopted from a diagram developed by World Resources Institute.

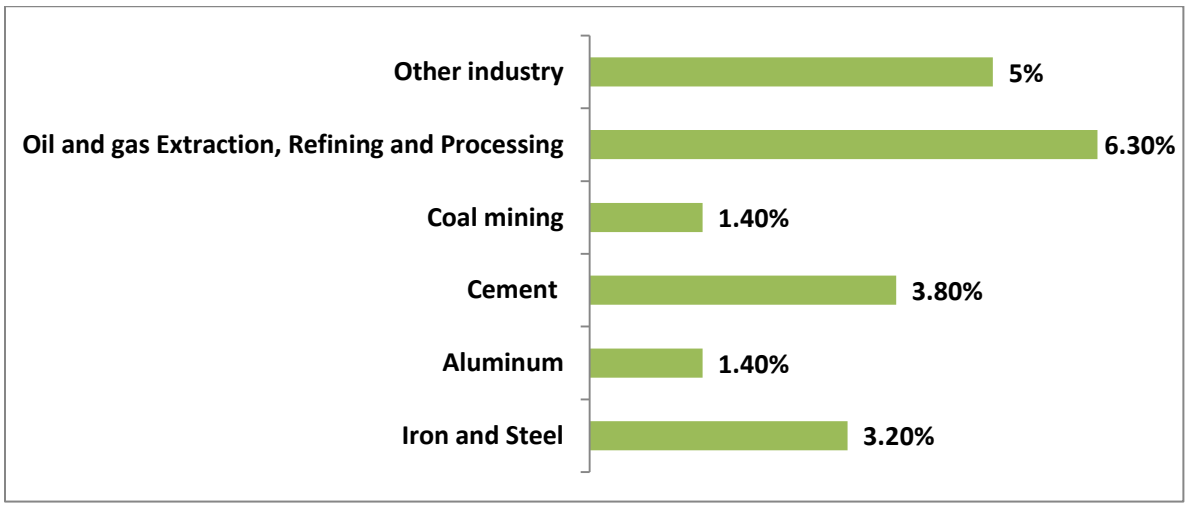


Figure 5 World GHG Emissions Flow Chart by sector
Source: Adopted from World Resources Institute, 2005

The data in Figure 5 shows that at global level upstream oil and gas industry had a share of world GHG emissions in 2005 as 6.3%. Its emissions included direct (fugitive emissions) and indirect sources (electricity and heat usage). It is noted that upstream oil and gas industry released more emissions than other heavy industries such as cement (3.8%), iron and steel (3.2%) and aluminum (1.4%). In addition, the research by UNEP revealed that GHG emissions from upstream oil and gas sector could rise up to 30% of global emissions in 2030, if there is no abatement measures [UNEP, 2009].

2.2.5 Climate change mitigation activities at an individual oil and gas company and in the sectoral approaches

At present, a number of oil and gas companies have initiated climate change mitigation activities on voluntary basis. There are various factors that contributed to more proactive climate change strategies of oil and gas companies. Some have pointed to strong environmental movements, the climate science as well as the government policy as main contributors [Pulver , 2007] [Kolk & Levy,2003]. However, it should be noted that individual climate change strategies which some oil and gas companies have already voluntarily conducted are diverse and not harmonious; thus the industry could not yet make big impact on global climate change mitigation. Unlike other heavy industries such as aluminum, which has established voluntary global industry sectoral approach and met its first voluntary objective in 2006 where per fluorocarbon (PFCS) emission had been reduced by 83% per tonne of product compared to 1990 level (see section 2.1.5). The sectoral approaches, especially at transnational level where companies in the industry across countries have cooperation, could help the industry contribute more to global GHG emissions reduction; while at the same time offering various benefits to the company members.

It should be emphasized that voluntary climate change mitigation efforts which oil and gas companies have conducted individually partly overlap with the activities of sectoral approaches. At the very basic, each company would measure and report GHG emissions (see section2.2.3 for GHG emissions sources of the upstream oil and gas industry). Corporate GHG emissions data are usually submitted to government authority, or international association of industry, or non-state organizations working on business and climate change such as Fortune 500, Carbon Disclosure Project and Solomon. In addition, the companies may install new technology to reduce GHG emissions such as Carbon Capture and Geological Storage (CCS) and Enhanced

Oil Recovery (EOR). Reducing flaring of gas which is associated with the extraction of crude oil could be another attractive GHG emission reduction activity which also helps the companies minimizing the waste of resources [IPEACA, 2007]. And last but not least, setting voluntary GHG reduction target is another climate change mitigation effort that the company can pursue individually.

The sectoral approaches activities include an elaboration and intensification of these individual efforts. First of all, the sectoral approach as a collective climate change mitigation effort requires the gathering of GHG emissions data of member companies to establish an industry GHG database. A common guideline for measuring and reporting GHG emissions is necessary. It can be developed either by the association of the industry such as 'Cement CO_2 and Energy Protocol' of Cement industry, or other international organizations, i.e. ISO's GHG Management and Lifecycle standards and the WBCSD/WRI Greenhouse gas Protocol applied by Aluminum industry, and ISO 14404:2013 applied by Iron and Steel industry (see section 2.1.5).

After GHG emissions are measured, the next common step is to set GHG reduction targets for the industry, which must be based on the Measurement, Reporting and Verification system (MRV) in order to "monitor, report, verify and mitigate CO2 emissions from the industry in a consistent and fair manner" [CO_2 Accounting and Reporting Standard for the Cement Industy, 2012]. The best practices will be showcased and diffused among member companies so that they will strive to improve performance. Research and development of green technology as well as technology transfer is expected to increase. Last but not least, financial assistance packages and carbon trading scheme can possibly be established once the sectoral approaches have become fully developed.

Chapter 3: Analytical framework and research methodology

3.1 Analytical frameworks

To examine the factors that can encourage upstream oil and gas industry in Thailand to set up sectoral approaches to greenhouse gas emission mitigation, the analytical frameworks from the book entitled "Climate change and the oil industry: Common problem, varying strategies" by Skjærseth & Skodvin (2009) were applied. The factors which caused big multinational oil companies like ExxonMobil, Shell and Statoil, to pursue different climate change strategies although facing the same challenge of global climate change were investigated. Three analytical frameworks, which were termed the Corporate Actor model, Domestic Politics model and International Regime model, were used to explain why these three large oil companies have chosen different climate strategies. The aim of the work is to explore differences in corporate climate strategies to "understand more about the conditions that promote the shift towards an effective climate policy" [Skjærseth&Skodvin, 2009, p.16].

The first model, or Corporate Actor (CA) model, is based on the business environmental management discipline. The main idea of the Corporate Actor model is that the "differences in the companies themselves" [Ibid, p.74] are the explanation of the differences in corporate climate strategies. The authors (Skjærseth & Skodvin) selected three company-specific factors from a long list of factors which appear to be the most influential for corporate choices. The three factors are "1) the environmental risk associated with current and future corporate operations, 2) the environmental reputation of the company and 3) the company's capacity for organizational learning" [Ibid, p.74]. The indicators for each factor can be clarified as follows.

First, the environmental risk is measured by considering the fossil-fuel portfolio of the companies, and whether their current production and reserves are highly stressed on a certain type of fossil fuels, such as crude oil, natural gas and coal. Coal is the most carbon intensive fossil fuel while crude oil and then natural gas are less carbon intensive, respectively. According to the logic set by the author, "the more carbon intensive the fossil-fuel portfolio of the companies is, the higher risk is their risk of being subjected to more stringent regulation, and the more likely they are to resist such policies and adopt a reactive (climate mitigation) strategies" [Ibid, p.75]. Consequently, the companies which have coal as one of their main products will be likely to be reactive to climate change mitigation policy than those companies in which crude oil and natural gas are main products.

Second, the environmental reputation is indicated by the companies' "experiences with public exposure and criticism in relation to environmental and political incidents" [Ibid, p.78]. The logic is that the companies which have experienced negative environmental reputation that resulted from severe accidents such as oil spills or human rights violation would be likely to choose a proactive climate strategy in order to amend its negative public image.

Third, the capacity for organizational learning is reflected in two dimensions: the monitoring ability to capture future trends and the organizational structure. Companies which have relatively more systematic and broad-based monitoring ability are likely to change their strategies in a response to public sentiment or prospective state regulations [Ibid, p.86-87]. In addition, Skjærseth & Skodvin examined the companies' organization structure and proposed that the companies which are highly centralized would have the ability to "make use of the knowledge generated through monitoring activities", better than those which are decentralized [Ibid]. In conclusion, they drew a prediction that companies which have higher learning capacity

(systematic monitoring ability and the centralized organizational structure) would be likely to adopt proactive climate change strategies [Ibid, p.93].

The second model, Domestic Politics (DP) model, is based on the political science discipline. The model, traditionally used for explaining state behavior, can be used to examine multinational corporate choices on climate strategy instead. The DP model basically proposes that "corporations are affected by a social demand for environmental protection, governmental supply of climate policies and the political institutions linking supply and demand" [Ibid, p.24]. It is noted that the domestic politics taken into account in the model are the domestic politics of the home-base country of the given multinational corporation. As the authors(Skjærseth & Skodvin) clearly stated, although the multinational oil corporates could be affected by the politics of the host countries where they operate, "the strongest influence is likely to be found in the companies' home-base countries, where they have their historical roots, have located their headquarters and have concentrated most of their activities " [Ibid]. Considering the companies' climate strategy through DP model, the authors (Skjærseth & Skodvin) drew an assumption that the strong social demand for environmental conservation (as reflected in the emergence of green consumerism), the ambitious climate policy from governments and a consensus-oriented approach between government and industry, are likely to promote a proactive corporate climate strategy [Ibid,p.26,29,31].

The third model, the International Regime (IR) model, is based on International Relations discipline. The authors(Skjærseth & Skodvin) applied IR model moving the focus from domestic to international level, since multinational corporations operate beyond one single state but within the framework of international institutions [Ibid, p.155]. The IR model's main contribution is that it enables to see the "dynamic relationship between corporate strategy and

international institutional development and thus serves to improve our understanding of changes in corporate climate strategy choice" [Ibid, p.188]. According to the IR model, corporate alliances (industry groups across states) can influence the international regime. The authors(Skjærseth & Skodvin) applied IR model with an assumption that " if a reactive industry exercises a strong influence and largely controls the development of the regime, a persistent reactive strategy can be expected, but if the industry has a weak influence and the regime matures, we can expect a change towards a proactive strategy" [Ibid]. The fossil fuel lobby groups studied by the authors(Skjærseth & Skodvin) were GCC (Global Climate Coalition) and API (American Petroleum Institute) which lobbied hard against binding climate change regulations [Ibid, p.164]. They were initially successful as the UNFCCC was roughly in line with the interests of the fossil fuels lobby. The Convention, which first emerged in 1992, "did not include any binding targets and timetables for emission reductions and it did not restrict the parties' choice of policy instruments" [Ibid, p.161]. However, five years later (1997), the Kyoto Protocol was adopted, which significantly deferred from the interests of the fossil fuel lobby in at least two ways: "first, by requiring specific and mandatory reduction objectives within specific time frames (targets and timetables), and second, by exempting developing countries from any commitments" [Ibid, p.163]. The authors (Skjærseth & Skodvin) then explained this change through the IR model, where the reasons behind it were that the international fossil fuel lobby had dissolved and lost its influence prior to the Kyoto Protocol [Ibid, p.164]. The authors, in addition, followed the logic of IR model by pointing that the loss of influence was allegedly the result from the withdrawal of major European oil companies such as BP and Shell from the GCC [Ibid, p.167].

Nevertheless, in conducting the research on sectoral approaches to climate change mitigation in oil and gas industry in Thailand, three analytical frameworks will be adopted in the present thesis: Corporate Actor model, Domestic Politics model and International Regime model, but with some adjustments. The reason for these modifications is exclusively because those three analytical frameworks were used to explain why major oil companies have chosen different corporate climate strategy although they have been facing the common challenge from global climate change. Their explanatory scope is thus constrained on the choice of climate policy of companies individually rather than collectively. The sectoral approaches, however, is related the collective behavior of companies in the particular industry. As a result, the present thesis has adjusted the content of each model so that the analytical frameworks would be suitable for examining the factors approach to reduce greenhouse gas emissions.

In this study, the three aforementioned analytical frameworks have been tuned to develop new analytical frameworks specific for the case of sectoral approaches. The new analytical frameworks significantly differ from the original ones in three respects, as outlined below.

Firstly, the key notion of Corporate Actor model which states that company specific features themselves are the determinant factor regarding corporate behavior, is still maintained. However, other company specific factors instead of environmental risk, environmental reputation and capacity of organizational learning have been selected. Three previous factors in the original Corporate Actor model can potentially predict whether a given company or group of companies are likely to adopt a reactive or proactive climate strategy (Skjærseth and Skodvin 2009). However, they are not sufficient to encourage the companies to take collective action with other companies in setting up sectoral approaches to reduce greenhouse gas emissions. The research, as a result, with literature reviews on oil and gas industry and sectoral approaches, has developed

a new set influential factor [Kolk & Levy, 2002] [Kolk & Levy, 2003] [Hofferberth, Brühl, Burkart, Fey, & Peltner, 2011] The factors chosen here are 1) capital availability, 2) human resources availability, 3) CEOs' vision and policy, 4) expectation on positive benefits from sectoral approaches and 5) the shareholder pressure.

In addition, the present study has formed new factors to test the capacity of organizational learning in a way of what they have learnt instead of how they do so. The determining factors are concerning the perception of companies on 1) global climate change as a threat, 2) the future of global climate change mitigation agreements, 3) the future demand for fossil fuels, 3) the future of coal, and 4) the market for renewable energy in Thailand.

Secondly, the focus in the Domestic Politics model has been shifted from the home-base country of the multinational corporations to the host country, which is Thailand in this case. In the concluding remarks, Skjærseth&Skodvin (2009) had stated that "the variance in domestic political context of the companies' home-base countries is more important for explaining differences in corporate climate strategy than are company specific factors" [Skjærseth & Skodvin, 2009, p.204]. They then made a policy suggestion based on the finding, "the interplay between corporate positions and (home-base) domestic political context may thus hold a potential to move entire global oil industry toward a more proactive position on climate change" [Skjærseth & Skodvin, 2001, p.61]. This is allegedly so because "a multinational company (unlike states) can requires its branch offices in various countries to comply with corporate policy--which is likely to reflect the policy of its home country" [Ibid]. The present study thus aims to test this claim, to see whether offices of multinational oil corporations in Thailand have followed the climate policy of their respective headquarters, which are mostly located in developed countries, or have responded to Thailand's domestic political context. The

determining factors in the research have been slightly changed from analysis of the government policy supply, the social demand for environmental quality and the political institutions linking supply and demand, to 1) Projection on state climate change regulation, 2) Projection on GHG emission reduction policy on oil and gas industry, 3) Urge for building good relationship with Thai government 4) response to public sentiment which has become more concerned on environmental problems , 5) company's perception on 5.1 being target of Thai government's climate change policy, 5.2 being target of NGOs' campaigns, 5.3 Thai consumer's willingness to pay more for green product, and 5.4 Thai consumers interests in environmental problems.

Third, the International Regime model was changed significantly from the original one. First of all, the study called the model 'International Relations' instead of International Regimes, because the determining factors are not exclusively on private or non-state actor authorities but including relationships among companies within the same industry. Secondly, in contrast to the original IR model which highlighted the influence of corporate alliance (industry group across states) on international climate regime, how the international association of oil and gas industry has influenced the behavior of companies in terms of establishing good practice and forming the norm of being a good corporate citizen, is the new focus. The reason for this substantial difference from the original framework is due to the target studies of the research being local branches of multinational oil corporations in Thailand rather than the headquarters located mostly in developed countries. These branches are more to comply with corporate policy of the headquarters than to take policy initiatives. More importantly, from the literature review on existing sectoral approaches in heavy industries: cement, aluminum and iron and steel, their international industry associations played an important role in initiating the sectoral approaches greenhouse gas emission reduction [Egenhofer, Fujiwara, & Stigson, 2008] [UNEP, 2009]. The

research aims to examine how the influence of international industry associations could express itself through the local offices of multinational oil corporations in developing countries like Thailand. In doing so, the research has designed a new set of factors including the perception of companies on 1) norm of being a good corporate citizen, 2) compliance with guidance of international association of industry, 3) a possibility of having free riders in the sectoral approaches activities and 4) a spillover effect from other industries.

Corporate Actor model

- **Company specific features**

1. Capital availability
2. Human resources availability
3. Leadership of CEOs
4. Expectation on positive benefits from sectoral approaches
5. Shareholder pressure
6. Company's perception on
   - 6.1 global climate change as a threat
   - 6.2 the future of global climate change mitigation agreement
   - 6.3 the future demand for fossil fuels
   - 6.4 the future of coals
   - 6.5 the market for renewable energy in Thailand.

Domestic Politics model

- **Thai political and social context**

1. Projection on state climate change regulation
2. Projection on GHG emission reduction policy on oil and gas industry
3. Urge in building good relationship with Thai government
4. Response to public sentiment which has become more concerned on environmental problems
5. Company's perception on
   - 5.1 being target of Thai government's climate change policy
   - 5.2 being target of Thai NGOs campaigns
   - 5.3 Thai consumer's willingness to pay more for green product
   - 5.4 Thai consumers' interests in environmental problems

International Relations model

- **International climate regime**

Company's perception on

1. norm of being a good corporate
2. compliance with guidance of international industry associations
3. possibility of having free riders
4. spillover effect from other industries

Figure 6 Analytical framework: Three models, modified from Skjærseth, J. B., & Skodvin, T. (2009). *Climate change and the oil industry:Common problem, varying strategies.* Manchester: Manchester University Press.

3.2 Research Methodologies

The research applied mainly qualitative methodologies, which are online questionnaire and semi-structure interviews, in answering the research questions. Although oil and gas companies are the target of study, the research also includes a non-company group which consists of government authorities, NGOs and scholars. The reason for having two groups of stakeholders is for comparing and cross-checking the findings so that the research could attempt to provide a comprehensive picture of the reality and thoughts of the various actors involved.

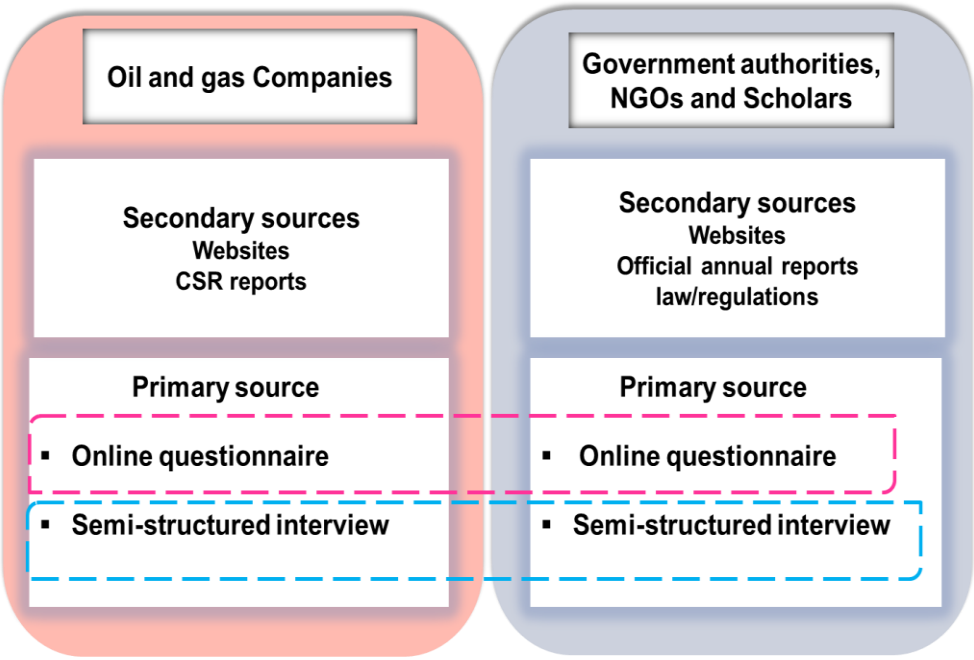


Figure 7 Summary of data collected from the company group and non-company group

As shown in figure 3, the research obtained secondary data of company and non-company groups from websites, legal documents, and reports. This secondary data provided a general understanding on the issues being investigated, necessary for the next step of research. The primary data was collected through an online questionnaire and semi-structured interviews.

Two versions of an online questionnaire were developed; one for company group and the other for the non-company group (government authorities, NGOs and scholars). The company group was asked to provide information concerning their individual voluntary climate change mitigation and the activities of sectoral approaches the company is willing to conduct. Conversely, the non-company group was asked to express opinions on sectoral approaches and Thailand climate change policy in general. The commonality of the two versions of online questionnaire is that both the company and non-company group were requested to give a score on the level of agreement on which factors have an influence on the company's decision on establishing sectoral approaches to climate change mitigation in Thailand, role of Thai government and type of sectoral approaches (see Table 6). The responses of two groups were presented for the purpose of cross-checking.

In addition to online questionnaires, a limited number of semi-structured interviews were conducted with key informants from companies, NGOs, academic and government officials due to the difficulty in accessing each stakeholders, especially for the case of companies. Again, questions inquired each stakeholder were partly the same for the purpose of cross-checking. The semi-structured interviews provided insightful qualitative data complementing findings from online-questionnaires. Both versions of the online questionnaire are inserted in Appendix A and Appendix B respectively; while questions for the semi-structured interviews are included in Appendix C.

It is noted here that one of the reasons why online questionnaires were distributed to stakeholders is because the researcher had been given contact name and email address of personnel at companies, government authorities, NGOs and scholars by the key informant, who is a government official. More importantly, online questionnaires are a convenient approach to

collect data from stakeholders in Thailand, while the researcher was based at the time in Japan. However, the list of company respondents will be kept anonymous. Companies are categorized and presented by referring to the international status of their home country, whether they are non-Annex I parties, Annex I parties or a country that does not ratify Kyoto Protocol.

Last but not least, all semi-structured interviews were conducted in Thai language. Responses from interviewees were translated into English by the researcher. Both versions of the online questionnaire were bilingual: Thai and English. However, responses to some questions were answered by respondents in Thai, which again were translated into English.

Chapter 4: Results from semi-structured interviews and online questionnaires

As mentioned in chapter 3, the study applied semi-structured interviews and online questionnaire to acquire primary data from stakeholders. This chapter will present findings from both research approaches. In this study, semi-structured interviews with key informants were conducted twice: a preliminary round in August 2013 and the second round in March 2014. The analyses of interviews will be presented with outstanding commonalities and differences highlighted. Regarding the findings from the online questionnaire, a series of comparative analyses between answers from company and non-company group will be illustrated. In this study, all names of interviewees and online questionnaire respondents are kept anonymous because some questions are sensitive and may unintentionally affect the reputation of stakeholders. As a result, the study refers to interviewees by categorizing them as company, government authority, NGOs or an academic. How online questionnaire respondents are referred will be described in the next section.

4.1 Semi-structure interviews

4.1.1 The preliminary round in August 2013

This round was the first fieldwork of the research. From August 15th to September 4th 2013, semi-structured interviews with a total of thirteen interviewees were conducted in four provinces in Thailand: Bangkok, Chiang Mai, Chonburi and Khon Kaen. The interviewees comprised seven company officials, three academics, two government officials and one NGOs staff. The study experienced some difficulty in accessing the interviewees; especially the companies. This is mostly because the research topic directly concerns the strategy of the various companies, which is regarded as a sensitive issue. To be able to interview companies, official

letters stating that the research would not disclose the name of company and submit the results to the company for approval before publishing were required in advance. Additionally, interview questions were provided for interviewees to consider in advance. This resulted in the adjustment of some questions which were considered too sensitive for companies to answer. Due to the aforementioned difficulties, the research conducted semi-structured interviews with officials from three oil and gas companies: two of them are upstream oil and gas companies which were the target study and the rest was a midstream oil company (oil refinery plant) which provided climate change mitigation-related issues from a perspective of the midstream company.

Since it was the preliminary round, the focus of the interviews was to gain general understanding on three issues which were 1) company's voluntary climate change mitigation activities, 2) the comments of governments, NGOs and academic on company's voluntary initiatives and 3) the current climate change mitigation policy in Thailand.

Question on company's voluntary climate change mitigation activities

The first issue on company's voluntary climate change mitigation activities was a result of the review on secondary data such as company websites, which suggested that nowadays many oil and gas companies have launched climate change mitigation activities on voluntary basis. Without state regulation or policy on greenhouse gas emission reduction, some oil and gas companies in Thailand have conducted measuring and reporting greenhouse gas emission by following standards or guidelines of international associations; a few have even voluntarily set greenhouse gas emission reduction targets. The interview thus aimed to understand the reason why and how oil and gas companies choose to conduct climate change mitigation activities.

Table 2 Answers from semi-structured interviews with four types of stakeholders on the issue about reasons for company to choose standards and guidelines on measuring and reporting GHG emissions.

Stakeholders / Issue	NGO	Academic	Government authority	Company
Question: How does the company choose standards or guidelines on measuring and reporting GHG emissions?	• The companies may choose more than one standard and guideline, because one is not enough to cover all operations. It is common to apply more than one standard and guideline. • The concern on market reasons does not really matter, since consumers do not usually ask to see which GHG standards the companies choose. • Companies receive policy from the mother companies abroad • good image and prevent criticism • peer pressure • no political and economic reasons to choose GHG guidelines or standards	• The companies consider market as a reason, such as for example how to do trade with European counterparts the companies need ISO. • GHG Protocol has less strict requirement than ISO, since it does not demand a verifier.	• TGO: It does not matter what GHG guidelines and standards the companies apply. What matters is that their GHG emission data can be categorized into codes and sub category codes of National GHG inventory. • DMF: The companies adopt some standards that provide guideline on how to set the organizational boundary and which GHG sources should be included, as well as some standards that provide quantifying methodology.	• The companies choose to follow some GHG standards and guidelines, because some guidelines only provide the reporting scheme but not quantifying methodology. For example, GHG Protocol provides only report scheme, so the company gets quantifying methodology from API Compendium. There is no political or economic reason to choose the standards or guidelines.

Note: TGO stands for Thailand Greenhouse Gas Management Organization.
DMF stands for Department of Mineral Fuels, Ministry of Energy, Thailand.
GHG stands for greenhouse gases.
API stands for American Petroleum Institute

Table 2 provides a summary of the answers of interviewees from four stakeholders, who suggested different reasons on why and how companies choose guideline and standard on measuring and reporting greenhouse gas emissions. Informants from NGOs, company and government authority (DMF) provided similar rationales, saying that the company may seek to apply more than one guideline or standard in order to have both descriptions on how to set the organizational boundary and which GHG sources should be included, as well as quantifying methodology (i.e. formula needed for calculating the emissions). Another informant from a government authority (TGO) mentioned the application of the emissions data from company with Thailand GHG inventory rather than the reason why the companies choose any particular guidelines and standards. However, it seems that from the view from the NGOs informants opposed the view from academic informants on the market or economic reasons. The former indicated that the policy from the headquarter, demand for good public image and peer pressure as influential factors on corporate choices of GHG measuring and reporting guidelines and standards; while the latter exclusively pointed to the location of company's market as an important determinant.

Question on opinions and comments of governments, NGOs and academic on company's voluntary initiatives

The second issue was the comments from government authorities, NGOs and academic on company's voluntary initiatives. First of all, two informants from oil and gas companies were asked to explain the details of GHG emissions measuring and reporting. Then interviewees from NGOs, government authorities and academic were asked to give opinions on the fact that at the present there are some oil and gas companies in Thailand that have already conducted some sort of climate change mitigation activities on a voluntary basis. The main purpose of asking this

question was to examine attitudes of non-company stakeholders on company's initiatives which could reflect their relationships. The answers from the four stakeholders are presented in Table 3.

Table 3 Answers from semi-structured interviews with four types of stakeholders on the details of company's GHG measuring and reporting activities and comments from government authorities, NGOs and academics.

Stakeholders Issue	NGO	Academic	Government authority	Company
Question: **What do you view the voluntary effort of company in measuring and report GHG emission?**	• The companies in Thailand which are an operator (not join venture) are doing accounting and reporting GHG emission. Salamander is a company which has no operation, so it does not conduct the report.	• Companies do GHG reduction policy for their own green washing. They are not serious to mitigate climate change.	• TGO: Oil and gas companies are not yet the target of GHG reduction mission. The electricity companies are the current target because they release the most GHG emission. Company A doesn't reveal the true data of GHG emission, since they are afraid that they will then fall under state regulations. • DMF: Company A doesn't reveal exact GHG emission.DMF is now preparing to implement **a guideline for GHG quantification and reporting for E&P sector** which has a penalty for the companies who do not follow, with a fine of THB 50,000. The reasons for implementing the guideline is to address the incomplete GHG emission data for E&P sector. The problem is that 1) companies can choose to report GHG emission by either operation control or equity share.2) not all companies submit data. 3) those who submit data do not use the same guidelines.The purpose is to have more complete and accurate GHG data to feed into National GHG inventory which is necessary for Thailand climate change mitigation policy.	• Company A: The Company has been measuring and reporting GHG emission since 2008. It has formed its own guideline which is called " Company A's name Group GHG Accounting and Reporting". The guideline has adopted ideas from some prominent GHG standards and guidelines which are ISO 14064-1, GHG Protocol, IPIECA, API Compendium and IPCC. • The companies voluntarily submit GHG emission report to the DMF once a year. The DMF just acknowledges the report. The company sets reduction target to meet the KPI of SEPA (State Enterprise Performance Agreement). This target is changed each year. • Company B: As a subsidiary of Company A, Company B follow their GHG Accounting and Reporting. However, Company B do not have reduction target. Company B focuses on increasing the technological efficiency o that the fossil fuels will be used less in the operation.

Note: The names of companies are kept anonymous. Company A refers to an upstream while Company B refers to a midstream company.

From Table 3, two oil and gas companies described their activities on measuring and reporting GHG emissions. Company A has started the activities since 2008 and developed its own measuring and reporting guideline which was the combination of various international guidelines and standards. Company B, as a subsidiary of Company A, has applied with the guideline of Company A. The emissions data from both companies were submitted voluntarily once a year to Department of Mineral Fuels (DMF). Only Company A has set a reduction target to meet the KPI of SEPA (State Enterprise Performance Agreement), with the target varying from year to year.

Despite the voluntary effort of companies, informants from government authorities and academics seem to question the company GHG emissions data. The answers from two government officials apparently showed suspicion on the emissions data of Company A. Moreover, the academic informant regarded the voluntary effort of companies as a green washing activity for them to have good public image NGOs informant provided information on a the basic conditions required for companies to measure and report GHG emissions. According to her, company would only report when they were actually involved in either exploration or production, not when they merely invested in capital with another oil and gas company.

Due to the fact that only a small number of oil and gas companies have voluntarily submitted GHG emissions data, and that they have applied different guidelines and standards to measure and report GHG emissions, the government office in charge (DMF) has thus prepared to implement guidelines for GHG quantification and reporting for petroleum exploration and production (E&P) sector. GHG emissions data from E&P sector will be included in Thailand National GHG inventory; thus complete and accurate GHG emissions data is vital. The guideline would have penalty as 50,000 baht fine for those companies who fail to submit the GHG

emissions data. However, at the time of writing the thesis (July 2014), the guideline has not yet implemented due to the political instability in Thailand, said the DMF informant.

Question on the current climate change mitigation policy in Thailand

The third issue on current climate change policy in Thailand, which focuses on the policy imposed on the upstream oil and gas industry, were asked to informants from four types of stakeholders. From answers shown in Table 4, the identical response among all informants was that Thailand at present does not have greenhouse gas emission policy in general and climate change policy on oil and gas industry in particular. The climate change mitigation in Thailand has so far conducted on voluntary basis only, and mostly been in the form of CDM (Clean Development Mechanism) projects, which brought about economic benefits to participants. The future of international agreement on climate change mitigation was considered similarly by informants from government authority (TGO) and academics as an important factor influencing Thailand climate change mitigation policy.

However, two informants had different views on the negotiation of Kyoto Protocol's second commitment period. The former expected stricter international agreement which would set binding reduction targets on every nation including Thailand; while the latter viewed Kyoto Protocol unreliable especially in the post-2012 period. In both cases, it is clearly seen that international climate change mitigation agreement has direct impact on Thailand climate change policy. In the absence of binding regulations from state and inter-state organizations, non-state actors such as associations of industry have played an important role in setting norms and rules for private actors. As Company B mentioned, a non-state organization called 'Solomon' has been proliferating best practice and conducing benchmarking for all oil refinery plants (midstream

industry) around the world. Meeting the requirements of Thailand government authority was not its focus, but to be listed in the first quartile of Solomon by the year 2018.

Table 4 Answers from semi-structured interviews with four types of stakeholders on Thailand climate change mitigation policy

Stakeholders Issue	NGO	Academic	Government authority	Company
Question: **Could you please explain the current climate mitigation policy in Thailand?**	• Thailand does not have any regulations imposed on oil and gas companies. • If the government would implement any policy about oil and gas companies, the Petroleum Institute of Thailand (PITI) will act as a middle person to send feedback from companies to the government.	• Two themes that Thailand is trying to do for climate change mitigation are energy efficiency and renewable energy. • There is no climate change Act, or any binding regulations. Thailand will not implement any in the future, since it will affect the economy - increasing the production cost, every sector will disagree. • Kyoto protocol is not reliable especially in the second round. So Thailand even doesn't have to make any binding regulation. We are now doing the GHG reduction by voluntary basis. • CDM is accepted since it provides income to project owners. • What Thailand is doing according to Kyoto Protocol is NAMAs and National Communication which is conducted by TGO. • TGO invented some standards such as Carbon Footprint, which has some content from ISO and GHG Protocol.	• TGO: The main state authority to be responsible in GHG emission reduction.TGO has not yet had authority to order sectors to reduce GHG emissiosn. TGO is trying to increase authority but has to wait to see an international agreement : The framework of Kyoto Protocol is on the process of negotiation. It is expected to finish by 2015. If the new framework is set, Thailand will have new organization to implement the law. (Saying that after 2020 all countries have to reduce the GHG emission.)GHG reduction mission is the responsibility of each ministry and it is not the first priority yet.	• Company B: The company follows Thai authority's policy in increasing energy efficiency and initiating renewable energy. The company has no obligation to submit GHG emission data to Department of Factory, Ministry of Industry. However, the goal of the company is beyond meeting national official requirements but to pass the criteria by a non-state organization called Solomon, which is the benchmarking organization for all oil refinery plants around the world. It aims to be listed in the first quartile of Solomon by 2018.

4.1.2 The second round in March 2014.

The fieldwork in March 2014 took place only in Bangkok, Thailand. The original plan was to interview key informants from four types of stakeholders: company, government authority, NGOs and scholars. However due to political situation in Thailand[vii], the study managed to interview three key informants from NGOs, company (Company A) and government authority (Department of Mineral Fuels: DMF). Interview questions were designed for each type of stakeholders. There are three questions were asked to interviewees. The first issue is asked about responsibility of individual interviewees concerning climate change mitigation. The second issue is their opinion on the possibility of establishing sectoral approaches for climate change mitigation in upstream oil and gas industry in Thailand. And the third issue is the actors who can be influential to company decision.

As shown in Table 5.1 and 5.2, responses from three key informants were presented and categorized into three types of stakeholders: NGOs, government authority and company. In Table 5.1 answers on each informant's particular responsibility were illustrated, and then following with a comparison of their answers on the second and third question are presented in Table 5.2.

Table 5.1 Answers from semi-structured interviews with three types of stakeholders on individual responsibility concerning climate change mitigation in Thailand.

Stakeholders Issue	NGOs	Government authority(DMF)	Company(Company A)
Question: Could you please explain your responsibility or work that is related to climate change mitigation in Thailand?	• I would like to create public awareness about distorted energy prices and the petroleum concession law which gives more benefits to oil and gas companies both Thai and foreign ones, more than Thai citizens. So far I have been applying social media such as Facebook , and political debate or conference as a media to convey messages to Thai people • Colleagues and I have tried to propose a law, so that oil and gas companies will have to reveal information to the public. The effort is now in stalemate due to current political dispute. • Thai people have become aware of energy issue due to high increases in energy prices, even before the protest against Prime Minister Yingluck Administer took place. At this moment, Thailand has an acting government. It is a good timing for Thai people to have more active discussions on energy issues. • Personally I am satisfied with the current awareness of Thai people. For example, they have become familiar with the concept of petroleum concession law.	• The policy from Ministry of Energy is focused on energy efficiency, not on greenhouse gas emissions reduction. The guidelines to measuring and report GHG emissions for upstream oil and gas industry is still inactive, waiting for the approval from the ministers. But there is no active government right now and the situation is not stable. • Thailand Greenhouse Gas Management Organization (TGO) tried to reinforce CDM projects in Thailand, but later the carbon prices have decreased so the CDM atmosphere become less active. Ongoing projects are on voluntary basis such as Carbon Footprint, Carbon Label, which do not contribute to greenhouse gases reduction. • Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environment is the focal point of climate change mitigation policy but so far has not provided any clear guidelines or regulations.	• Com A has reported GHG emission since 2008 and sent them to the authorities, which have only acknowledges the report. • The national inventory considers the macro energy used in the country and calculate this information as a national GHG emission. The national inventory is not the sum up of all GHG emission from each sector. This is also because the corporate sector has its particular inventory which is different from national inventory. IPCC 2006 has three calculation methods for country, company and project levels • There is so far no law to assign companies to reduce GHG emission. At least not until 2020 that the developing countries have to reduce GHG emission as an obligation.

Table 5.2 Answers from semi-structured interviews with three types of stakeholders on opinions on possibility of sectoral approach establishment and the actors that can be influential to company decision

Stakeholders Issue	NGOs	Government authority (DMF)	Company(Company A)
Question: **How do you view the possibility of establishing sectoral approaches for climate change mitigation in upstream oil and gas industry in Thailand?**	No information on this issue.	• Upstream oil and gas industry is regarded as an energy producer which do not release greenhouse gases as much as electricity generating plants which are the main energy user. Moreover, releasing gas to the atmosphere causes oil and gas company to lose benefits since the emitted gases are their products. The oil and gas companies thus avoid emitting gases. The oil refinery plants also have less GHG emissions than the power generating plants. • The GHG emissions from upstream oil and gas sector are very small relatively to those from other sectors such as industrial and transportations. If Thailand would really reduce greenhouse gas emissions, the target sector will not be upstream oil and gas industry • Power generating plants or those plants with boilers have started to increase energy efficiency by themselves because they can reduce production cost and increase their public image.	• The sectoral approach can be applied only in the industry which has very similar products such as cement industry. Even the oil refinery plants cannot compare each other due to the difference in capacity. • The production and exploration process of the company will anyway release GHG even though they apply the best technology. So the point is how each company can help produce low-emission products, so that both the company and the society can get benefits. Also the company can implement carbon-offset project such as planting forest as carbon sink. • People misunderstand that oil and gas companies are the main emitters. However in fact all of us who use fossil fuel are the emitters. So the best way to reduce GHG emission is to decrease the usage of fossil fuels. For example, we should increase renewable energy such as biodiesel, ethanol gas. Alternatively forest can be planted to absorb GHG emission.

Table 5.2 (continued) Answers from semi-structured interviews with three types of stakeholders on opinions on possibility of sectoral approach establishment and the actors that can be influential to company decision

Stakeholders Issue	NGOs	Government authority (DMF)	Company (Company A)
Question: **Which actor has influence on company decision to set up sectoral approaches?**	• Scholars should be the one who suggest the solution to social problems. However, they have to be totally independent from any interest groups; otherwise they might cause conflict of interest. Nevertheless, Thai scholars still do not pay much attention to the oil and gas industry. NGOs are weak at trying to convince society and are criticized for not having reliable knowledge, but only opinions. • As a member of subcommittee of the Senate on Energy security, I have participated in tri-party conferences among government, business and civil society. However, the government role has been limited by the lobby of business sectors. Moreover, the current petroleum concession law gives autonomous authority over operation sites to the companies. This disables the government from assigning the companies. The government can mostly only seek cooperation with companies. • Some government officials have been involved in the companies, for example having an executive position, which leads to conflict of interest. Some government offices even offer scholarships to their personnel using money from companies. Taking this fact into account, how could one expect the government to impose law or regulation on companies?	• The government is the most important actor. Clear policy is very necessary. However, Thailand's policy depends on the outcome of international agreement. The international organizations have to assign reduction targets so that Thailand government will take action, or else nothing would happen. From COP19, Thailand and other developing countries were not required to reduce GHG emissions, but only to submit NAMAs. After 2020, every nation may have to reduce GHG emission. However, things are not certain. Negotiations are ongoing on these issues.	No information on this issue.

Question on responsibilities related to climate change mitigation

From Table 5.1, three informants described their particular responsibility or work related to climate change mitigation in Thailand. The NGOs interviewee not only has been working for the Foundation for Consumers, a non-for-profit organization, but also serving as member of subcommittee of the Senate on energy security issues. His current activism works are not directly related to climate change mitigation with oil and gas industry; rather they aim to build awareness of Thai people on the distorted energy prices (oil and gas) which he claims are partly the result of Thailand petroleum concession law that gives many advantages and benefits to oil and gas companies over Thai citizens. One of key issues understood from interviewing with the NGOs informant is that the rise in energy prices seems to be a trigger of public concerns on energy issues in Thailand. Together with political uprisings against government, energy issues have been more actively and widely discussed among Thai people, no matter the ages, occupations and economic status of the person.

The informant from the Department of Mineral Fuels (DMF), which is the government office directly in charge of upstream oil and gas industry, has provided information to this study for the second time. According to his responses, the guideline for GHG quantification and reporting for E&P sector is still on the waiting process. To implement the guideline which has a legal status, the approval of minsters is required. The current political conflict has put the issue in on stalemate. Concerning climate change mitigation in Thailand at present, the informant illustrated a rather static atmosphere in the three main government offices involving the issue. First of all, the Ministry of Energy, in charge of Energy security in Thailand, prioritizes energy efficiency over GHG emissions reduction. The Office of Natural Resources and Environmental Policy and Planning, Ministry of Natural Resources and Environmental Policy, a focal point of

Thailand climate change mitigation, has so far not implemented any clear regulations or guidelines on GHG emissions reduction. Last but not least, Thailand Greenhouse Gas Management Organization (TGO), in charge of accrediting CDM projects, is facing the difficulty of proliferating CDM projects in Thailand due to the decrease of carbon price. Although it has launched many pilot projects on voluntary basis with business sectors such as Carbon Footprint and Carbon Label, these projects do not contribute much to GHG emissions reduction.

The company informant is also from Company A, but a different person from the preliminary round. Responses from the company informant provide thoughts on climate change mitigation from a business perspective which is a policy practitioner. Once again, it was noted by the informant that there is no law imposed on oil and gas companies to reduce greenhouse gas emissions. However, Company A has voluntarily submitted GHG emissions data to the authority who would usually only acknowledge the report. According to the informant, the reason given by the government authority for obtaining GHG emission data from companies in order to develop National GHG Inventory is misleading. This is because the National Inventory is not the sum of all GHG emission data from all sectors, but must be developed by using specific methodology and macro data at the country level. The informant further pointed out that IPCC revised guideline in 2006 mentioned three levels of GHG emission data: corporate, country, and project. Each required specific methodology on measuring GHG emissions.

Responses from the company informant reflect different technical understanding on GHG emission measurement between business sector and government authority. GHG emission measuring and reporting approach is a fundamental requirement of sectoral approaches. In order to cut down emissions, knowing emission data is vital. The study will discuss the importance of this issue in more detail in Chapter 5.

Question on opinions on the possibility to set up sectoral approaches

From the data in Table 5.2, due to having different working areas, the first issue on sectoral approaches was not asked to the informant from NGOs, but exclusively to the informants from government authority (DMF) and company (Company A), whose views on sectoral approaches in upstream oil and gas industry were pretty much alike. Interestingly, both informants agreed on the fact that upstream oil and gas industry has relatively lower GHG emissions than other sectors; thus the industry may not be the target of GHG emission reduction policy, if there is any. The informant from the government authority pointed to electricity generating companies for using much energy and emitting relatively more GHG emissions. On the other hand, the company informant stated that everyone who uses fossil fuels has a responsibility in releasing GHG emissions; thus the blame should not be put wrongly on oil and gas companies. While responses from the government informant could imply that other sectors, such as industrial, transportations and power generating, should be the targets of GHG emissions reduction policy thank to relatively high emissions, the company informant clearly dismissed the possibility to establish sectoral approaches in oil and gas industry, saying that industries which have homogenous products like cement industry are more suitable candidates. The point raised by the company informant is very important since it is related to the debate on which sectors could be candidate for sectoral approaches. Having homogenous products is one of the various criteria on selecting the sectors for sectoral approaches. The study has exemplified all possible criteria taken from main literatures in section 2.1.4 in Chapter 2.

Question on the actors that can be influential to company decision

Another key point from the second round of semi-structured interviews is which actor is influential on corporate decision to set up sectoral approaches. The company found this question to be sensitive; hence it was omitted from the interview with the company informant. Only NGOs and government authority informants were asked to express insightful opinion on the issue. However, each gave different responses, with the NGOs informant entailing some sort of disappointment on the role of government. When asked about the actor who can influence the oil and gas corporate decision to establish sectoral approaches, the NGOs informant firstly pointed out to the inability of government in dealing with corporations. Two main reasons were mentioned: the conflict of interest of some government officials and the current petroleum concession Act which allegedly offers more benefits to corporates more than Thai citizens. Acknowledging that the role of NGOs has also been limited since society tends to regard information from NGOs as mere opinions, not true knowledge, the NGOs informant referred to scholars as the ones who should give solutions to social problems. The scholars must be independent to interest groups in order to make unbiased judgments. However, Thai scholars have not much worked on the oil and gas industry-related issues, said the NGOs informant.

Some of the government criticisms voiced by the NGOs informant were shared with the informant from government authority during his interview, to attempt to gain knowledge about how the other side perceived the issue. However, details will not be presented here, not only because they were not related to the research topic but also because in accusations of conflict of interest it is difficult to make a judgment without any strong evidence. Unlike the NGOs informant, the government respondent considered the state to be the most important actor who can influence the oil and gas industry on the establishment of a sectoral approach. Nevertheless,

Thailand climate change mitigation policy depends on the outcome of international negotiations. Without obligation assigned to it by international organizations, Thailand would not take any step on cutting down GHG emissions. From the negotiation at COP 19, Thailand is required to submit NAMAs. After 2020, every nation-state may have to set reduction target, but there is little certainty because negotiations are still ongoing, as reported by the government official at the end of interview.

The findings presented above summarized both rounds of semi-structured interviews with informants from four types of stakeholders: company, NGOs, academic and government authority. The preliminary semi-structured interviews provided general understandings on climate change mitigation in Thailand; while the second round interview investigated deeper on the issue of sectoral approaches in oil and gas industry. Because the research applied a cross-checking approach while conducting the interview, there were occasions when the informants presented the same issue with different point of view. The research tried to maintain the objectivity by considering the stance of each informant and taking into account data from literature reviews. The following section will present responses to online questionnaires of company and non-company group. The latter consists of respondents from NGOs, academic and government authorities. The findings from both semi-structured interviews and online questionnaires will be combined together and discussed in Chapter 5.

4.2 Online questionnaires

As explained in Chapter 3, the research conducted two versions of online questionnaires distributed to upstream oil and gas companies and non-company group which is comprised of NGOs, academic and government authorities. Most of the questions were specifically asked to each group. However, both groups were asked to provide agreement level on factors influential on corporate decision on setting up sectoral approaches, and technical questions such as what type and activities of sectoral approaches should be established in Thailand. An overview of questions asked to company and non-company group was shown in comparison in table 6. The red mark (*) was put on the compulsory questions required responding. Some respondents skipped answering some alternative questions; thus the research will not present responses to alternative questions because of lacking complete responses from all respondents. However, the research still takes all available answers into account when discussing results in Chapter 5.

In conclusion, results from online questionnaire are comprised of three parts:

4.2.1 Responses to specific questions asked to company group

4.2.2 Responses to specific questions asked to non-company group

4.2.3 Responses to identical questions asked to company and non-company group

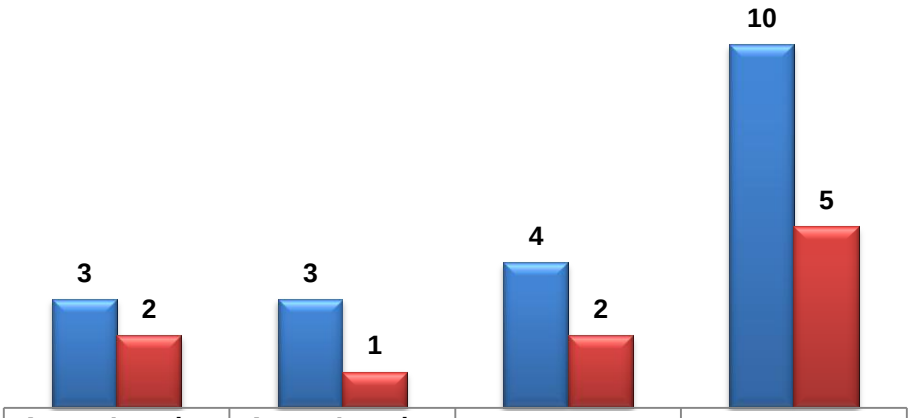
Following Table 6, the first two sections will present responses to specific questions asked to company and non-company group respectively, and the third section will present responses to identical questions asked to both groups.

Table 6 Overview of questions in online questionnaire

Type of questions	No.	Oil and gas companies	No.	Non-company (NGOs, Academic, government)
Specific questions	1	Company name / home-country location *	1	Name /Institute / position *
	2	Renewable energy investment*	2	Responsibilities related to climate change mitigation in Thailand *
	3	Voluntary climate change mitigation initiatives*	3	Degree of involvement with upstream oil and gas industry in Thailand*
	4	GHG emissions data/ guidelines for measuring and reporting/ emission reduction target	4	Opinions on the sectoral approaches to climate change mitigation and the sectors suitable for establishing sectoral approached in Thailand*
	5	Company's main product in next 20 years	5	Opinions on the absence of sectoral approaches in upstream oil and gas industry*
	6	Policy making process on climate change mitigation	6	Agreement level on actors influential on corporate decision to establish sectoral approaches in Thailand*
	7	Awards for good performance in environmental conservation	7	Opinions on the most influential actors on corporate decision*
	8	Environmental conservation projects with NGOs or Academics		
	9	Membership to industry association and company's role in the association		
	10	Representative of industry		
	11	Perceptions on socio-economic issues*		
	12	Activities in sectoral approaches that companies are willing to conduct together*		
Identical questions	1	Agreement level on factors that influence company to set up sectoral approaches*		
	2	Type of sectoral approaches*		
	3	Role of government in sectoral approaches*		
	4	View on possibility of sectoral approaches establishment in Thailand Upstream oil and gas industry*		
	5	Reasons for the view*		
	6	Any comments or suggestions on the research		

4.2.1 Responses to specific questions asked to company group

In February 2014, online questionnaire (see Appendix A for the complete online questionnaire) was sent to ten upstream oil and gas companies which have actual petroleum exploration and production in Thailand. Five of them replied the online questionnaire. Respondents were company personnel whose positions are related to climate change mitigation policy of the given company, for instance, Health, Safety and Environment Manager, Environmental Specialist, and Engineer. Names of respondents and companies were kept in anonymous. Additionally, to avoid bias on nationality of companies, the study presents responses of each company by referring to the international status in Kyoto Protocol of their home country: Annex I parties ratified Kyoto Protocol, Annex I parties Not ratified Kyoto Protocal and non-Annex I parties,



	Annex I parties ratified Kyoto protocol	Annex I parties Not ratified Kyoto Protocol	Non-Annex I parties	Total
Number of company in each category	3	3	4	10
Number of company responding to questionnaire	2	1	2	5

Figure 8 The number of companies in three categories: Annex I parties, non-Annex I parties and Not ratify Kyoto Protocol, comparing with number of company responding to online questionnaire

Table 7 Responses from companies to questions on renewable energy investment, voluntary climate change mitigation initiatives and sectoral approach activities that companies are willing to conduct collectively

Company categorized by status on Kyoto Protocol of home country	Renewable energy investment	Voluntary climate change mitigation initiatives	Current climate change mitigation initiatives	Sectoral approaches activities
Company A from Annex I party Not ratified Kyoto Protocol	**No**	**No**	Reason for not conducting: Only big company should do so.	• Conduct industry GHG database • Set up Monitoring, Reporting and Verification system (MRV) • Identify and proliferate best practice
Company B from Annex I party ratified Kyoto Protocol	**No**	**Yes**	Measure and report GHG emissions	• Conduct industry GHG database • Identify and proliferate best practice • Set voluntary reduction target • Set benchmark indicators
Company C from Annex I party ratified Kyoto Protocol	**No**	**Yes**	Measure and report GHG emissions	• Conduct industry GHG database • Set industry reduction target • Identify and proliferate best practice • Set benchmark indicators • Set up MRV • Technology transfer • Set financial assisting package
Company D from non-Annex I party	**No**	**Yes**	Measure and report GHG emissions	• Conduct industry GHG database
Company E from non-Annex I party	**Solar energy**	**Yes**	• Measure and report GHG emissions • Set voluntary reduction target • Increase energy efficiency • Switch fuels with low carbon content • Increase carbon sink: reforestation • Found R&D and committee on Climate change mitigation strategy. • Launch environmental projects with NGOs and Academics • Join pilot projects with government	• Conduct industry GHG database • Set industry reduction target • Identify and proliferate best practice • Set benchmark indicators • Set up MRV • Technology transfer • Set financial assisting package

Table 7 shows the responses to three specific questions asked to companies were presented in comparison. The responses to the online questionnaire from the five upstream oil and gas companies were categorized by the status on Kyoto Protocol of their home country (the location of headquarter). New tags for each company are Company A from Annex I party Not ratified Kyoto Protocol, Company B from Annex I party ratified Kyoto Protocol, Company C from Annex I party ratified Kyoto Protocol, Company D from non-Annex I party, and Company E from non-Annex I party. It should be noted that Company A and Company B mentioned in results from online questionnaire are not the same with those mentioned in results from semi-structured interviews in section 4.1.

Question on renewable energy investment

The first specific question asked in the online questionnaire was "if your company (Thailand branch) has invested in renewable energy, please name the type of renewable energy". Six possible answers were offered to respondents to choose from: No investment in renewable energy, wind power, solar energy, bioenergy, geothermal energy and ocean energy. The choice 'Other' was provided for them to answer different type of renewable energy. As shown in Table 7, only Company E from non-Annex I party has invested in solar energy.

Question on company voluntary climate change mitigation activities

The next specific question asked in the online questionnaire was "Has your company (Thailand branch) internalized climate change mitigation into the business operation?" If the answer was yes, the respondent was asked to give further information on what are the voluntary climate change mitigation initiatives that the company has currently conducted. In opposite, the respondent was asked to provide additional explanation if the answer was negative. Figure 9

shows voluntary climate change mitigation initiatives for respondents to choose any that applied, and Figure 10 shows choices reasons why the company has not yet launched climate change mitigation activities, which the respondent can choose more than one item.

- ☐ Adjust the organizational structure by founding the climate change R&D team and/or climate change department and/or executive committee on climate change
- ☐ Launch environmental conservation projects with NGOs or academic
- ☐ Participated in the climate change mitigation pilot projects with governments
- ☐ Increase energy conservation and efficiency
- ☐ Enhance technology such as Carbon Capture and Storage (CCS)
- ☐ Switch to fuels with lower carbon content
- ☐ Investing in renewable energy (change portfolio)
- ☐ Measuring and reporting greenhouse gas (GHG) emission
- ☐ Setting voluntary emission reduction target
- ☐ Increase carbon sinks : forest re-plantation
- ☐ Other: _____

Figure 9 Voluntary climate change mitigation initiatives for respondents to choose any that applied. This is only for the companies which answer "yes, already conduct climate change mitigation activities". (Taken from online questionnaire in Appendix A)

- [ ] Lack of human resources capacity
- [ ] No mandatory regulation from the state to mitigate climate change
- [ ] Unavailability of technology
- [ ] Lack of capital availability
- [ ] No top-down policy for climate change mitigation
- [ ] No benefit expected from climate change mitigation
- [ ] No incentives from the government
- [ ] Only big oil and gas companies should mitigate climate change.
- [ ] No suggestions are provided from the headquarter
- [ ] Other: _____

Figure 10 Choices reasons why the company has not yet launched climate change mitigation activities. This is only for companies which answer "No climate change mitigation activity yet". (Taken from online questionnaire in Appendix A)

From responses of five companies in Table 7, Company A from Not ratified Kyoto Protocol country was only one which has not yet launched any climate change mitigation activities, saying that only big oil and gas companies should mitigate climate change. Company A from Not ratified Kyoto Protocol country chose to explain the absence of climate change mitigation activities in its operation with one mere reason over other available choices. The reason that the company A chose reflected how the company related itself with other companies in the same industry. The rationale of having only big corporations carry out GHG mitigation tasks is likely to lead to the problem of free riders. This is not encouraging for the successful establishment of sectoral approach, an action required cooperation among companies in the given industry (see more discussion in Chapter 5).

Among four companies which have already conducted voluntary climate change mitigation activities, Company E from non-Annex I party country has the most ambitious efforts. Eight out of ten voluntary activities have been performed by Company E including setting

voluntary emission reduction targets which was remarkable considering the fact that it is located in non-Annex I party country, which does not yet have a binding obligation to cut down GHG emissions. Company B and C from Annex I party ratified Kyoto Protocol country, and Company D and Company E from non-Annex I party have also measured and reported GHG emissions data, which is basic step of climate change mitigation efforts.

Question on sectoral approaches activities

Another specific question asked to companies is about the sectoral approaches activities. The complete question in online questionnaire is "what kind of activities in sectoral approaches in Thailand that your company would agree to join collectively with other companies?" Figure 11 presents choices on sectoral approaches activities for respondents to choose from (multiple answers allowed).

- ☐ Making collective data on GHG emission
- ☐ Setting GHG emission reduction target
- ☐ Setting benchmark indicators
- ☐ Establishing monitoring, reporting and verifying system
- ☐ Identifying and proliferating best practices
- ☐ Technology transfers
- ☐ Setting financial assisting package
- ☐ Designing and creating carbon credits market
- ☐ Other: _____

Figure 11 Choices on sectoral approaches activities for respondents to choose any that applied. (Taken from online questionnaire in Appendix A)

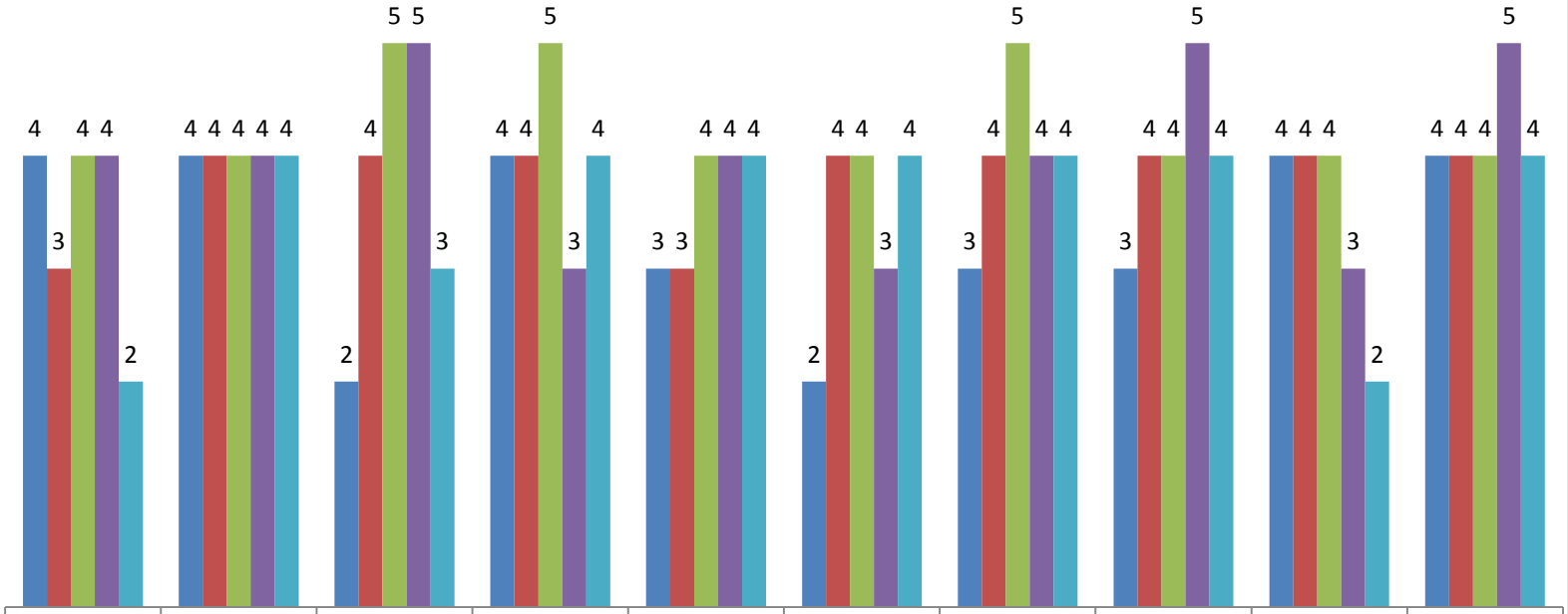
From responses shown in Table 7, Company D from non-Annex I party country was willing to participate only in conducting GHG emissions database of the industry; while the other four companies agreed to join force in at least three different schemes. Both Company C from Annex I party country and Company E from non-Annex I party country agreed on same seven sectoral approach programs. Designing and creating carbon credits market is the only sectoral approach program which was not chosen by any companies; while making collective data on GHG emission was an only scheme that all companies agreed on. It is noted that all eight sectoral approach schemes portrayed in Figure 11 were collected from literatures on sectoral approaches as well as the sectoral approach schemes practiced by heavy industries: cement, aluminum, and iron and steel (see chapter 2 for literature reviews).

Question on perceptions concerning socio-economic issues in Thailand and in global level

In this specific question, respondents were asked to provide level of agreement to express their perceptions on ten socio-economic issues happened in both Thailand and at the global level. The agreement level was ranked from a score of 1 to 5, in which a score of 1 refers to strongly disagree, 2 to disagree, 3 to neutral, 4 to agree and 5 to strongly agree. Ten socio-economic issues represent five themes which are related to the examination on factors influence upstream oil and gas companies in Thailand to set up sectoral approaches: consumers demand, NGOs campaigns, government policies, future of global climate change mitigation and future of fossil fuels.

Figure 12 in the following page shows scores of agreement level given to each issue by five respondents. The sum scores given to each issue were calculated to find average score, as shown in Figure 13. The issues that receive lowest average score (3.4) are related to the issues

whether Thai consumers can pay more for green products, Thai government will implement GHG reduction policy in next 5 years, and coal will be driven out from energy mix in next 10-20 years. The highest average score as 4.2 was given to the issue that Thai market of renewable energy will be big in next 10-20 years. Nevertheless, there are four issues that receive a high average score as 4, which are first, Thai consumers are more interested in environmental issues, second, oil and gas industry are a target of Thai sectoral approach policy, third, climate change mitigation will be set as a binding regulation for all states in next 5 years, and fourth, fossil fuels will be replaced by renewable energy in next 10-20 years.



	Thai consumers can pay more for green products.	Thai consumers are interested more in environmental issues.	O&G industry as a target of NGOs campaign in Thailand	O&G industry as a target of Thailand sectoral approach policy	Climate change as a threat to O&G industry	Thai GHG reduction regulation in next 5 years	Climate change mitigation as binding regulation for all nations in next 5 years	Fossil fuels will be replaced by renewable energy in 10-20 years	Coal will be driven out from energy mix in 10-20 years	Thai market of renewable energy will be big in 10-20 years
Company A	4	4	2	4	3	2	3	3	4	4
Company B	3	4	4	4	3	4	4	4	4	4
Company C	4	4	5	5	4	4	5	4	4	4
Company D	4	4	5	3	4	3	4	5	3	5
Company E	2	4	3	4	4	4	4	4	2	4

Score 1	Strongly disagree
Score 2	Disagree
Score 3	Neutral
Score 4	Agree
Score 5	Strongly agree

Figure 12 Scores of agreement level given to ten socio-economic issues by five companies

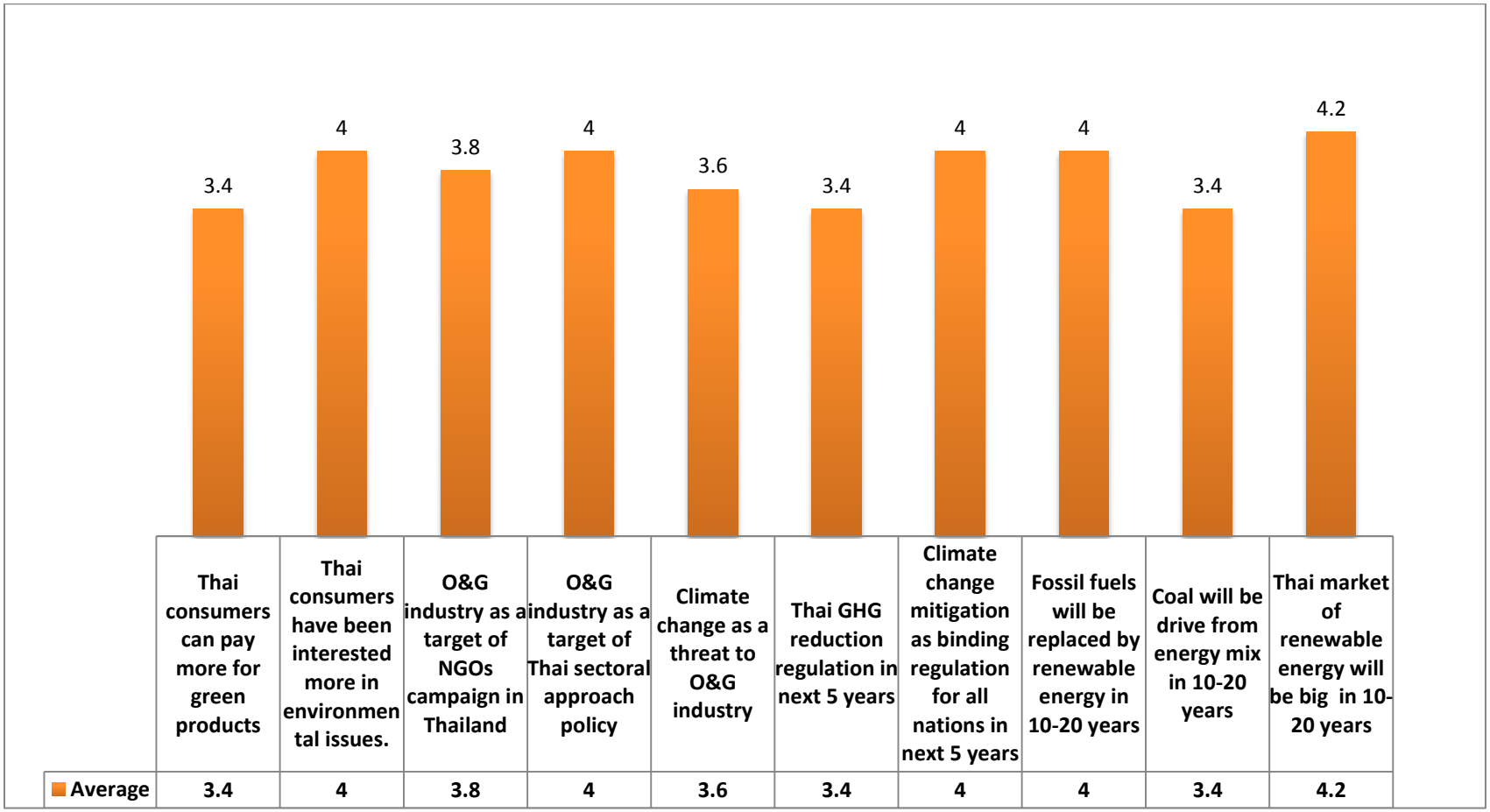


Figure 13 Average score for each issue, based on data from Figure 12

4.2.2 Responses to specific questions asked to non-company group

The second version of online questionnaire was designed and distributed to stakeholders apart from upstream oil and gas companies in April and May 2014. The target groups of this online questionnaire wree first, the government officials working in the climate change mitigation policy-related government offices, second, NGOs staff whose works are related to upstream oil and gas industry, and third, academics that have expertise in climate change mitigation and greenhouse gas emission reduction. In total received six replies were received: one from NGOs, three from different government authorities, and two from academics (from two different universities). However, in presenting the responses, the names of respondents were kept anonymous and each respondent will be referred by new titles as shown in Table 8.

Table 8 Respondents' affiliates and titles referred in the research

No	Affiliate	Status of Affiliate	Referred in the research as
1	Petroleum Institute of Thailand (PTIT)	NGOs	Respondent A
2	Thailand Greenhouse Gas Management Organization (TGO)	Government authority	Respondent B
3	Measure analysis and development, climate change office Office of Natural Resources and Environmental Policy and Planning (ONEP)	Government authority	Respondent C
4	Department of Alternative Energy Development and Efficiency. Ministry of Energy	Government authority	Respondent D
5	Kasetsart University,Bangkok	Academic	Respondent E
6	Faculty of Engineering Chiang Mai University	Academic	Respondent F

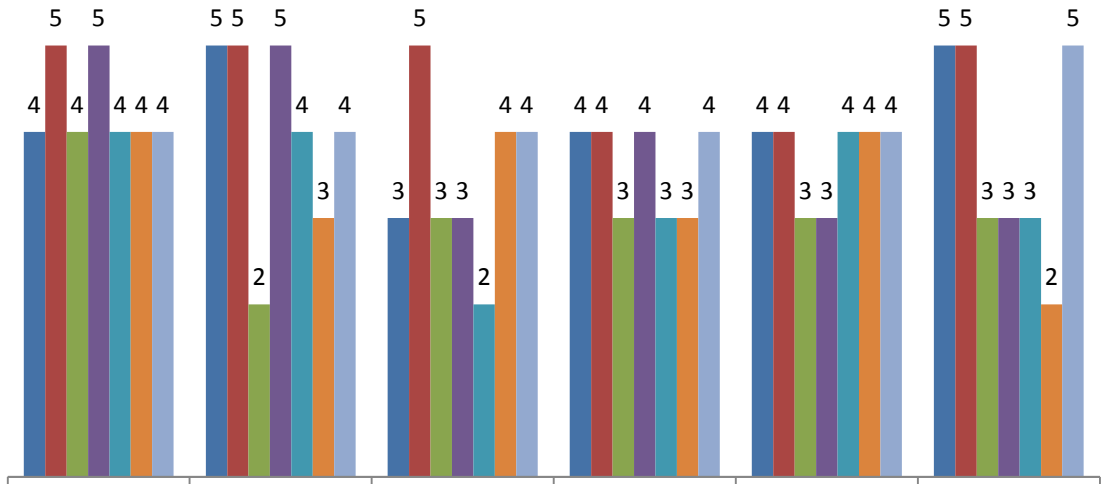
The specific questions asked to respondents in the non-company group were mostly about their opinions and insights on issues related to sectoral approaches to climate change mitigation in upstream oil and gas industry in Thailand. In this section, the responses to four specific questions asked to non-company respondents are presented. They are 1) opinions on potential of sectoral approaches establishment and the sectors suitable for sectoral approaches in Thailand, 2) opinions on the absence of sectoral approaches in upstream oil and gas industry, and 3) agreement level on which actors are influential on corporate decision to set up sectoral approaches in Thailand, and 4) opinions on the most influential actor and the reason why it is so. In the following page, Table 9 presents responses to the first and the second question. Figure 14 and Figure 15 present responses to the third question. And lastly, Table 10 presents responses to the fourth question. The explanation of aforementioned Tables and Figures will be illustrated in the following section.

Table 9 Responses on potential of sectoral approaches establishment and the sectors suitable for sectoral approaches in Thailand, and on the absence of sectoral approaches in upstream oil and gas industry

Respondents	Potential of sectoral approaches establishment and which sectors are suitable for sectoral approaches in Thailand	Why there is no sectoral approaches in upstream oil and gas industry?
Respondent A	There is high possibility of sectoral approaches in Thailand. Every sector can start doing research on GHG emissions reduction. If the government provides support, the action will be taken placed faster. The government should not focus only on sectors which emit high GHG emissions, but should include those sectors which have potentials to do efficient GHG reduction. However, there should be a study on real reduction potential of each entrepreneur. This is because some companies in upstream oil and gas and petro-chemical industry have already cut down GHG emissions; thus do not have much potential to reduce further emissions.	Actually there is sectoral approach in upstream oil and gas sector: GHG inventory has been developed and possible reduction approaches are being examined.
Respondent B	Waste sector should be the target of sectoral approaches. Although it is shown in Thailand National GHG Inventory that this sector has relatively low emissions compared to energy sector, but there is a deficiency management of waste sector. If there is good waste management, especially the good hygienic household waste landfills, we can not only reduce GHG emissions but also decrease social problems such as health. (The smell from those garbages can cause diseases.) In addition, the community will have better living condition. The gases released from the waste can be reused, which create jobs for local community.	There is an effort to set up sectoral approach in upstream oil and gas industry in Thailand by Department of Mineral Fuels (DMF). The department has done a study and developed GHG inventory in the sector. I also participated in the conference held by the department, to hear opinions from companies and related government offices. The industry seems to be willing to corporate in the project. There also has been a discussion on possible reduction approaches which can be beneficial to the industry as well such as, reusing gases from Flaring process.
Respondent C	There is high possibility of establishing sectoral approaches in Thailand. For developing countries like Thailand, sectoral approach can be developed as NAMAs if having high reduction potential and complete reduction circle.	It may be because measuring and reporting GHG emissions for example fugitive emissions, from the upstream oil and gas sector is quite difficult.

Table 9 (continued): Responses on potential of sectoral approach establishment and the sectors suitable for sectoral approaches in Thailand, and on the absence of sectoral approaches in upstream oil and gas industry

Respondents	Potential of sectoral approaches establishment and which sectors suitable for sectoral approaches in Thailand	Why there is no sectoral approaches in upstream oil and gas industry?
Respondent D	GHG emissions reduction in Thailand requires cooperation from all stakeholders: government, industrial sectors, Academic and civil society.	The mentioned heavy industries have used a large quantity of energy in production process; thus released relative higher emissions than other sectors.
Respondent E	It is possible but there must be preparation by studying the current situation of the industries. Additionally, the technology for GHG reduction must be examined.	Because the companies in the industry have not made agreement to work collectively. Also the fossil fuels exploration and production has been more difficult to achieve; the companies use more energy to produce petroleum and release more GHG emissions. The GHG reduction is thus difficult to undertake.
Respondent F	Sectoral approaches in Thailand are usually conducted in private sectors; especially power generating sectors, some heavy industries and commercial building sector. This could happen if their headquarters have a clear Corporate Social Responsibility (CSR) policy. Power generating sector is for example Electricity generating plants, oil refinery plants and gas separation plants. The industrial sector is such as cement, iron and steel, paper, and petrochemical. The commercial building sector is mainly comprised of big department stores; headquarter of commercial banks and five-star hotels.	It is because upstream oil and gas industry is the primary energy producer, and usually have operation sites off shore. Its share in GHG emissions is thus not obviously seen by people in society.



	Respondent A	Respondent B	Respondent C	Respondent D	Respondent E	Respondent F
Oil and gas companies	4	5	3	4	4	5
Thai government	5	5	5	4	4	5
NGOs	4	2	3	3	3	3
Consumers	5	5	3	4	3	3
Scholars	4	4	2	3	4	3
International organization: UNFCCC	4	3	4	3	4	2
International associoation of industry	4	4	4	4	4	5

Score 1	Strongly disagree
Score 2	Disagree
Score 3	Neutral
Score 4	Agree
Score 5	Strongly agree

Figure 14 Scores of agreement level given to seven actors can be influential to corporate decision to set up sectoral approaches in Thailand

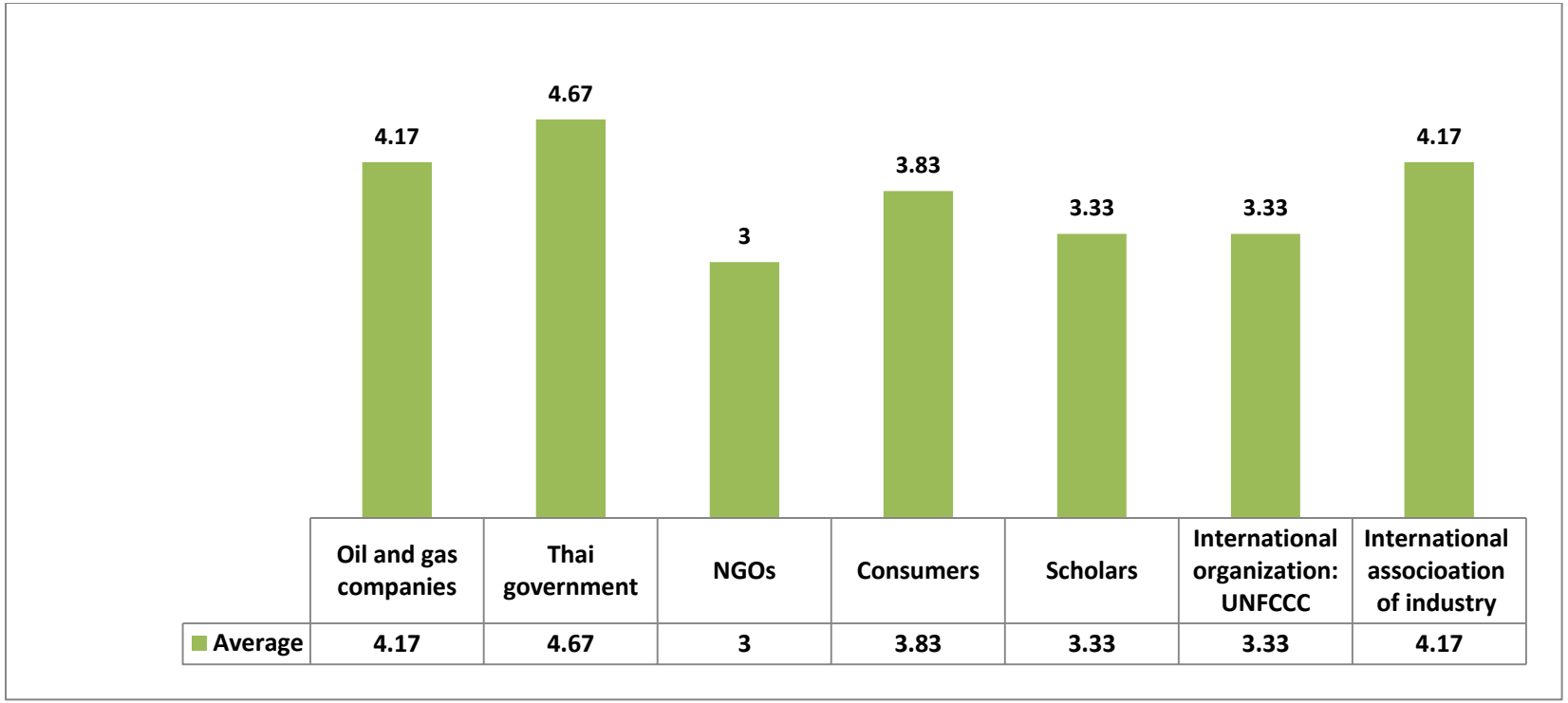


Figure 15 Average scores of agreement level on which actors are influential on corporate decision to set up sectoral approaches in Thailand, based on data from Figure 14

Table 10 Opinions on the most influential actor and why it is so

Name	The most influential actor	Why it is so?
Respondent A	Thai Government	Government can implement laws, If the companies violate, they will not be able to continue business. Thus the government influence is stronger than other actors.
Respondent B	Companies	If CEOs sees the importance of the issue, and assign a policy on climate change mitigation, as well as which the operation staffs are responsible for the task, the companies can initiate sectoral approach to reduce GHG emissions without the government implementing policy or other actor doing campaigns.
Respondent C	Thai Government	Because the companies have to comply with the law.
Respondent D	Consumers/ companies / Thai government authority	Every part of society has to cooperate in sectoral approaches.
Respondent E	Thai Government	The government can set binding regulation.
Respondent F	Thai Government	The government authority in charge in granting concession right, because it can set the conditions for companies to follow.

Question on potential of sectoral approaches establishment and which sectors suitable for sectoral approaches in Thailand

From Table 9, the respondents provided various opinions on both potential of sectoral approaches establishment and the sectors which are best candidate for sectoral approaches in Thailand. Respondent A and Respondent C viewed sectoral approaches as have high possibility to take place in Thailand. The former suggested that not only sectors with high GHG emissions, but also those which have potential to cut down emissions should be included in sectoral approaches; while the latter viewed that Thailand can implement sectoral approaches as Nationally Appropriate Mitigation Actions (NAMAs), which is a requirement from Bali Action Plan for developing countries to undertake reducing GHG emissions in their own ways. Respondent D and Respondent E had positive views on the possibility of sectoral approaches if there was a good level of preparation and cooperation of all stakeholders: government, industrial sectors, academics and civil society.

Regarding the sectors which are conducive for sectoral approaches in Thailand, Respondent B pointed to the waste sector which has a relatively small share in Thailand national GHG inventory. The reason for promoting sectoral approaches in waste sector according to the Respondent B, is that there is a deficiency in proper waste management system; especially in household waste. In addition, Respondent F provided information on three sectors that usually conduct sectoral approaches: power generating sector (i.e. electricity generating plants, oil refineries and gas separation plants), heavy industries (i.e cement, iron and steel, paper and petrochemical), and commercial buildings (i.e. big department stores, headquarters of commercial banks and five-star hotels).

Question on the absence of sectoral approaches in upstream oil and gas industry

The respondents were asked to give opinions on the absence of sectoral approaches in upstream oil gas industry, given the fact that there has been increasingly attention to sectoral approaches to GHG emissions reduction in heavy industries such as cement, aluminum, iron and steel, but there is not much discussion in sectoral approaches in upstream oil and gas industry which is also an energy-intensive industry.

From Table 9, Respondent C, D, E and F all pointed out the unique circumstances of the upstream oil and gas industry's GHG emissions as a reason for the absence of sectoral approaches in the sector, but their rationales were diverse. Respondent C viewed that because of GHG emissions; especially fugitive gases released through exploration and production process of upstream oil and gas industry is difficult to measure, so there is no sectoral approach in the industry. Respondent D's view is that those heavy industries such as cement, aluminum, iron and steel, have used a large quantity of energy in production process; thus releasing higher GHG emissions than upstream oil and gas sector. Respondent E in oppositely, viewed that fossil fuels have become scarcely; the companies needs to use more energy in exploration and production process which is resulted in emitting higher GHG emissions. Thus the GHG emissions reduction in upstream oil and gas industry has not taken place, concluded Respondent E. Another GHG emissions related issue was raised by Respondent F. According to him, the fact that upstream oil and gas industry is a primary energy produce and have often operation sites offshore, people thus have not recognized the GHG emissions from the sector.

Nevertheless, Respondent A and Respondent B both had different views from the questions. According to them, sectoral approach in upstream oil and gas industry has already

occurred in Thailand. They cited GHG inventory of upstream oil and gas industry, developed by Department of Mineral Fuels (DMF) as an evidence of sectoral approach establishment. Respondent B mentioned further to the conference held by the Department, to hear opinions from the companies in the upstream oil and gas industry and some related government offices on GHG inventory development. The companies seems to be willing to corporate in the program and there was discussion on possible GHG reduction approaches which can be beneficial to companies, such as the reusing gases from flaring process. However, the issue on GHG inventory in upstream oil and gas industry was differently expressed by a government informant during semi-structured interviews. More discussion on this issue will be provided in Chapter 5.

Question on agreement level on actors influencing on corporate decision to set up sectoral approaches in Thailand

In this question, the respondents were asked to provide agreement level on seven actors who can be influential to corporate decision to set up sectoral approaches in Thailand. The scores of agreement level were ranked from score 1 to 5, which score 1 means strongly disagree, score 2 means disagree, score 3 means neutral, score 4 means agree and score 5 means strongly agree. The respondents were supposed to give score 5 to actors whom they think were very important to the oil and gas companies in setting up sectoral approaches with other companies in the industry. Score 1 was given to actors whom they think had very low importance.

From data shown in Figure 14, scores of agreement level given to each actor were presented. Respondent A gave score 5 to Thai government and consumers, viewing them as having very high importance on company decision and gave score 4 to the rest actors, meaning that they have high importance. Respondent B gave score 5 to oil and gas companies and Thai

government, but score 2 to NGOs, meaning had low importance on company decision. Respondent C gave score 5 to Thai government; while score 2 to scholars. Respondent D gave score 3 to NGOs, scholars, and International Organization (UNFCCC), viewing them having medium importance, and score 4 to the rest actors. Similarly respondent E gave score 3 to NGOs and consumers, viewing them as having medium importance, and score 4 to the rest of actors. Lastly, respondent F gave score 5 to oil and gas companies and Thai government, and score 2 to international organization (UNFCCC).

Moreover, the study calculated the average score given to each actor, using data from Figure 14. The results were shown in Figure 15. Thai government was given the highest average score as 4.67. The second highest score as 4.17 was given to oil and gas companies and international association of oil and gas industry. The third highest score as 3.83 was given to consumers. Scholars and international organization (UNFCCC) received the fourth highest score as 3.33. Lastly, NGOs were given the lowest average score as 3.

The results in Figure 15 reflect that the respondents considered the Thai government have very high importance; while regarding NGOs as having very low importance on corporate decision to set up sectoral approaches in Thailand.

Question on the most influential actor and the reason why it is so

These are following questions to the question on agreement level on actors influencing on corporate decision to set up sectoral approaches in Thailand. In the previous question, the respondents gave agreement level on importance of seven actors. Same scores of agreement level may be given to various actors. For example, Respondent A gave score 5 to both Thai

government and consumers. As a result, the respondents were asked further to select the most influential actor and explain why it is so.

Table 10 presents the responses to aforementioned questions. Four from six respondents: Respondent A, C, E and F, said Thai government was the most influential actor. This answer compared well to the results in Figure 15, which showed that Thai government had the highest average score. These four respondents also explained similar reason why the Thai government was the most important actor; namely the government holds authority in setting binding regulation for companies to comply with. However, only Respondent B selected oil and gas companies, saying that the CEOs and the operation staffs can initiate sectoral approaches by themselves if they see importance of GHG emission reduction activity. Respondent D selected three actors: Thai government, oil and gas companies, and consumers. Every part of society has to cooperate if sectoral approaches would be successfully taken place, explained Respondent D.

4.2.3 Responses to identical questions asked to company and non-company group

This section presents the last result part from online questionnaire. There are in total six identical questions asked to upstream oil and gas companies which are collected in company group, and to government authorities, NGOs and Academics, which are gathered in non-company group.

The study will illustrate six questions in the following arrangement. In addition, since there are two groups of responses, the study will present data in each question in comparison between data from company group and data from non-company group.

1. Agreement level on factors that influence upstream oil and gas companies to set up sectoral approaches in Thailand
2. Type of sectoral approaches
3. Role of Thai government in sectoral approaches
4. Evaluating the possibility level of sectoral approaches establishment in Thailand upstream oil and gas industry
5. Reasons for the evaluated possibility level
6. Comments and suggestions on the research

Question on agreement level on factors that influence upstream oil and gas companies to set up sectoral approaches in Thailand

Respondents from company group (five upstream oil and gas companies) and from non-company group (one NGOs, three government officials and two academics) were asked to provide agreement level on factors that influence upstream oil and gas companies to act collectively with other companies in establishing sectoral approaches to climate change mitigation in Thailand (see complete online questionnaire in Appendix A and B).

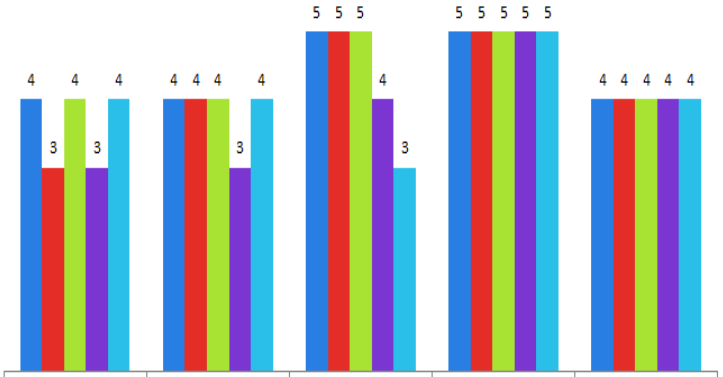
Scores for agreement level are ranked from a score 1 to 5, which score 1 means strongly disagree, score 2 means disagree, score 3 means neutral, score 4 means agree , and score 5 means strongly agree. The respondents are supposed to give score 5 if they think the factor is very high influential; while giving score 1 if they think the factor is very low influential to company decision on sectoral approaches establishment.

The factors in question are categorized into three sets which are based on the three models (see analytical frameworks described in Chapter3): Corporate Actor model factors, Domestic Politics model factors and International Relations model factors. Table 11 in the following page shows a list of factors in three models. Figure 16, 17, 18 and 19 present the responses of company group and non-company group in comparison.

Table 11 A list of factors in three models

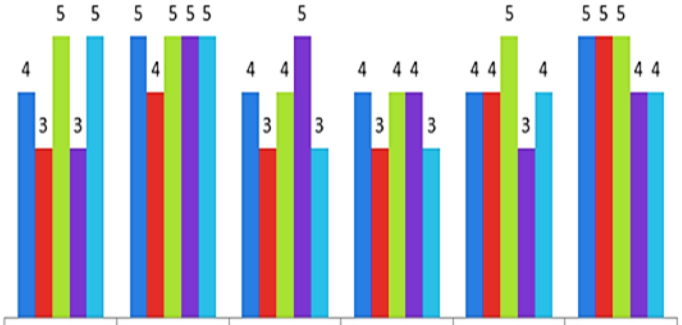
Models	Factors
Corporate Actor model	1.Capital availability
	2.Human resource availability
	3.CEOs' visions and policy
	4.Company is expecting positive benefits from sectoral approaches i.e. technology transfer
	5.Shareholder pressures
Domestic Politic model	1.Projecting Thai government will implement climate change mitigation regulations
	2.Good relations with government
	3.Good public image
	4.Response to public sentiment on environment incidents
International Relations model	1.Norm of being a good corporate citizen
	2.Compliance with guidance from international association of oil and gas industry
	3.Having no free riders
	4. Spillover effect from other industries which have already conducted sectoral approaches.

Corporate Actor model



	Company A from Annex I party Not ratified KP	Company B from Annex I party ratified KP	Company C from Annex I party ratified KP	Company D from Non-Annex I party	Company E from Non-Annex I party
Capital Availability	4	4	5	5	4
HR Availability	3	4	5	5	4
CEOs' vision and policy	4	4	5	5	4
Expected positive benefits	3	3	4	5	4
Shareholder pressure	4	4	3	5	4

Company group



	Respondent A	Respondent B	Respondent C	Respondent D	Respondent E	Respondent F
Capital Availability	4	5	4	4	4	5
HR Availability	3	4	3	3	4	5
CEOs' vision and policy	5	5	4	4	5	5
Expected positive benefits	3	5	5	4	3	4
Shareholder pressure	5	5	3	3	4	4

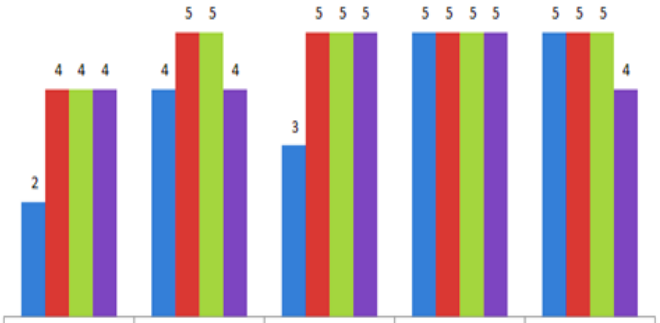
Non-company group

Figure 16 Scores of agreement level given to factors in Corporate Actor model by company and non-company group

Table 12 Averages scores given to factors in Corporate Actor model by company and non-company group

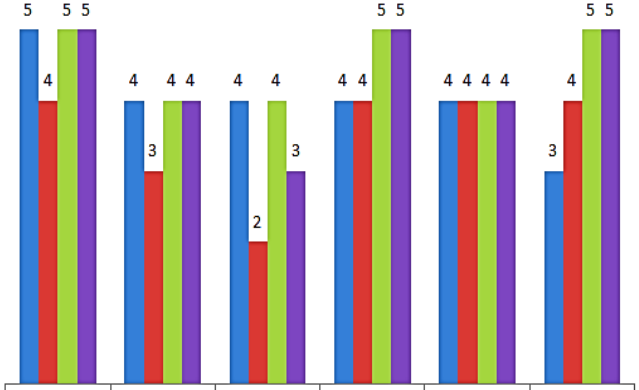
Factors	Average scores	
	Company group	Non-company group
Capital Availability	4.4	4.33
HR Availability	4.2	3.67
CEOs' vision and policy	4.4	4.67
Expected positive benefits	3.8	4
Shareholder pressure	4	4

Domestic Politics model



	Company A from Annex I party Not ratified KP	Company B from Annex I party ratified KP	Company C from Annex I party ratified KP	Company D from Non-Annex I party	Company E from Non-Annex I party
Project Thai climate change regulation	2	4	3	5	5
Good relations with government	4	5	5	5	5
Build good public image	4	5	5	5	5
Response to public sentiment	4	4	5	5	4

Company group



	Respondent A	Respondent B	Respondent C	Respondent D	Respondent E	Respondent F
Project Thai climate change regulation	5	4	4	4	4	3
Good relations with government	4	3	2	4	4	4
Build good public image	5	4	4	5	4	5
Response to public sentiment	5	4	3	5	4	5

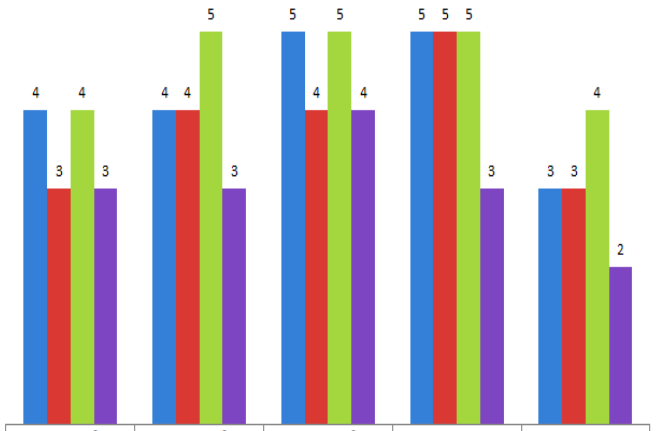
Non-company group

Figure 17 Scores of agreement level given to factors in Domestic politics model by company and non-company group

Table 13 Averages scores given to factors in Domestic politics model by company and non-company group

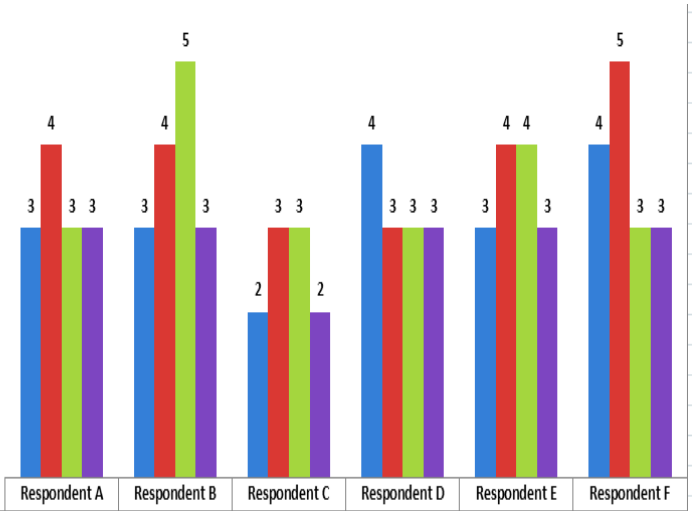
Factors	Average scores	
	Company group	Non-company group
Project Thai climate change regulation	3.8	4.0
Good relations with government	4.8	3.5
Build good public image	4.8	4.5
Response to public sentiment	4.4	4.3

International Relations model



	Company A from Annex I party Not ratified KP	Company B from Annex I party ratified KP	Company C from Annex I party ratified KP	Company D from Non-Annex I party	Company E from Non-Annex I party
Norm as being a good corporate citizen	4	4	5	5	3
Compliance with guidance of international association of industry	3	4	4	5	3
Having no free riders	4	5	5	5	4
Spillover from other industries	3	3	4	3	2

Company group



	Respondent A	Respondent B	Respondent C	Respondent D	Respondent E	Respondent F
Norm as being a good corporate citizen	3	3	2	4	3	4
Compliance with guidance of international association of industry	4	4	3	3	4	5
Having no free riders	3	5	3	3	4	3
Spillover from other industries	3	3	2	3	3	3

Non-company group

Figure 18 Scores of agreement level given to factors in International Relations model by company and non-company group

Table 14 Averages scores given to factors in International Relations model by company and non-company group

Factors	Average scores	
	Company group	Non-company group
Norm as being a good corporate citizen	4.2	3.17
Compliance with guidance of international association of industry	3.8	3.83
Having no free riders	4.6	3.5
Spillover from other industries	3	2.83

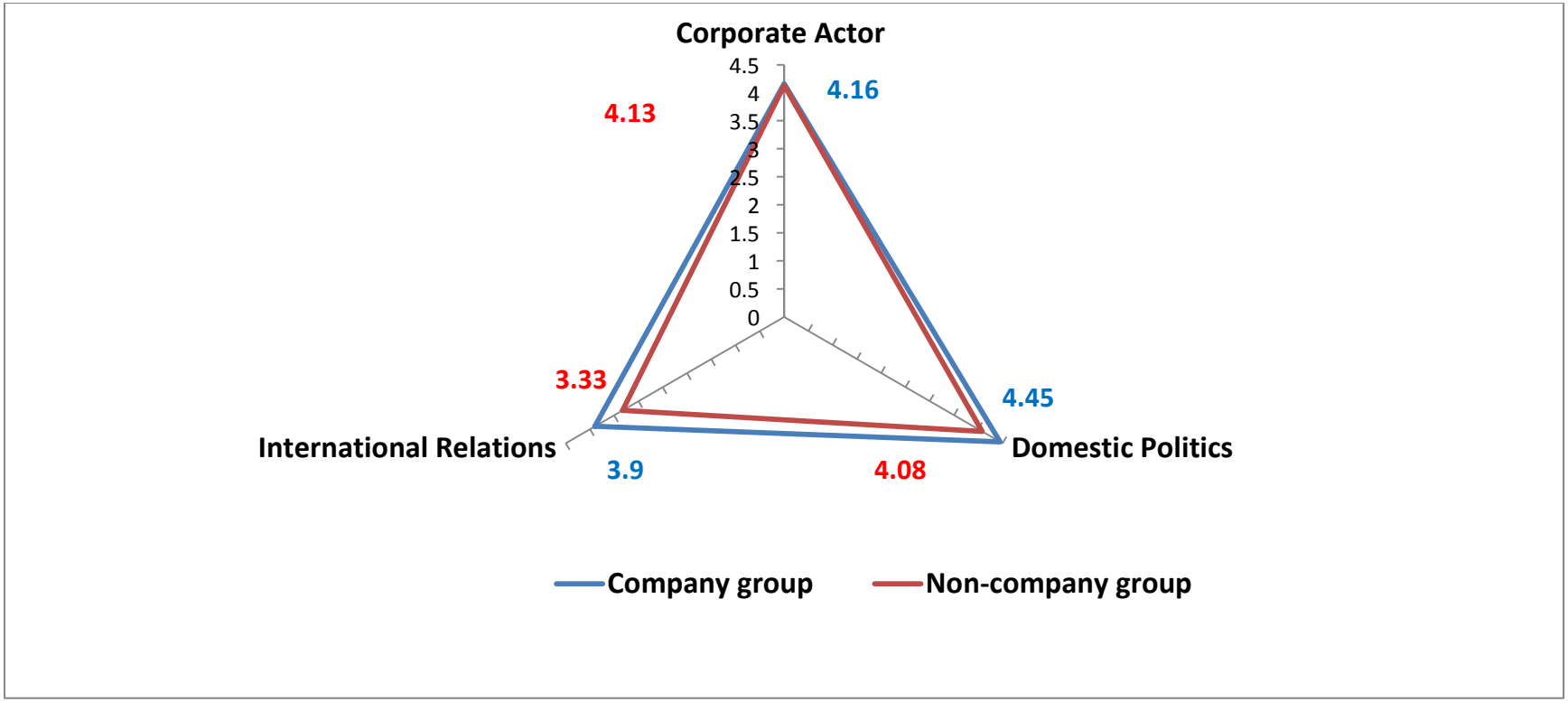


Figure 19 Average of sum scores of each model by company and non-company group

Table 15 Average of sum scores of each model by company and non-company group

Data	Average of sum scores of each model		
	Corporate Actor model	Domestic Politics model	International Relations model
Company group	4.16	4.45	3.9
Non-company group	4.13	4.08	3.33

Explanation of Figure 16,17,18,19 and Table 12,13,14,15

1) Corporate Actor model

Figure 16 presents scores of agreement level given to five factors in Corporate Actor model by company and non-company group. From the data, scores of agreement level given by respondents from both groups are ranked from score 3 to score 5. No respondents gave score 1 and score 2. Score 3 was given to factors which the respondents view as having medium influence, score 4 to factors which the respondents view as having high influence and score 5 to factors which the respondents view as having very high influence on companies decision to set up sectoral approaches.

Table 12 in the same page presents average scores of each factor by using data from Figure 16 in calculation. In company group data, the factors 'Capital availability' and 'CEOs' vision and policy' have highest average score as 4.44. This means that respondents in company group view that the companies would be very likely to join other companies in the industry in setting up sectoral approaches if they have capital availability and CEOs' vision and policy. The factor 'Expected positive benefits' was given the lowest average score by company group as 3.8. This means that the respondents in company group view that the companies regard expected positive benefits as the least influential factor for them to establish sectoral approaches together with other companies.

In comparison, data from non-company group shows that the factor 'CEOs' vision and policy' has the highest average score as 4.67, which is higher than an average score given to this factor by company group (average score 4.44). This means that respondents from non-company group view that the companies would be very much likely to join other companies in the industry in

setting up sectoral approaches if they have CEOs' vision and policy. Moreover, the respondents in non-company group view the factor 'HR availability' as having the lowest importance on the companies' decision, due to it was given the lowest average score as 3.67.

2) Domestic Politics model

Figure 17 presents scores of agreement level given to four factors in Domestic Politics model by company and non-company group. The data show that scores of agreement level given by respondents from both groups are ranked from score 2 to score 5. No respondents gave score 1 to any factors. Score 2 was given to the factor 'Project Thai climate change mitigation policy' by Company A from Annex I party Not ratified Kyoto Protocol in company group, and to the factor 'Good relations with government' by Respondent C in non-company group. This means that these respondents think that two aforementioned factors have low importance on the companies' decision to set up sectoral approaches. Score 5 was given by four from five respondents in company group to the factors 'Good relations with government' and 'Build good public image', meaning that the respondents think that companies would be very much likely to join other companies in establishing sectoral approaches because they want to have good relations with government and good public image.

Table 13 in the same page presents average scores of each factor, based on data in Figure 17. The factors 'Good relations with government' and 'Build good public image' were given the highest average score in company group as 4.8. This means that the respondents in company group think that to have good relations with government and good public image are very much encouraging factors for companies to join other companies in establishing sectoral approaches. The respondents in company group gave the lowest average score to the factor 'Project Thai

climate change mitigation regulation' as 3.8, meaning that they think the factor has very low influential on corporate decision.

The average scores given to four factors in Domestic Politics model by non-company group show similar results with the average scores by company group. The factor 'Build good public image' was given the highest average score as 4.5., which is a bit lower than the average score given by company group (average score as 4.8). This means that the respondents in non-company group view that the companies would very much like to build good public image as the prime reason for them to set up sectoral approaches. However, the respondents in non-company group view the factor 'Good relations with government' as having the lowest importance on corporate decision, due to it was given the lowest average score as 3.5. This result is opposite to the company group perception, which view that 'Good relations with government' is the most important factor.

3) International Relations model

Figure 18 presents scores of agreement level given to four factors in International Relations model by company and non-company group. The respondents gave scores of agreement level to factors in the third model ranking from score 2 to score 5. No one gave score 1 to any factors, which means that the factors in this model have at least low importance on companies' decision, according to viewpoints of respondents from both groups. In the company group, score 2 was given to the factor 'Spillover effect from other industries' by Company E from non-Annex I party. This means that the respondent view that the spillover effect from other industries would not give very high influence on companies' decision on setting up sectoral approaches with other companies in the industry. Respondent C in non-company group also gave score 2 to the factors 'Norm as being a good corporate citizen' and 'Spillover effect from other

industries'. This means that the respondent view that the norm as being a good corporate citizen and spillover effect from other industries have low influence on companies' decision. Three respondents in company group gave score 5; while the other two gave score 4 to the factor 'Having no free riders'. This means that the respondents in company group view that companies tend to a very high degree to set up sectoral approaches if there is no free riders. In non-company group, the factor 'Compliance with guidance from International association of industry' was given generally positive scores of agreement level, ranking from score 3 to score 5: Respondent C and D gave score 3, Respondent A, B and E gave score 4 and Respondent F gave score 5. This means that the factor is viewed as having medium to very high influence on companies' decision.

From Table 14, the average scores of each factors were presented, based on data in Figure 18. The factor 'Having no free riders' was given the highest average score in company group as 4.6, meaning that the respondents consider all companies must participate in the activities as an very important condition for companies to start sectoral approaches. At the same time, the factor 'Spillover effect from other industries' received the lowest average score as 3 in company group. This means that the respondents view the factor have the lowest influence in the International Relations model on the companies' decision. For non-company group, the factor 'Compliance with guidance from International association of industry' obtains the highest average score as 3.83. This means that the respondents view that the guidance from International asocial of industry is the most important factor for companies to establish sectoral approaches. Like the company group, the respondent in non-company group also gave the factor 'Spillover effect from other industries' the lowest average score as 2.83. This means that both groups view that 'Spillover effect from other industries' has very low influence on companies' decision.

4) Comparing data from company and non-company groups on three models

The study calculated an average of sum scores that company group and non-company group gave to factors in three models. The total scores of agreement level given by company group to all factors in Corporate Actor model was divided by the total number of responses, which is formulated as 104 / 25 = 4.16. 4.16 is thus the average of sum scores given by company group to Corporate Actor model. Same approach was done with the rest of data from company group and non-company group. The results were then shown in Figure 19 and Table 15.

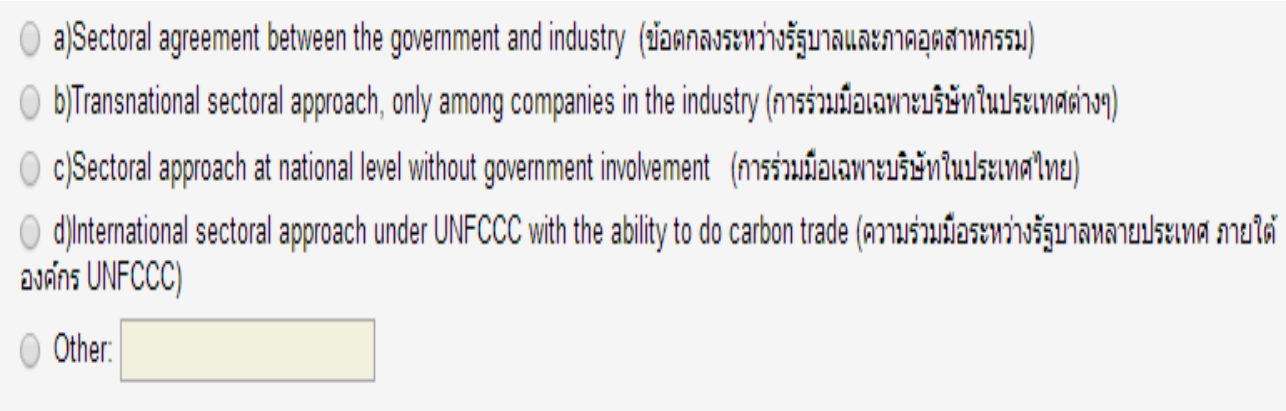
The results reveal that firstly, Domestic Politic model has the highest average of sum scores as 4.45 in all three models, and in all average of sum scores. The company group was the one who gave average of sum score as 4.45 to Domestic Politics model. Similarly, the non-company group also gave Domestic Politics model a high degree of importance due to the average of sum score is 4.08. Although Domestic Politics model has the highest second average of sum score after Corporate Actor model, according to non-company group, the Domestic Politics model is still considered high importance due to its average of sum score is not much different from average of sum score given to Corporate Actor model which is 4.13. In conclusion, Domestic Politics model, concerning factors about Thai government and the public sentiment, are very important to companies' decision to set up sectoral approaches in Thailand.

Secondly, Corporate Actor model received fairly high average of sum score from company group and non-company group, which are 4.16 and 4.13 respectively. This means that both groups view that the factors in Corporate Actor model, which all are concerning to company's specific features, are fairly influential determinants to companies' decision on sectoral approaches establishment.

Thirdly, International Relations model received the lowest average of sum scores from both company group and non-company group, which are 3.9 and 3.33 respectively. This means that both groups consider factors in International Relations model are hardly influential to companies' decision. In addition, average of sum score as 3.33, given by the non-company group, to International Relations model, is the lowest amount in all averages of sum score. The margin between the lowest average of sum score and the highest is 1.12, which is quite large. This result emphasizes that factors in International Relations model has much lower impact on companies' decision than factors in Domestic Politics model.

Question on type of sectoral approaches

In this question, respondents were provided four possible types of sectoral approaches and asked to choose only one type that they considered as the most appropriate to be established in upstream oil and gas industry in Thailand. Those four possible types are shown in Figure 13 (see complete online questionnaire in Appendix A).


a)Sectoral agreement between the government and industry (ข้อตกลงระหว่างรัฐบาลและภาคอุตสาหกรรม)

b)Transnational sectoral approach, only among companies in the industry (การร่วมมือเฉพาะบริษัทในประเทศต่างๆ)

c)Sectoral approach at national level without government involvement (การร่วมมือเฉพาะบริษัทในประเทศไทย)

d)International sectoral approach under UNFCCC with the ability to do carbon trade (ความร่วมมือระหว่างรัฐบาลหลายประเทศ ภายใต้องค์กร UNFCCC)

Other:

Figure 20 Four possible types of sectoral approaches, taken from online questionnaire in Appendix A

Table 16 Response on the most appropriate type of sectoral approaches in Thailand

Type of sectoral approaches	Sectoral agreement between government and the industry	Transnational sectoral approach among companies	Sectoral approach at national level but without government	International sectoral approach under UNFCCC
Company group	Company B, C, D and E	nil	Company A	nil
Non-company group	Respondent A,B,E, D and F	nil	nil	Respondent C

From Table 16, a majority of respondents chose sectoral agreement between government and the industry as the most appropriate type of sectoral approaches for upstream oil and gas industry in Thailand. Only Company A from Annex I party Not ratified Kyoto Protocol chose sectoral approach at national level but without government involvement, and Respondent C was only one who view the most appropriate type is International sectoral approach under UNFCCC. Transnational sectoral approach among companies in the same industry is only type which has no respondents voted for.

Question on role of Thai government in sectoral approaches

Respondents were asked to express opinions on the suitable role of Thai government if sectoral approaches will be established in upstream oil and gas industry. Like previous question, the respondents were provided four possible roles of Thai government and asked to choose only one role which is the most suitable. Figure 21 presents four choices offered to the respondents.

- a)There is no need for government support. ไม่ต้องการความสนับสนุนจากรัฐ กรุณาตอบคำถามข้อ 6
- b)Government authority should involve in offering monitoring, reporting and verifying system. หน่วยงานราชการควรให้ความสนับสนุนด้านการจัดตั้งกระบวนการ monitoring, reporting and verifying
- c)Government authority should offer incentive such as tax waiver for the companies who join sectoral approaches. หน่วยงานราชการควรให้แรงจูงใจแก่บริษัทที่เข้าร่วม เช่น ลดหย่อนภาษี
- d)Government authority should launch the emission reduction as a regulation, to prevent the free riders. หน่วยงานราชการควรออกกฎหมายให้มีการลดก๊าซเรือนกระจก เพื่อป้องกันปัญหาผู้หลีกเลี่ยงไม่ทำตาม
- Other:

Figure 21 Four possible roles of Thai government, taken from online questionnaire in Appendix A

Table 17 Responses on the most suitable role of Thai government in sectoral approaches

Role of Thai government	No need for government support	Offering Monitoring, Reporting and Verification system (MRV)	Offering incentives such as tax waiver	Launching the regulation to prevent free riders
Company group	nil	Company A, C and E	Company D	Company B
Non-company group	nil	Respondent D,E and F	Respondent A and C	Respondent B

The data shown in Table 17 include responses from respondents in company group and non-company group to the question 'what should be the role of government regarding sectoral approaches in Thailand?' (Online questionnaire taken from Appendix A). The majority of respondents in both groups view that the government should assist in Monitoring, Reporting and Verification system (MRV), which is necessary in measuring and reporting GHG emissions data (further explained by the researcher). Respondent A, Respondent C and Company D from non-Annex I party, considered 'Offering incentives such as tax waiver' to companies so that they will be willing to join sectoral approaches, is the most suitable role of Thai government. Two respondents, Company B from Annex I party ratified Kyoto Protocol and Respondent B, have same opinion that the government should launch sectoral approaches as a regulation so that there will be no free riders. According to the data, there is no votes for the choice 'a) There is no need for government support', meaning that all respondents consider government involvement in sectoral approaches necessary, although to different degrees.

Question on evaluation of sectoral approaches establishment possibility and the explanation

In this question, respondents were asked to evaluate the possibility of sectoral approaches establishment in upstream oil and gas industry in Thailand. Evaluation scores are ranked from score 1 to score 5. Score 1 is for the least possibility and score 5 is for the most possibility. Following the evaluation, respondents were required to give brief explanations. Both evaluation scores and explanations of all respondents are shown in Table 18.

Table18 Evaluation scores of possibility of sectoral approaches establishment in Thailand upstream oil and gas industry and the explanations

Group	Name	Evaluation scores	Explanation
Company group	**Company A from Annex I party Not ratified Kyoto Protocol**	**3**	The GHG emission reduction cannot not be seen the effect in the immediate time and not in the reduction area. The company officials responsible for the GHG reduction, such as those working on oil and gas rigs, may be actively involved at the beginning of activity. However, after a while and the result cannot be seen concretely, they would become passive and less inspired to continue eventually. It is then difficult for executives or manager in the company to push everyone to continually involve, since the task has no substantial effect and is endless.
	Company B from Annex I party ratified Kyoto Protocol	**5**	We as an oil and gas industry have worked for this approach for a while and have reported on their GHG inventory as a minimum. A reduction on the GHG emission would be the destination of our currently preparation
	Company C from Annex I party ratified Kyoto Protocol	**4**	The E&P companies have shown willingness to participate in many projects to reduce GHG impacts, and are eager to work together to develop sectoral approaches.

Table18(continued): Evaluation scores of possibility of sectoral approaches establishment in Thailand upstream oil and gas industry and the explanations

	Company D from non-Annex I party	**3**	Our company is just a small operator with a small production rate, however, we have a good intention to do a good thing for this earth
	Company E from non-Annex I party	**4**	Company has GHG accounting and reporting system and GHG reduction target
Group	**Name**	**Evaluation scores**	**Explanation**
Non-company group	**Respondent A**	**4**	The upstream oil and gas sector has potential and been interested in setting up sectoral approaches.
	Respondent B	**4**	There is high possibility but it is not certain that all companies in the industry will cooperate.
	Respondent C	**3**	Because if there is new international agreement assigning every country to cut down GHG emissions, Thai government will implement laws or measurements to achieve the obligation.
	Respondent D	**3**	It depends on readiness and awareness of oil and gas companies in Thailand for GHG mitigation issue.
	Respondent E	**4**	The government office in charge of GHG reduction policy in upstream oil and gas industry has good understanding on the issue and already informed the industry to get ready.
	Respondent F	**4**	Upstream oil and gas industry has readiness both capital and human resources. If CEOs approve, they can start the activity right away.

Regarding the question on evaluation scores, respondents in company group and non-company group considered sectoral approached have positive possibility to be established in upstream oil and gas industry, due to all evaluation scores given are ranked from score 3 to score 5. Company B from Annex I party ratified Kyoto Protocol was only one respondent giving score 5 which means the most possibility. In its explanation, Company B stated that oil and gas industry have conducted the climate change mitigation activities for a while, at least by measuring and reporting GHG emissions data. As a result, the sectoral approaches to mitigate GHG emissions are the goal of industry efforts.

Score 4, the high possibility, was given by a majority of respondents in both groups: Company C from Annex I party ratified Kyoto Protocol, Company E from non-Annex I party, Respondent A, B, E and F. However, reasons for the views were various. Company C, Respondent A and Respondent F mentioned similarly that the upstream oil and gas industry has potential and readiness to perform sectoral approaches. Respondent B also had same agreement about the potential of the industry, but was not certain that all companies will participate into the scheme. Company E from non-Annex I party considered sectoral approaches high possibility to be established given the fact that the company has already GHG accounting and reporting system and set voluntary GHG reduction targets. Respondent E considered government authority's good performance as the reason for positive view on possibility of sectoral approaches establishment.

There are four respondents giving score 3, medium possibility, to the sectoral approaches establishment. They are Company A from Annex I Not ratified Kyoto Protocol, Company D from non-Annex I party, Respondent C and Respondent D. The explanations are however diverse. Respondent C was concerned that Thai government will implement GHG emission reduction policy if international agreement obliges all countries to undertake the action. Hence, the

possibility of sectoral approaches in Thailand is only at medium level. Respondent D was concerned on readiness and awareness of oil and gas companies for GHG emission mitigation activities. Similar to Respondent D, Company A mentioned that GHG emission reduction activities do not reveal the results immediately. The company operation staffs in charge will become less enthusiastic and it is difficult for managers to encourage them to continue this endless and result-hard-to-be-seen jobs. Company D, moreover, mentioned to the size of company, which is relatively small compared to other companies in the industry. The small production volume of the company led Company D to consider sectoral approaches a medium possibility of establishment.

Question on comments and suggestions for the research

This is the last question in online questionnaire. Respondents were asked to provide any comments or suggestions regarding the research. Since it is not compulsory, some respondents did not answer the question. In the Table19 in the following page, the study collected responses and highlighted some important comments.

Company D from non-Annex I party considered the research as a good start for oil and gas companies to be concerned on climate change mitigation activities. Company B from Annex I party ratified Kyoto Protocol encouraged publishing of research findings so that it would be beneficial to oil and gas industry and related government authorities. Lastly, Respondent C emphasized that sectoral approaches in the upstream oil and gas industry in Thailand has to be implemented by government authority, because the industry is dominated by a small number of companies which almost causes monopoly. The effort from NGOs and civil society is thus not efficient to drive oil and gas companies.

Table 19 Comments and suggestions on the research

Group	Name	Comments or suggestions
Company group	**Company A from Annex I party Not ratified Kyoto Protocol**	Some questions are difficult to answer.
	Company B from Annex I party ratified Kyoto Protocol	Publish findings to oil and gas industry for the research outcome would be benefit to the industry and related government.
	Company C from Annex I party ratified Kyoto Protocol	Hope it is useful in understanding the impact of the GHG on the environment in Thailand.
	Company D from non-Annex I party	This research is a good start of making the potential oil and gas business to concern about the climate change before the implementation in the next step.
	Company E from non-Annex I party	Nil
Non-company group	**Respondent A**	Nil
	Respondent B	Nil
	Respondent C	There are a small number of upstream oil and gas companies in Thailand, which almost causes monopoly in petroleum production and exploration. Thus the sectoral approach in this industry needs to be pushed by government authority, not NGOs or civil society.
	Respondent D	Nil
	Respondent E	OK in overall
	Respondent F	Nil

Chapter 5: Discussions

From the mid-1990s till present, substantial changes in the climate change strategies pursued by major multinational oil and gas corporations have been noticed and discussed various commentators. At the very beginning, climate change mitigation, which represents efforts to reduce man-made greenhouse gases, was considered as a threat to the oil and gas industry since its products were a direct cause of climate change [van den Hove, Le Menestrel, & de Bettignies, 2002]. The Global Climate Coalition (GCC), representing major fossil fuels producers, was formed in 1989 to put efforts into "preventing an international regime to impose caps on GHG emissions, and the USA from joining the Kyoto Protocol" [Kolk, Levy, & Pinkse,2008, p.2]. After the adoption of the Kyoto Protocol, changes in the oil and gas industry started to take place when British Petroleum (BP) decided to leave the GCC in 1996 [Kolk & Levy, 2001]. BP's withdrawal from the anti-climate change movement was followed by Royal Dutch Shell, which left the GCC in 1998. However, major US-based companies like ExxonMobil stayed in the GCC until it was dissolved in 2002 [Ibid].

Research published during that period paid attention mostly on understanding the causes of changes in corporate responses to climate change (why some companies have become less pessimistic about climate change) and the divergence of climate strategies between European and US-based oil and gas companies (why and how the divergence happened) [Sethi & Elango, 1999][Rondinelli & Berry, 2000] [Stonham, 2000] [Levy & Ans, 2002] [van den Hove, Le Menestrel, & de Bettignies, 2002] [Kolk & Levy, 2003] [Kolk & Pinkse, 2005] [Pulver, 2007b] [Kolk, 2008][Kolk, Levy, & Pinkse,2008] [Skjærseth & Skodvin, 2009]. However, as the issue has matured, the recent trend in the literature reflecting an increasing convergence of corporate

responses in the positive manner in which they respond to climate change mitigation [Kolk & Levy, 2004].

Although many have studied the increasing proactive climate strategies of the oil and gas industry, those efforts are still at the individual company level and focused on the headquarters of major European and US-based multinational oil and gas corporations. As a result, this study aims at examining sectoral approaches, which are the collective effort of companies in a particular industry in mitigating GHG emissions. The upstream oil and gas industry is the focus of the study since it has released more GHG emissions at the global level than any other heavy industries which have already established sectoral approaches. Moreover, the upstream oil and gas industry holds the potential to be a good candidate for sectoral approaches due to the high concentration of companies in the industry and the homogeneity of its products (see section 2.1.3 in Chapter 2).

Choosing Thailand as a study area, the study examined the perception of local branches of multinational corporations as well as the Thailand national oil and gas company on the possibility of sectoral approaches establishment. The responses to both semi-structured interviews and online questionnaires from upstream oil and companies and non-company group (NGOs, government authorities and academics) were presented in Chapter 4. In this chapter the implications of the findings will be discussed in detail. The focus will be on answering the research questions regarding which factors can be influential on corporate decision to set up sectoral approaches to climate change mitigation in Thailand, and what are the contents of sectoral approaches in term of type, activities and the role of Thai government, that are likely to be developed. First of all, the study would like to present two important findings on individual corporate responses to climate change of companies' local offices. After that, it will discuss

findings and answer research questions. Lastly, it will present several interesting issues for future research.

5.1 Perceptions of the upstream oil and gas industry in Thailand toward global climate change

As discussed earlier, the oil and gas industry has become less hostile to global climate change due to various incidents such as strong public sentiments on environmental conservation and the development of climate science. Since the upstream oil and gas industry in Thailand is comprised of multinational corporations whose countries of origin are Europe (Annex I party that ratified Kyoto Protocol), North America (Annex I party that did not ratify Kyoto Protocol), and Asia (both Annex I party that ratified Kyoto Protocol and non-Annex I party), the findings of this study reflects diverse company perceptions.

The issue in question here is whether companies in the upstream oil and gas industry in Thailand have positive or negative views on global climate change. The companies' responses to the online questionnaire (Figure 13) shows that the upstream oil and gas companies in Thailand do not consider climate change as a substantial threat to the industry. They are expecting a stricter international agreement on global climate change mitigation which will set binding GHG reduction targets to all countries in next 5 years. Moreover, they agreed that fossil fuels will be replaced by renewable energy and projected Thailand renewable energy market will enlarge in the next 10-20 years.

The perceptions of the upstream oil and gas industry in Thailand imply that the sector has become more aware that climate change is real and the world's efforts to address GHG emissions is gaining strong momentum. These climate-friendly attitudes spreading among upstream oil and

gas companies imply also that the companies are likely to take action in climate change mitigation efforts rather than opposing them.

5.2 Corporate responses to climate change in the developing country context (Thailand)

One of the main contributions of this study is that the data were collected from local offices of multinational corporations that are operating in upstream industry in Thailand together with the Thailand national oil and gas company. The findings from Thailand branches examine the hypothesis that multinational corporations, unlike states[viii], can instruct their branches operating across countries to comply with their headquarters' climate change policies, which usually correspond to the home countries' policies. [Skjærseth & Skodvin, 2001]. The climate change policy of the home country of multinational corporations has been considered an important factor influencing corporate climate change strategies [Sethi & Elango, 1999] [Levy & Newell, 2000] [Kolk& Levy, 2001].

The study tests the aforementioned hypothesis by asking company respondents about the companies' current voluntary climate change mitigation activities (Table 7). The responses partly prove the hypothesis; namely Company A which is from Annex I party Not ratified Kyoto Protocol has not yet conducted any voluntary climate change mitigation activities and explained that only big corporates should carry out the tasks. Meanwhile; the responses from Company B and Company C which are both from Annex I party ratified Kyoto Protocol (having GHG emissions reduction targets in their countries) show different findings from the hypothesis. These two companies have only conducted voluntary GHG emissions measuring and reporting, which is the most basic and common climate change mitigation effort. Moreover, the responses from Company D and Company E, which are from non-Annex I party, are also different from the

hypothesis, since they have initiated voluntary climate change mitigation activities without the requirement from state regulations. It should be noted that Company E from non-Annex I party has conducted a wide range of climate change mitigation activities including, setting reduction targets. The interviews with company informants revealed that Company E, as a state enterprise, sets reduction target as part of SEPA's KPI (State Enterprise Performance Appraisal's Key Performance Indicators). This explains why Company E has pursued various climate change activities.

In conclusion, the study finds that highly proactive climate change mitigation policies in the home country of multinational corporations may not influence to great extent local offices in other countries, and this appears to be the case for Thailand. The study hypothesizes the lack of climate change mitigation regulations in Thailand as a reason why the branches of multinational corporations have pursued only basic climate change activity in measuring and reporting GHG emissions although their countries of origin are from Annex I party which ratified Kyoto Protocol. The policy implication which can be drawn from this finding is that host country's political and social context may be the main determinant for climate strategies of local offices of multinational corporations. However, the study suggests further investigation on companies' local branches in other developing countries or non-Annex I parties in order to further clarify this issue.

5.3 Factors which can be influential to sectoral approaches establishment in the upstream oil and gas industry in Thailand

The study examined three set of factors based on an analytical framework of three models: Corporate Actor, Domestic Politics and International Relations models. The average of

the sum score given by respondents from the companies to the factors in the three models shows that the Domestic Politics model has the most influence on the corporate decision to set up sectoral approaches (Figure12). Within the Domestic Politics model, 'Good relations with government' and 'Build good public image' are given the highest average score by company group (Figure 10). This compares well with their perceptions on Thailand socio-economic which suggested that the companies considered themselves as a target of the state sectoral approaches policy, and that Thai consumers have become more interested in environmental issues (Figure 13). However, the companies considered that Thai consumers would not be willing to pay more for Green products. Their perception on Thai consumers implies that 'consumer boycott' on their products is unlikely to happen. Thus Thai consumers, although having become more active in environmental issues, are still not the influential factor that can give pressure to companies to set up sectoral approaches due to insufficient consumer power. NGOs are also not an influential actor since the companies do not consider themselves as a target of NGOs campaigns (Figure 13). In conclusion the Thai government is the most influential actor for companies regarding sectoral approaches establishment.

However, the non-company group of respondents (government authorities, NGOs and academics) gave the Corporate Actor model the highest average of sum score in the three models (Figure 12). The factor 'CEOs' vision and policy' in Corporate Actor model received the highest average score in all factors from the three model. The factor 'Good relations with government' in Domestic Politics model was given fairly lower average score than the factor 'CEOs' vision and policy' (Figure 9 and Figure 10). These responses show that non-company respondents considered the companies themselves the most important actor, but viewed Thai government has much lower influence on corporate decision on setting up sectoral approaches.

The view that Thai government appears to have less influence on the companies is reflected by the semi-structured interviews with government authorities, NGOs and academics. The non-company respondents mentioned that Thai government offices are facing some conditions that prevent them from imposing climate change mitigation on the upstream oil and gas industry.

The first condition is that the Thai government is waiting for a clear result from international negotiation on climate change mitigation. Without the binding obligation from international organization to cut down GHG emissions, non-company respondents expect that Thai government will not impose regulations on the industry (Table 4). Secondly, although the government would implement GHG reduction regulation in the future, the upstream oil and gas industry is not considered as the prime target due to relatively lower GHG emissions than other sectors such as transportation sector and electricity generating sector (Table 5.2). Because of these two conditions, the non-company respondents considered the companies themselves (CEOs' vision and policy in particular) more important than the Thai government in encouraging the sectoral approaches establishment.

While the companies are willing to follow the state policy, the Thai government seems reluctant to implement stringent GHG emissions regulations on the industry due to two conditions mentioned earlier. One of possible ways to solve the divergent perspective of government and companies is, as the NGOs informant proposed, that the government should change the policy-making criteria from merely focusing on the sectors which have high GHG emissions to the sectors which have a potential to reduce GHG emissions (Table 9). The data in Table 18 shows that a majority of company and non-company respondents agreed that the upstream oil and gas industry has potential to conduct sectoral approaches because they possess

capital and human resources availability. Many of the companies have experiences in conducting voluntary individual climate change mitigation activities, at least in GHG emissions measuring and reporting (Table7). Moreover, as one of non-company respondents suggested, the sectoral approaches in the upstream oil and gas industry can be developed as Nationally Appropriate Mitigation Actions (NAMAs) which is the requirement of Bali Action Plan to all developing countries (Table 9).

In conclusion, the findings from the study suggest that the companies consider the Thai government as the most influential actor for them to establish sectoral approaches and are willing to comply with the state policy in order to have good relations with the government. As a result, the Thai government may consider shifting policy focus to impose GHG reduction reduction on the potential sectors as part of its Nationally Appropriate Mitigation Actions (NAMAs).

5.4 The type of sectoral approaches and role of Thai government

After examining which factors can be influential to the corporate decision on sectoral approaches establishment, the study investigated the perceptions of company and non-companies respondents on which type of sectoral approaches is the most likely to be established and what is the most appropriate role of Thai government. The sectoral approaches as an effort to mitigate climate change of the companies in a particular sector can take place in various levels (national and international) and with multi-parties to the agreement (companies, governments, international organizations). Table 1 in section 2.1.2 showed the possible types of sectoral approaches.

The study found that the sectoral agreement between the industry and Thai government at national level was given a majority votes from company and non-company respondents (Table

16). This choice has important implications and shows that in order establish sectoral approaches in the upstream oil and gas industry in Thailand there must be cooperation between the government and the companies. Also, the sectoral approach at the national level is more likely to be established than transnational sectoral approaches or international sectoral approaches which have a wider scope and more actors involved.

While only Company A from Annex I party which did not ratified the Kyoto Protocol chose the sectoral approaches among companies in the industry at national level without making an agreement with the government (Table16), it did not reject government assistance. Rather, Company A was interested in having government assistance in Measurement, Reporting and Verification system (MRV) (Table 17). In GHG emissions mitigation effort, MRV is crucial for companies to apply the same standard and guideline in measuring and reporting their released GHG emissions [UNFCCC, 2013]. For accrediting GHG emissions data of the companies it is necessary to have a third party who performs MRV . Without "robust, transparent, consistent and accurate" MRV [Climate Action, 2014], the companies may find it is troublesome to conduct GHG emissions measuring and reporting, and are at risk to have public disproval of their emissions data.

The data in Table 17 also showed that all respondents from company and non-company group prefer to have government involvement in sectoral approaches, although the degree of hoped involvement varies. Their responses were ranked from soft involvements such as government assistance in MRV, medium involvement like government incentives such as tax waiver to participating companies, to strong involvement as government imposing legally-binding regulation on sectoral approaches to prevent free riders.

In order to decide what the most appropriate role of Thai government in sectoral approaches is, the study found that the factor 'Having no free riders' which received a very high average score may be the key factor (Figure 11). This finding has implication that the companies would like to establish sectoral approaches if there are no free riders. As a result, the strong role of government in implementing the sectoral approach as a legally- binding regulation seems to be the most suitable. Only by this way, it can be ascertained that there will be no free riders in the sectoral approach in the upstream oil and gas industry in Thailand.

In conclusion, the responses from company and non-company respondents agree largely that Thai government and the upstream oil and gas industry must cooperate in establishing sectoral approaches. The Thai government is also required to take a stringent role in implementing the sectoral approach as a legally-binding regulation so that all companies have to participate in. The findings of this study are consistent with the policy suggestion on "initiating sectoral approach" made by the Pew Center on Global Climate Change, stating that "in sectors where companies have organized voluntarily, proposal for government action/commitments may arise from the private sector. For sectoral approaches to emerge in other sectors, the initiative may have to come from governments" [Pew Center on Global Climate Change, 2008, p.4].

5.5 The activities of sectoral approaches that the companies are willing to participate

Before discussing the activities of sectoral approaches that the upstream oil and gas companies in Thailand are willing to act collectively, it should be noted that individual climate change strategies which some companies have already conducted on voluntary basis partly overlap with the activities of sectoral approaches (Table 7). Individually, companies would measure and report GHG emissions to government authority, or international association of

industry, or non-state organizations working on business and climate change such as Fortune 500, Carbon Disclosure Project and Solomon. In addition, the companies may install new technology to increase energy efficiency such as Carbon Capture and Geological Storage (CCS) and Enhanced Oil Recovery (EOR). Setting voluntary GHG reduction target is another climate change mitigation effort that the company can pursue individually.

However, sectoral approaches activities include an elaboration and intensification of these individual efforts. First of all, the sectoral approach as a collective climate change mitigation effort requires the gathering of GHG emissions data of member companies to establish an industry GHG database. A common guideline for measuring and reporting GHG emissions is necessary. It can be developed either by the association of the industry such as 'Cement CO_2 and Energy Protocol' of Cement industry, or other international organizations, i.e. ISO's GHG Management and Lifecycle standards and the WBCSD/WRI Greenhouse gas Protocol applied by Aluminum industry, and ISO 14404:2013 applied by Iron and Steel industry (see section 2.1.5 in Chapter 2).

When GHG emissions are measured, the next common step is to set GHG reduction targets for the industry, which must be based on the Measurement, Reporting and Verification system (MRV) in order to "monitor, report, verify and mitigate CO2 emissions from the industry in a consistent and fair manner" [CO_2 Accounting and Reporting Standard for the Cement Industy, 2012]. The best practices will be showcased and diffused among member companies so that they will strive to improve performance. Research and development of green technology as well as technology transfer is expected to increase. Last but not least, financial assistance packages and carbon trading scheme can possibly be established once the sectoral approaches have become fully developed.

As shown in Table 9, Respondent A and Respondent B stated that the sectoral approaches in Thailand upstream oil and gas industry already exists and that an industry GHG Inventory has been developed. The study partly agrees with their opinions. This is because there are many more elaborating activities than industry GHG Inventory in the sectoral approaches, as explained earlier. Furthermore, the key informant from government authority during the semi-structured interview expressed the view that a 'Guideline for GHG quantification and reporting for Exploration and Production sector' is still inactive, waiting for the approval from the ministers (Table 5.1). Without a common guideline in measuring and reporting GHG emissions, the study considers that the sectoral approaches actually have not yet existed in the upstream oil and gas industry in Thailand.

Concerning activities in sectoral approaches that companies are willing to perform collectively, the data in Table 7 showed that all companies agreed on conducting industry GHG database. Identifying and proliferating best practice was given the second most popular form of action among company respondents. These findings suggest that the companies are mostly willing to measure and report GHG emissions to outsiders, which is a fundamental step of sectoral approaches. Moreover, the fact that four from five respondents chose best practice showcasing and spreading implies that the companies expected positive benefits from participating in the sectoral approaches, which normally come in the form of technology or performance improvement.

Nevertheless, the responses also showed that no company respondents selected the activity 'Designing and creating carbon credits market' (Table 7). The study hypothesizes that carbon credits market or carbon trading may be too advanced for the upstream oil and gas industry at the moment. Even in the well-established sectoral approaches in Cement, Iron and

Steel and Aluminum industry, there is not yet a development of carbon trading. Other reflections arise from the responses of Respondent C, D and E (Table 9), saying that GHG emissions from the industry are likely to increase as companies use more energy to explore and produce fossil fuels as these become scarcer. As a result, it may be difficult for the companies to gain carbon credits for trading. The study suggests further investigation on a trend of GHG emissions in relation to fossil fuel supply and potential of the upstream oil and gas industry on carbon trading.

Chapter 6: Conclusion and issues for future research

6.1 Conclusion

The upstream oil and gas industry is one of the most powerful and global actors, especially those multinational oil and gas corporations which have operations across countries. As Kolk and Levy pointed out, multinational corporations possess "substantial technological, financial and organizational resources which, if applied appropriately, could play a major role in reducing these emissions and in implementing international politics" [Kolk & Levy,2001]. As a result, understanding corporate responses to climate change and what factors can be influential to trigger the change of their climate change strategies is crucial for policy-makers at national and international level.

Recently some major oil and gas companies have shifted their climate change strategies to be more supportive and friendly to global climate change mitigation. However, many of their mitigation efforts have been done individually. The study thus aimed to shed the light on sectoral approaches, which is a collective action to mitigate GHG emissions among companies in a given industry. Thailand upstream oil and gas industry was chosen as a case study, since there are a number of multinational oil and gas corporations operating actively. Moreover, the case of Thailand offered the political and social context of developing countries, which are non-Annex I party to Kyoto Protocol.

The study, by collecting data from local offices of multinational oil and gas corporations, Thailand national oil and gas company, government authorities, NGOs, and scholars, has found important issues as well as policy suggestions concerning firstly the factors that are main determinants for upstream oil and gas companies to set up sectoral approaches and secondly the content of sectoral approach which is the most likely to be established in Thailand.

Based on the findings in this study, it can be concluded that the Thai government is the most influential actor and should be the one who initiates the sectoral approaches in the upstream oil and gas industry. The responses of companies pointed out that they were willing to comply with government policy and preferred to have a sectoral agreement with Thai government. The study made policy suggestions to the Thai government to include the potential sectors such as upstream oil and gas industry into climate change policy; rather than strictly focusing on high-GHG emissions sectors. Since the companies were concerned about the possibility of free riders, the government should consider implementing sectoral approaches as a legally-binding regulation. The fundamental step of sectoral approaches establishment is to develop an industry GHG database. Thus the government should provide a guideline for measuring and reporting GHG emissions which suits the unique operational requirements of this sector, as well as assist in Measurement, Reporting and Verification system (MRV).

The future of international negotiation on climate change mitigation is not yet assured. However, the wind of change seems to blow towards the setting of more stringent GHG reduction policy. Thailand may eventually be forced to undertake GHG emissions reduction, as implied by the outcome from the Warsaw Climate Change Conference (COP 19) held in Poland 2013. The meeting "adopted an ADP[ix] decision that invited parties to initiate or intensify domestic preparations for their intended nationally determined contributions (INDC), and resolve or accelerate the full implementation of the BAP[x] and pre-2020 ambition" [International Institute for Sustainable Development, 2014] Thus the Thai government may consider initiating sectoral approaches in the upstream oil and gas industry as part of its Nationally Appropriate Mitigation Actions (NAMAs) in order to prepare itself for the next era of global climate mitigation.

6.2 Issues for future research

When discussing the findings in Chapter 5, the study has found that there are rooms for further investigation on issues related to sectoral approaches in the upstream oil and gas industry. This section is going to mention several interesting topics for future research.

- **Timing**

The study collected data on perceptions of company and non-company respondents toward the current situation on sectoral approaches and corporate responses to climate change. Thus the findings, especially on the factors which can be influential to corporate decision, reflected the present political, social and economic context at both the national and international level. However, the study assumes that if there is a re-examining of Thailand upstream oil and gas industry in the future, the findings of who are the most influential actors may be changed from the government to other actors such as NGOs or Academics. In conclusion, the study would like to suggest re-examining the findings from Thailand upstream oil and gas industry again in the future so that any changes in their perceptions could be observed.

- **Company respondents**

There are at least two issues on company respondents which the future research should take into account: the number of company respondents and the data collection from headquarters of multinational oil and gas corporations.

Gaining access to upstream oil and gas companies was one of the most challenging issues in the study. From ten companies which are having active exploration and production operation, only five companies agreed to provide information in online questionnaire. The

findings in this study could have been more reflecting corporate responses to climate change mitigation and perceptions on sectoral approaches establishment if the number of company respondents are increased. Whether or not the conclusions of this study will change due to more company respondents is worth examining in the future research.

In addition, since the data were collected from local offices of multinational oil and gas corporations in Thailand, influence of factors in International Relations model has not widely recognized. Those factors are, for example, normative power of international association of industry on company members, peer pressure from companies in the same industry, and spillover effect from other industries which have already established sectoral approaches. The study hypothesizes that if the data are collected from the headquarters of those multinational corporations, the influence of those aforementioned non-state actors could be seen more clearly. This is because the headquarters represent companies in the interaction with international industry associations or with other companies in the same industry. As a result, the study suggests that data from the headquarters of these multinational oil and gas corporations should be included and compared with the data from the local offices.

- **Area of study**

In this study Thailand was chosen as the area of study. However, the findings from Thailand upstream oil and gas industry are not sufficient to be generalized and certainly cannot represent all developing countries or non-Annex I parties. The study would like to suggest expanding the area of study to other developing countries but applying the same an analytical framework of three models and research methodologies. This is to examine whether or not government of the host country is the main determinant of the climate change strategy of local

offices of multinational oil and gas corporations. Moreover, it is interesting to examine whether the upstream oil and gas industry in other developing countries have different or similar preferences on type and activities of sectoral approaches with the upstream oil and gas industry in Thailand.

- **Scope of sectoral approaches**

The sectoral approaches were originally designed to address competiveness distortion and carbon leakages which resulted from uneven GHG emission reduction responsibilities of developed and developing countries (see section 2.1.2 in Chapter 2). To efficiently address the problems as well as to enhance GHG emissions reduction in the oil and gas industry, sectoral approaches among companies across countries, which is called transnational sectoral approaches, is desirable. The findings from Thailand upstream oil and gas industry could serve as a stepping stone for a transnational sectoral approaches establishment. Since Southeast Asian countries will integrate further as the ASEAN Economic Community (AEC) in 2015[ASEAN Economic Community , 2014], the study would like to suggest investigating the possibility to set up transnational sectoral approaches of upstream oil and gas industry in Southeast Asian region. Each ASEAN nation has national oil and gas companies. For example, Lao State Fuel Company (LSFC), Brunei National Petroleum Company Sendirian Berhad or PetroleumBRUNEI, Pertamina (Indonesia), Petronas (Malaysia), Philippine National Oil Company (PNOC), PTT Public Company Limited (Thailand), and PetroVietnam. Thus the new research on transnational sectoral approaches in upstream oil and gas industry may start from investigating these national oil and gas companies before expanding to multinational oil and gas corporations.

ENDNOTE

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[i] There are six main gases formally recognized by IPCC's Revised 1996 Guidelines as greenhouse gas, a cause of climate change or the rise of global temperature. They are "Carbon dioxide (CO_2), Methane (CH4), Nitrous oxide (N2O), Hydrofluorocarbons (HFCs - this is really a family of gases, there are many individual gases), Perfluorocarbons (PFCs - this is also a family of gases) and Sulphur hexafluoride (SF6)". [FAQs, n.d.]

[ii] In his article on "Global Climate Change", Hoffmann criticized the international climate mitigation which conventionally evolved around the state and inter-state actors such as UNFCCC. These traditional multilateral agreements have limited the solution for climate change mitigation only on emission reduction while overlooked the causes of emissions. Rather, he presented that there have been more actors playing important role in climate change mitigation. Together they have formed what he called transnational climate governance. They are for example NGOs, Research institutes and business. These new actors have come up with multiple approaches to tackle climate change. Of course emission of the goals, but other goals such as changing infrastructure, promote renewable energies, and developing green economy are also included.

[iii] Article 4.1(c) of the UNFCCC Convention requires governments to promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases not controlled by the Montreal Protocol in all relevant sectors, including the energy, transport, industry, agriculture, forestry, and waste management sectors (Decision CP13). Source: CEPS Task Force Report p.8.

[iv] COP19 negotiations, http://vlscop.vermontlaw.edu/category/kyoto-protocol/

[v] Ian Christmas had been served the association for the past 12 years as Director General and was retired in August 2011. [Worldsteel appoints new Director General, 2011]

[vi] The Department of Mineral Fuels (DMF) of the Ministry of Energy is the sole governmental agency overseeing the upstream petroleum industries of Thailand. As the state agency in charge of domestic E&P regulation, DMF therefore operates to ensure that matters related to petroleum concessions and approval of concessionaires' operation follow the Petroleum Act B.E. 2514 (1971). The office has published a wide range of knowledge on petroleum as well as important statistic information concerning petroleum exploration and production in its website[vi]. They are, for instance, an annual report from 1994-2011, monthly production report, petroleum supply, petroleum reserves and petroleum prices. Below are some important figures on petroleum exploration and production in Thailand.

[vii] The study experienced challenges mostly due to the political demonstrations from both anti and pro-government (Prime Minister Yingluck Shinnawatra). The political assemblies held at some main areas in Bangkok resulted in the closure of some governmental offices and headquarter of an oil and gas companies, which was one targets of the study. Making appointments with those interviewees was difficult and once took place outside the official buildings.

[viii] The state power, in opposite, usually ends at its border. This hypothesis is based on the governance theory that argue that non-state actors; especially those who operate transnationally such as Multinational Corporations (MNCs) and International Non-Governmental Organizations (INGOs), are gaining governance authority as a new sovereign in global politics which are conventionally ruled by nation-states [Risse, 2007].

[ix] ADP stands for Ad hoc Working Group on the Durban Platform for Enhanced Action

[x] BAP stands for Bali Action Plan, COP 13, 2007

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APPENDIX A : Online Questionnaire for upstream oil and gas companies in Thailand

Questions for a potential of sectoral approaches for Thailand upstre

แบบสอบถามนี้เป็นส่วนหนึ่งของระเบียบวิธีวิจัยเพื่อเก็บข้อมูลประกอบการเขียนวิทยานิพนธ์ปริญญาโท ของนางสาว วรธิดา ไชยปะ คณะSustainability Science มหาวิทยาลัยโตเกียว ประเทศญี่ปุ่น (http://www.sustainability.k.u-tokyo.ac.jp/) โดยจุดประสงค์งานวิจัย คือ เพื่อศึกษาศักยภาพและความเป็นไปได้ในการจัดทำการลดก๊าซเรือนกระจกเฉพาะภาคส่วนบริษัทผู้สำรวจและผลิตปิโตรเลียมในประเทศไทย

วิธีการตอบแบบสอบถาม

แบบสอบถามจัดทำในลักษณะออนไลน์เพื่อความสะดวกของผู้ตอบแบบสอบถาม โดยคำถามประกอบไปด้วย 4 ส่วน ได้แก่ คำถามข้อมูลทั่วไปของบริษัท คำถามคุณลักษณะเฉพาะของบริษัท คำถามการเป็นสมาชิกขององค์กรหรือสมาคมผู้ผลิตน้ำมันและก๊าซธรรมชาติ และความร่วมมือกับกลุ่มประชาสังคม และคำถามรูปแบบการจัดทำการลดก๊าซเรือนกระจกเฉพาะภาคส่วน ทั้งนี้คำถามบางข้อต้องการคำตอบเพียงข้อเดียว ในขณะที่บางคำถาม ท่านสามารถตอบได้มากกว่าหนึ่งข้อ นอกจากนี้บางคำถามต้องการทราบข้อมูลของบริษัท เฉพาะสาขาในประเทศไทย และบางคำถามต้องการทราบข้อมูลของบริษัทแม่ หรือสำนักงานใหญ่ ดังนั้นจึงใคร่ขอความกรุณาท่านอ่านคำถามอย่างละเอียด และ ขอขอบพระคุณท่านที่กรุณาสละเวลาตอบแบบสอบถามฉบับนี้ค่ะ หากท่านมีข้อสงสัยใดๆ กรุณาติดต่อนางสาว วรธิดา ไชยปะ ที่อีเมล์ wwlnajah@gmail.com

นิยามศัพท์

Sectoral approaches คือ "นโยบาย ข้อตกลง และมาตรการในการลดก๊าซเรือนกระจกในเฉพาะภาคส่วนธุรกิจ โดยไม่ว่าจะอยู่ในรูปแบบใดจากที่กล่าวมา จุดร่วมสำคัญอยู่ที่ว่าเป็นการลดก๊าซเรือนกระจกบนฐานภาคส่วนไม่ใช่ระดับประเทศ"
Climate change mitigation คือ การบรรเทาผลกระทบของการเปลี่ยนแปลงสภาพภูมิอากาศซึ่งสามารถกระทำโดยสองวิธีหลัก คือ ลดปริมาณก๊าซเรือนกระจก (greenhouse gas emission) และเพิ่มแหล่งดูดซับก๊าซเรือนกระจก (carbon sinks)

General information ข้อมูลทั่วไป

1.Company name*

2.Home-based country (where is the headquarter located?)*
ประเทศที่ตั้งของบริษัทแม่หรือสำนักงานใหญ่

3. If your company (Thailand branch) has invested in renewable energy, please name the type of renewable energy.*
หากบริษัทของท่านเฉพาะสาขาในประเทศไทยได้มีการลงทุนในพลังงานหมุนเวียน กรุณาระบุชนิดของพลังงานหมุนเวียนดังกล่าว หากไม่ได้ลงทุนกรุณาตอบ No

- ☐ No investment in renewable energy
- ☐ Wind power
- ☐ Solar energy
- ☐ Bioenergy
- ☐ Geothermal energy
- ☐ Ocean energy
- ☐ Other:

Add item

Company specific features ข้อมูลคุณลักษณะเฉพาะของบริษัท

1.Has your company (Thailand branch) internalized climate change mitigation into the business operation? If yes, please go to question No.2 If no, please go to question No.7*
บริษัทของท่านได้ผนวกมาตรการ climate change mitigation เข้าไปในการดำเนินธุรกิจแล้วหรือไม่

2. For the company who answers 'Yes' in question No.1, how has your company (Thailand branch) internalized climate change mitigation? Please choose any items that apply.
สำหรับบริษัทที่ได้ผนวกมาตรการ climate change mitigationเข้าไปในธุรกิจแล้ว ท่านได้ดำเนินการอย่างไรบ้าง โปรดเลือกคำตอบตามที่ท่านได้ดำเนินการ เลือกได้มากกว่าหนึ่งข้อ

- ☐ Adjust the organizational structure by founding the climate change R&D team and/or climate change department and/or executive committee on climate change
- ☐ Launch environmental conservation projects with NGOs or academic
- ☐ Participated in the climate change mitigation pilot projects with governments
- ☐ Increase energy conservation and efficiency
- ☐ Enhance technology such as Carbon Capture and Storage (CCS)
- ☐ Switch to fuels with lower carbon content
- ☐ Investing in renewable energy (change portfolio)
- ☐ Measuring and reporting greenhouse gas (GHG) emission
- ☐ Setting voluntary emission reduction target
- ☐ Increase carbon sinks : forest re-plantation
- ☐ Other:

3. If your company (Thailand branch) has measured and reported greenhouse gas(GHG) emission, what is the company's GHG emission data measured in the latest year? Please also identify the year of the data.
สำหรับบริษัท (สาขาในประเทศไทย)ที่ดำเนินการวัดและรายงานปริมาณก๊าซเรือนกระจกระดับองค์กรแล้วนั้น กรุณาระบุปริมาณก๊าซเรือนกระจกในปีล่าสุดที่มีการจัดทำและระบุปีที่จัดทำ

4.If your company (Thailand branch) has measured and reported GHG emission, what standards or guidelines have been applied? Please choose any items that apply.

สำหรับบริษัท(สาขาในประเทศไทย)ที่ได้ดำเนินการวัดและรายงานปริมาณก๊าซเรือนกระจกระดับองค์กรแล้วนั้น โปรดระบุ standards หรือ guidelines ที่ท่านใช้ สามารถตอบได้มากกว่าหนึ่งข้อ

- ☐ Company's self-developed standards/guidelines
- ☐ IPIECA
- ☐ Greenhouse gas protocol by WRI and WBCSD
- ☐ American Petroleum Institute : API
- ☐ Global Reporting Initiative: GRI
- ☐ GHG guideline and GHG calculator implemented by Department of Mineral Fuels (กรมเชื้อเพลิงธรรมชาติ
- ☐ Other:

5.If your company (Thailand branch) has already set the voluntary emission reduction target, please iden e c target in the latest year and the year.

สำหรับบริษัท(สาขาในประเทศไทย)ที่มีการจัดตั้งเป้าหมายในการลดปริมาณก๊าซเรือนกระจกโดยสมัครใจแล้วนั้น กรุณาระบุเป้าหมายการลดในปีล่าสุด และระบุปีข้อมูล หากยังไม่ได้กำหนดเป้า กรุณาข้ามคำถามข้อนี้ไป

6.The climate change mitigation activities that your company (Thailand branch) adopted has been designed by which actor? Please choose one item that applies.

มาตรการ climate change mitigationที่บริษัทของท่าน (สาขาในประเทศไทย) ได้ดำเนินการนั้น เป็นการริเริ่มจากหน่วยงานใด กรุณาเลือกตอบเพียงข้อเดียว

- ○ The headquarter which is located in another country.
- ○ Thailand branch
- ○ Some policies are assigned by the headquarter, and some policies are initiated by Thailand branch.
- ○ Other:

7. For the company who answer 'No' in question No.1 which has not yet launched climate change mitigation activities, what would be the reasons? Please choose any items that apply.
สำหรับบริษัท (สาขาในประเทศไทย)ที่ยังไม่ได้ผนวกมาตรการ climate change mitigation โปรดเลือกคำตอบที่ท่านเห็นว่าเป็นสาเหตุหรืออุปสรรคที่ทำให้ยังไม่สามารถดำเนินการ สามารถเลือกคำตอบได้มากกว่าหนึ่งข้อ

- ☐ Lack of human resources capacity
- ☐ No mandatory regulation from the state to mitigate climate change
- ☐ Unavailability of technology
- ☐ Lack of capital availability
- ☐ No top-down policy for climate change mitigation
- ☐ No benefit expected from climate change mitigation
- ☐ No incentives from the government
- ☐ Only big oil and gas companies should mitigate climate change.
- ☐ No suggestions are provided from the headquarter
- ☐ Other: _____

8. In your company (Thailand branch), what is the fossil fuel which will have the highest production volu n years? Please choose one item that applies.
ในอีก 20 ปีข้างหน้า ผลิตภัณฑ์ในข้อใดของบริษัทท่าน(สาขาในประเทศไทย)จะมีปริมาณการผลิตมากที่สุด กรุณาเลือกตอบเพียงข้อเดียว

- ☐ crude oil
- ☐ natural gas
- ☐ condensate
- ☐ coal
- ☐ Other: _____

9. Has your company (Thailand branch) been awarded for good performance in environmental conservation or climate change mitigation related projects?If yes, please identify a few outstanding awards and the names of organizations that provide the awards. (such as the government authority and/or non-governmental organizations) If answer no, please go to question No.9

บริษัทของท่าน (สาขาในประเทศไทย)ได้รับรางวัลด้านการอนุรักษ์สิ่งแวดล้อมหรือผลงานด้าน climate change mitigation หรือไม่ หากเคยได้รับรางวัล กรุณาระบุชื่อรางวัลที่โดดเด่น 2-3 รางวัลและองค์กรที่มอบรางวัล อาจเป็นหน่วยงานรัฐ หรือองค์กรNGO หากบริษัทยังไม่เคยได้รับรางวัล กรุณาข้ามคำถามข้อนี้ และไปยังคำถามข้อ 9

10. Please give your agreement level for each statement about the socio-economic situations in Thailand n i community.*

โปรดแสดงระดับความคิดเห็นของท่านต่อข้อความด้านล่างนี้ซึ่งเกี่ยวกับสถานการณ์ทางสังคมและเศรษฐกิจทั้งในประเทศไทยและระหว่างประเทศ

	Strongly disagree ไม่เห็นด้วยอย่างยิ่ง	Disagree ไม่เห็นด้วย	Neutral เฉยๆ	Agree เห็นด้วย	Strongly agree เห็นด้วยอย่างยิ่ง
1. At present Thai consumers have become more willing to pay more for green products. ในปัจจุบันผู้บริโภคไทยยินดีจ่ายเงินเพิ่มมากขึ้นเพื่อซื้อสินค้าที่เป็นมิตรต่อสิ่งแวดล้อม	○	○	○	○	○
2. At present Thai Consumers have become more interested in news on environmental incidents. ในปัจจุบันผู้บริโภคไทยสนใจประเด็นปัญหาสิ่งแวดล้อมมากขึ้น	○	○	○	○	○
3. At present oil and gas industry is the main target of environmental NGOs in climate change related campaign. ในปัจจุบันอุตสาหกรรมผู้ผลิตน้ำมันและก๊าซธรรมชาติเป็นเป้าหมายหลักของการรณรงค์ด้าน Climate change mitigation โดยกลุ่มองค์กรเอ็นจีโอด้านสิ่งแวดล้อม	○	○	○	○	○

4. At present oil and gas industry is prime target for government to pose sectoral approach. ในปัจจุบันอุตสาหกรรมผู้ผลิตน้ำมันและก๊าซธรรมชาติเป็นเป้าหมายสำคัญของภาครัฐไทยในการจัดทำการลดก๊าซเรือนกระจกเฉพาะภาคส่วน	○	○	○	○	○
5. At present climate change is a threat to oil and gas industry. ในปัจจุบันปัญหาการเปลี่ยนแปลงสภาพภูมิอากาศเป็นผลร้ายต่ออุตสาหกรรมผู้ผลิตน้ำมันและก๊าซธรรมชาติ	○	○	○	○	○
ฺ6. Within next 5 years Thai authority would set up regulatory policy on oil and gas sector in cutting down GHG emission. ภายใน 5 ปี ข้างหน้า ภาครัฐไทยจะมีการออกกฎหมายให้มีการลดก๊าซเรือนกระจกในภาคอุตสาหกรรมผู้ผลิตน้ำมันและก๊าซธรรมชาติ	○	○	○	○	○
7. Within next 5 years climate change mitigation will become a binding obligation for every country in the world. ภายใน 5 ปีข้างหน้า Climate change mitigation จะเป็นพันธกิจที่ทุกประเทศในโลกต้องกระทำตาม	○	○	○	○	○

8. In next 10-20 years the demand for fossil fuels will keep decreasing and be replaced by renewable energy eventually. ใน 10-20 ปีข้างหน้า ความต้องการเชื้อเพลิงฟอสซิลจะลดลงเรื่อยๆและถูกทดแทนโดยพลังงานหมุนเวียนในที่สุด	○	○	○	○	○
9. In the next 10-20 years coal will be driven out of energy mix especially in the developed countries. ใน 10-20 ปี ข้างหน้า จะไม่มีการใช้ถ่านหินเป็นพลังงานเชื้อเพลิง โดยเฉพาะในประเทศที่พัฒนาแล้ว	○	○	○	○	○
10. In next 10-20 years renewable energy will have big market opportunity in Thailand. ใน10-20 ปีข้างหน้า พลังงานหมุนเวียนจะมีโอกาสทางตลาดอย่างมากในประเทศไทย	○	○	○	○	○

Add item

Membership in associations of oil and gas industry and partnership with civil society ความเป็นสมาชิกขององค์กรหรือสมาคมผู้ผลิตน้ำมันและก๊าซธรรมชาติ และความร่วมมือกับภาคประชาสังคม

1.Has your company (both Thailand branch and the headquarter) been a member of any oil and gas industry associations? Please choose any items that apply.*

บริษัทของท่าน ทั้งสาขาในประเทศไทย และบริษัทแม่ เป็นสมาชิกขององค์กรหรือสมาคมบริษัทน้ำมันและก๊าซธรรมชาติ ใดบ้าง กรุณาระบุชื่อองค์กรหรือสมาคมทั้งในประเทศไทยและต่างประเทศ ตอบได้มากกว่าหนึ่งข้อ

- ☐ Petroleum Institute of Thailand สถาบันปิโตรเลียมแห่งประเทศไทย
- ☐ IPIECA
- ☐ International association of Oil&Gas Producers (OGP)
- ☐ Japan Petroleum Institute (JPI)
- ☐ American Petroleum Institute (API)
- ☐ Other:

2.Please identify which associations your company (both Thailand branch and the headquarter) prefers having as the representative for oil and gas industry in negotiating with government authority on the policy which affects the industry. (Please name associations as many as you want.) *

กรุณาระบุองค์กรหรือสมาคมที่บริษัทของท่านทั้งสาขาในประเทศไทยและบริษัท เห็นว่าเป็นตัวแทนของกลุ่มบริษัทผู้ผลิตน้ำมันและก๊าซธรรมชาติ ในการเจรจาร่วมกับหน่วยงานรัฐในประเด็นเกี่ยวกับนโยบายที่มีผลกระทบต่อบริษัท โปรดระบุชื่อองค์กรตามที่ท่านเห็นสมควร

3.Has your company (both Thailand branch and the headquarter) participated in climate change mitigation activity as a member of industrial association of oil and gas producers? Please name a few most outstanding activities and describe briefly the detail of each project. (For example, conference, working group, and etc.)

บริษัทของท่านทั้งสาขาในประเทศไทยและบริษัทแม่ ได้เข้าร่วมกิจกรรมด้าน climate change mitigation ในฐานะสมาชิกขององค์กรหรือสมาคมบริษัทผลิตน้ำมันและก๊าซธรรมชาติอย่างไรบ้าง กรุณาระบุรายละเอียดของกิจกรรมที่โดดเด่น จำนวน 2-3 กิจกรรม ทั้งในระดับประเทศและระหว่างประเทศ

4.Has your company (Thailand branch) run the climate change mitigation related projects with non-governmental organizations (NGOs) or universities? If yes, please name a few projects which are the most well-known by the public. If no, please skip this question.

บริษัทของท่าน(สาขาประเทศไทย)ได้มีความร่วมมือจัดทำโครงการด้าน climate change mitigationกับหน่วยงาน NGOหรือสถาบันการศึกษาใดบ้าง โปรดระบุ 2-3 โครงการที่โดดเด่น พร้อมชื่อองค์กรในความร่วมมือ หากยังไม่มีความร่วมมือ กรุณาข้ามคำถามข้อนี้ไป

Add item

After page 3 | Continue to next page

Page 4 of 4

Potential proposal of Sectoral approaches รูปแบบการจัดทำการลดก๊าซเรือนกระจกเฉพาะภาคส่วน

1.What factors or reasons would encourage your company to act collectively with other oil and gas comp sectoral approach in Thailand? Please give your agreement level for each reason.*

อะไรเป็นปัจจัยที่เอื้อหนุนให้บริษัทของท่านตัดสินใจร่วมมือกับบริษัทผู้สำรวจและผลิตน้ำมันและก๊าซธรรมชาติรายอื่นเพื่อทำการลดก๊าซเรือนกระจกเฉพาะภาคส่วนในประเทศไทย โปรดแสดงระดับความคิดเห็นของท่านต่อข้อความข้างล่างนี้

	Strongly disagree ไม่เห็นด้วยอย่างยิ่ง	Disagree ไม่เห็นด้วย	Neutral เฉยๆ	Agree เห็นด้วย	Strongly agree เห็นด้วยอย่างยิ่ง
1.Company has capital availability for investing or improving environmental friendly technology. บริษัทมีเงินลงทุนสำหรับจัดหาหรือปรับปรุงเทคโนโลยีที่เป็นมิตรกับสิ่งแวดล้อม	○	○	○	○	○
2. Company has human resources capacity on climate change mitigation. บริษัทมีทรัพยากรบุคคลที่มีความรู้ความเชี่ยวชาญด้านclimate change mitigation	○	○	○	○	○
3. Company has been led by CEO who is keen for sustainable development. ผู้บริหารของบริษัทให้ความสำคัญต่อการพัฒนาอย่างยั่งยืน	○	○	○	○	○

4. Company expects business benefits from sectoral approaches such as technology transfer and capital assistance. บริษัทคาดคำนวณถึงผลประโยชน์ทางธุรกิจจากการเข้าร่วมการลดก๊าซเรือนกระจกเฉพาะภาคส่วน เช่น การถ่ายทอดเทคโนโลยี หรือ การได้รับความช่วยเหลือทางการเงิน	○	○	○	○	○
5.Company is required by shareholders to address climate change problem. บริษัทได้รับแรงกดดันจากผู้ถือหุ้นให้ต้องดำเนินการclimate change mitigation	○	○	○	○	○
6.Company has projected a regulatory climate change mitigation policy in Thailand. บริษัทคาดการณ์ว่าภาครัฐจะมีการออกกฎหมายด้านการclimate change mitigation ในไทย	○	○	○	○	○
7.Company would like to build/maintain good relationship with government authority. บริษัทต้องการสร้างหรือรักษาสัมพันธ์อันดีกับภาครัฐ	○	○	○	○	○
8.Company would like to enhance good image in the society.บริษัทต้องการเพิ่มภาพลักษณ์ที่ดีในสังคม	○	○	○	○	○

9.Company responses to the public sentiment which has become more concerned on environmental problems.บริษัทดำเนินการสอดรับความคิดเห็นสาธารณะซึ่งให้ความสนใจปัญหาด้านสิ่งแวดล้อมมากขึ้น	○	○	○	○	○
10.Company helps promote global benefits and tackle global challenge as a good citizen. บริษัทช่วยเสริมสร้างผลประโยชน์และแก้ปัญหาระดับโลกอันเป็นหน้าที่ของพลเมืองที่ดี	○	○	○	○	○
11.Company follows the guidance of association of oil and gas industry in climate change mitigation.บริษัทดำเนินการตามคำแนะนำของสมาคมของบริษัทผู้ผลิตน้ำมันและก๊าซธรรมชาติเกี่ยวกับ climate change mitigation	○	○	○	○	○
12.Company would like to establish the sectoral approach if there is no free rider. บริษัทจะร่วมจัดทำการลดก๊าซเรือนกระจกเฉพาะภาคส่วนหากทุกบริษัทร่วมดำเนินการ	○	○	○	○	○
13.Oil and gas industry adopts sectoral approach due to a spillover effect from other industry such as cement industry. ภาคอุตสาหกรรมผู้ผลิตน้ำมันและก๊าซธรรมชาติจัดทำการลดก๊าซเรือนกระจกเฉพาะภาคส่วนเนื่องมาจากเห็นว่าภาคอุตสาหกรรมอื่น เช่น	○	○	○	○	○

2. If there are any, please identify other reasons /factors that are not mentioned in the table in question No.1. If there is no other factor, please go to question No.3
กรุณาระบุปัจจัยอื่นๆนอกจากที่กล่าวในคำถามข้อที่ 1 หากไม่มี กรุณาข้ามคำถามนี้ และ ไปยังคำถามข้อที่ 3

*

หากจะมีการจัดดำเนินการลดก๊าซเรือนกระจกเฉพาะภาคส่วนบริษัทผู้สำรวจและผลิตน้ำมันและก๊าซธรรมชาติในประเทศไทย บริษัทของท่านจะเห็นด้วยในการดำเนินการร่วมกับบริษัทอื่นตามข้อใดบ้าง กรุณาเลือกตอบตามที่ท่านเห็นด้วย โดยเลือกได้มากกว่าหนึ่งข้อ

- ☐ Making collective data on GHG emission
- ☐ Setting GHG emission reduction target
- ☐ Setting benchmark indicators
- ☐ Establishing monitoring, reporting and verifying system
- ☐ Identifying and proliferating best practices
- ☐ Technology transfers
- ☐ Setting financial assisting package
- ☐ Designing and creating carbon credits market
- ☐ Other:

4.What type of sectoral approaches does your company (Thailand branch) view as the most feasible for Thai upstream oil and gas industry? Please choose one item that applies. *
หากจะมีการจัดดำเนินการลดก๊าซเรือนกระจกเฉพาะภาคส่วนบริษัทผู้สำรวจและผลิตน้ำมันและก๊าซธรรมชาติ บริษัทของท่านเห็นว่าควรเป็นความร่วมมือในลักษณะใด กรุณาเลือกตอบเพียงข้อเดียว

- ○ a) Sectoral agreement between the government and industry (ข้อตกลงระหว่างรัฐบาลและภาคอุตสาหกรรม)
- ○ b) Transnational sectoral approach, only among companies in the industry (การร่วมมือเฉพาะบริษัทในประเทศต่างๆ)
- ○ c) Sectoral approach at national level without government involvement (การร่วมมือเฉพาะบริษัทในประเทศไทย)
- ○ d) International sectoral approach under UNFCCC with the ability to do carbon trade (ความร่วมมือระหว่างรัฐบาลหลายประเทศ ภายใต้องค์กร UNFCCC)
- ○ Other:

5.What should be the role of government regarding sectoral approaches? Please choose one item that applies *
หากจะมีการจัดดำเนินการลดก๊าซเรือนกระจกเฉพาะภาคส่วนบริษัทผู้สำรวจและผลิตน้ำมันและก๊าซธรรมชาติ รัฐควรมีบทบาทอย่างไรตามความคิดเห็นของบริษัทของท่าน โปรดเลือกคำตอบเพียงข้อเดียว

- ○ a) There is no need for government support. ไม่ต้องการความสนับสนุนจากรัฐ กรุณาตอบคำถามข้อ 6
- ○ b) Government authority should involve in offering monitoring, reporting and verifying system. หน่วยงานราชการควรให้ความสนับสนุนด้านการจัดตั้งกระบวนการ monitoring, reporting and verifying
- ○ c) Government authority should offer incentive such as tax waiver for the companies who join sectoral approaches. หน่วยงานราชการควรให้แรงจูงใจแก่บริษัทที่เข้าร่วม เช่น ลดหย่อนภาษี
- ○ d) Government authority should launch the emission reduction as a regulation, to prevent the free riders. หน่วยงานราชการควรออกกฎหมายให้มีการลดก๊าซเรือนกระจก เพื่อป้องกันปัญหาผู้หลีกเลี่ยงไม่ทำตาม
- ○ Other: _____

6. For the company that responses that a) there is no need for government support, what are the most convincing reasons for not having state involvement? Please choose one item that applies.
เฉพาะบริษัทที่เห็นว่าไม่จำเป็นที่จะมีการสนับสนุนจากภาครัฐ อะไรเป็นเหตุผลสำคัญ กรุณาเลือกคำตอบเพียงข้อเดียว

- ○ a) The companies have sufficient knowledge and capacity to act collectively within the industry in sectoral approaches
- ○ b) The state involvement could mean that sectoral approach has to be compulsary not on voluntary basis.
- ○ c) The companies may at risk of having some information leaked to the government.
- ○ Other: _____

7.How does your company (Thailand branch) evaluate the possibility to set up sectoral approaches in oil and gas industry in Thailand? *
บริษัทของท่าน(สาขาในประเทศไทย)ประเมินความเป็นไปได้ของการจัดทำการลดก๊าซเรือนกระจกเฉพาะภาคส่วนอย่างไร กรุณาให้คะแนน จาก 1-5 โดย 1 หมายถึงประเมินว่ามีความเป็นไปได้ต่ำสุด และ 5 หมายถึงมีความเป็นไปได้สูงสุด

	1	2	3	4	5	
Least possiblity	○	○	○	○	○	Most possibility

8. Why do you think so? (Please write in Thai or English.) *
กรุณาอธิบายคร่าวๆ ถึงสาเหตุที่ประเมินตามข้อที่ 7 สามารถเขียนตอบเป็นภาษาอังกฤษหรือภาษาไทย

9. Please write any comments about this questionnaire or the research theme. (Please write in Thai or English)*
กรุณาให้ความคิดเห็น ข้อแนะนำ หรือคำติชมใดๆ เกี่ยวกับแบบสอบถามหรืองานวิจัย ซึ่งท่านคิดว่าจะเป็นประโยชน์ต่อการปรับปรุงงานวิจัยต่อไป สามารถเขียนตอบเป็นภาษาอังกฤษหรือภาษาไทย

THE END. Thank you very much for your kind cooperation.

APPENDIX B: Online questionnaire for non-company group (Government authorities, NGOs and scholars)

A study on sectoral approaches to greenhouse gas reduction for up

แบบสอบถามนี้เป็นส่วนหนึ่งของระเบียบวิธีวิจัยเพื่อเก็บข้อมูลประกอบการเขียนวิทยานิพนธ์ปริญญาโท ของนางสาว วรธิดา ไชยปะ คณะSustainability Science มหาวิทยาลัยโตเกียว ประเทศญี่ปุ่น (http://www.sustainability.k.u-tokyo.ac.jp/)
โดยจุดประสงค์งานวิจัย คือ เพื่อศึกษาปัจจัยที่จะเอื้อหนุนการจัดทำการลดก๊าซเรือนกระจกเฉพาะภาคส่วนอุตสาหกรรมผู้สำรวจและผลิตน้ำมันและก๊าซธรรมชาติในประเทศไทย ขอขอบพระคุณท่านที่กรุณาสละเวลาตอบแบบสอบถามฉบับนี้ค่ะ หากท่านมีข้อสงสัยใดๆ กรุณาติดต่อนางสาว วรธิดา ไชยปะ ที่อีเมล์ wwlnajah@gmail.com

นิยามศัพท์

Sectoral approaches คือ "นโยบาย ข้อตกลง และมาตรการในการลดก๊าซเรือนกระจกในเฉพาะภาคส่วนธุรกิจ โดยไม่ว่าจะอยู่ในรูปแบบใดจากที่กล่าวมา จุดร่วมสำคัญอยู่ที่ว่าเป็นการลดก๊าซเรือนกระจกบนฐานภาคส่วนอุตสาหกรรมหนึ่งๆ ไม่ใช่ระดับประเทศ"
Climate change mitigation คือ การบรรเทาผลกระทบของการเปลี่ยนแปลงสภาพภูมิอากาศซึ่งสามารถกระทำโดยสองวิธีหลัก คือ ลดปริมาณก๊าซเรือนกระจก (greenhouse gas emission) และเพิ่มแหล่งดูดซับก๊าซเรือนกระจก (carbon sinks)

Name and surname*
กรุณาระบุชื่อ-นามสกุลของท่าน

Institution and/or position*
กรุณาระบุสถานที่ทำงานหรือตำแหน่งของท่าน

1. Please explain briefly about your current role/responsibility/project and how it is related to climate change mitigation in Thailand.
กรุณาอธิบายโดยคร่าวถึงผลงานหรือหน้าที่รับผิดชอบของท่านที่เกี่ยวข้องกับการจัดการ"การเปลี่ยนแปลงสภาพภูมิอากาศ" ในประเทศไทย

2. How much does your work concerning the upstream oil and gas industry in Thailand?*
ตามหน้าที่งานรับผิดชอบหรือโปรเจคของท่านนั้นมีความเกี่ยวข้องกับบริษัทผู้สำรวจและผลิตน้ำมันและก๊าซธรรมชาติในประเทศไทยมากน้อยเพียงใด

- ○ Less than 50%
- ○ More than 50% but less than 70%
- ○ More than 70 % up to 100%

3. Sectoral approaches allegedly enhance more inclusive participation of developing countries in climate change mitigation and address the competitiveness distortion and carbon leakages. How do you view the potential of setting up sectoral approaches in Thailand? And which sectors can be the suitable candidates? Please also give reason why you think so in brief. *

การลดก๊าซเรือนกระจกเฉพาะภาคส่วนอุตสาหกรรมช่วยเพิ่มการมีส่วนร่วมของประเทศกำลังพัฒนาในการจัดการการเปลี่ยนแปลงสภาพภูมิอากาศ อีกทั้งช่วยบรรเทาปัญหาความได้เปรียบเสียเปรียบระหว่างบริษัทในภาคส่วนเดียวกันและลดปัญหาการรั่วไหลของก๊าซเรือนกระจกมายังประเทศกำลังพัฒนา ในการนี้ท่านเห็นว่าการจัดการลดก๊าซเรือนกระจกเฉพาะภาคส่วนในประเทศไทย มีความเป็นไปได้มากน้อยเพียงใด และภาคส่วนอุตสาหกรรมใดเหมาะสมที่จะดำเนินการนโยบายดังกล่าว สามารถเขียนตอบเป็นภาษาไทยหรือภาษาอังกฤษ

4. Recently,due to the uncertainty of global climate agreement in post 2020, there has been increasingly attention to sectoral approaches to greenhouse gas emission reduction in heavy industries such as cement, aluminum and iron&steel. Upstream oil and gas industry is also a heavy industry but there is not much discussion on sectoral approaches in its sector. What do you think is the reason for this absence?

ในปัจจุบันซึ่งข้อตกลงเรื่องการจัดการการเปลี่ยนแปลงสภาพภูมิอากาศมีความไม่แน่นอนในช่วงหลังปี 2563, การลดก๊าซเรือนกระจกเฉพาะภาคส่วนได้รับความสนใจเพิ่มมากขึ้นในอุตสาหกรรมหนักที่ใช้พลังงานมาก เช่น ซีเมนต์ อลูมิเนียม และเหล็กกล้า อย่างไรก็ตามอุตสาหกรรมผู้สำรวจและผลิตน้ำมันและก๊าซธรรมชาติซึ่งจัดเป็นอุตสาหกรรมหนักเช่นกัน กลับไม่ได้มีการพูดถึงการลดก๊าซเรือนกระจกเฉพาะภาคส่วน ท่านคิดว่าอะไรเป็นเหตุผลสำหรับเหตุการณ์ดังกล่าว

5. If the sectoral approaches to greenhouse gas emission reduction for upstream oil and gas industry would happen in Thailand, what do you think could be the most likely potential type of sectoral approaches?*

หากจะมีการดำเนินการลดก๊าซเรือนกระจกเฉพาะภาคส่วนในอุตสาหกรรมผู้สำรวจและผลิตน้ำมันและก๊าซธรรมชาติในประเทศไทย ท่านคิดว่าอะไรเป็นรูปแบบการลดก๊าซเรือนกระจกเฉพาะภาคส่วนที่มีความเป็นไปได้ที่จะเกิดขึ้นมากที่สุด กรุณาเลือกเพียงคำตอบเดียว

- ○ a) Sectoral agreement between the government and industry (ข้อตกลงระหว่างรัฐบาลและภาคอุตสาหกรรม)
- ○ b) Transnational sectoral approach, only among companies in the industry (การร่วมมือเฉพาะบริษัทในประเทศต่างๆ)
- ○ c) Sectoral approach at national level without government involvement (การร่วมมือเฉพาะบริษัทในประเทศไทย)
- ○ d) International sectoral approach under UNFCCC with the ability to do carbon trade (ความร่วมมือระหว่างรัฐบาลหลายประเทศ ภายใต้องค์กร UNFCCC)
- ○ Other:

6. From the answer in Question 5, please explain briefly why you think so.*

กรุณาอธิบายเหตุผลที่ตอบในข้อ5 (โดยคร่าว) สามารถเขียนตอบเป็นภาษาไทยหรือภาษาอังกฤษ

7.What should be the role of government regarding sectoral approaches to greenhouse gas reduction in upstream oil and gas industry? Please choose one item that applies. *

หากจะมีการจัดดำเนินการลดก๊าซเรือนกระจกเฉพาะภาคส่วนบริษัทผู้สำรวจและผลิตน้ำมันและก๊าซธรรมชาติ รัฐควรมีบทบาทอย่างไรตามความคิดเห็นของท่าน โปรดเลือกคำตอบเพียงข้อเดียว

○ a) Government should not get involved. รัฐไม่ควรเข้าไปมีส่วนเกี่ยวข้อง กรุณาตอบคำถามข้อ 8

○ b) Government authority should be involved in offering monitoring, reporting and verifying system. หน่วยงานราชการควรให้ความสนับสนุนด้านการจัดตั้งกระบวนการ monitoring, reporting and verifying

○ c) Government authority should offer incentives such as tax waiver for the companies who join sectoral approaches. หน่วยงานราชการควรให้แรงจูงใจแก่บริษัทที่เข้าร่วม เช่น ลดหย่อนภาษี

○ d) Government authority should launch the emission reduction as a regulation, to prevent the free riders. หน่วยงานราชการควรออกกฎหมายให้มีการลดก๊าซเรือนกระจก เพื่อป้องกันปัญหาผู้หลีกเลี่ยงไม่ทำตาม

○ Other: _____

8. For those who answer Question 7 that a) Government should not get involved, what are the most convincing reasons for not having involvement from government? Please choose one item that applies.

เฉพาะท่านที่เห็นว่าไม่จำเป็นที่จะมีส่วนร่วมจากภาครัฐ อะไรเป็นเหตุผลสำคัญ กรุณาเลือกคำตอบเพียงข้อเดียว

○ a) The companies have sufficient knowledge and capacity to act collectively within the industry in sectoral approaches

○ b) The state involvement could mean that sectoral approach has to be compulsary not on voluntary basis.

○ c) The companies would feel worried that government would know some confidential information and thus feel reluctant to join the sectoral approaches.

○ Other: _____

9. What factors or reasons do you think would encourage oil and gas companies to act collectively with each other in the industry to establish sectoral approach in Thailand? Please give your agreement level for each reason.*

ท่านคิดว่าอะไรเป็นปัจจัยที่เอื้อหนุนให้บริษัทตัดสินใจร่วมมือกับบริษัทผู้สำรวจและผลิตน้ำมันและก๊าซธรรมชาติรายอื่นเพื่อทำการลดก๊าซเรือนกระจกเฉพาะภาคส่วนในประเทศไทย โปรดแสดงระดับความคิดเห็นของท่านต่อข้อความข้างล่างนี้

	Strongly disagree ไม่เห็นด้วยอย่างยิ่ง	Disagree ไม่เห็นด้วย	Neutral เฉยๆ	Agree เห็นด้วย	Strongly agree เห็นด้วยอย่างยิ่ง
1.Company has capital availability for investing or improving environmental friendly technology. บริษัทมีเงินลงทุนสำหรับจัดหาหรือปรับปรุงเทคโนโลยีที่เป็นมิตรกับสิ่งแวดล้อม	○	○	○	○	○

2. Company has human resources capacity on climate change mitigation. บริษัทมีทรัพยากรบุคคลที่มีความรู้ความเชี่ยวชาญด้านclimate change mitigation	○	○	○	○	○
3. Company has been led by CEO who is keen for sustainable development. ผู้บริหารของบริษัทให้ความสำคัญต่อการพัฒนาอย่างยั่งยืน	○	○	○	○	○
4. Company expects business benefits from sectoral approaches such as technology transfer and capital assistance. บริษัทคาดคำนวณถึงผลประโยชน์ทางธุรกิจจากการเข้าร่วมการลดก๊าซเรือนกระจกเฉพาะภาคส่วน เช่น การถ่ายทอดเทคโนโลยี หรือ การได้รับความช่วยเหลือทางการเงิน	○	○	○	○	○
5.Company is required by shareholders to address climate change problem. บริษัทได้รับแรงกดดันจากผู้ถือหุ้นให้ต้องดำเนินการclimate change mitigation	○	○	○	○	○
6.Company has projected a regulatory climate change mitigation policy in Thailand. บริษัทคาดการณ์ว่าภาครัฐจะมีการออกกฎหมายด้านการclimate change mitigation ในไทย	○	○	○	○	○
7.Company would like to build/maintain good relationship with government authority. บริษัทต้องการสร้างหรือรักษาสัมพันธ์อันดีกับภาครัฐ	○	○	○	○	○

8.Company would like to enhance good image in the society.บริษัทต้องการเพิ่มภาพลักษณ์ที่ดีในสังคม	○	○	○	○	○
9.Company responses to the public sentiment which has become more concerned on environmental problems.บริษัทดำเนินการสอดรับความคิดเห็นสาธารณะซึ่งให้ความสนใจปัญหาด้านสิ่งแวดล้อมมากขึ้น	○	○	○	○	○
10.Company helps promote global benefits and tackle global challenge as a good citizen. บริษัทช่วยเสริมสร้างผลประโยชน์และแก้ปัญหาระดับโลกอันเป็นหน้าที่ของพลเมืองที่ดี	○	○	○	○	○
11.Company follows the guidance of association of oil and gas industry in climate change mitigation.บริษัทดำเนินการตามคำแนะนำของสมาคมของบริษัทผู้ผลิตน้ำมันและก๊าซธรรมชาติเกี่ยวกับ climate change mitigation	○	○	○	○	○
12.Company would like to establish the sectoral approach if there is no free rider. บริษัทจะร่วมจัดทำการลดก๊าซเรือนกระจกเฉพาะภาคส่วนหากทุกบริษัทร่วมดำเนินการ	○	○	○	○	○
13.Oil and gas industry adopts sectoral approach due to a spillover effect from other industry such as cement industry. ภาคอุตสาหกรรมผู้ผลิตน้ำมันและก๊าซธรรมชาติจัดทำการลดก๊าซเรือนกระจกเฉพาะภาคส่วนเนื่องมาจากเห็นว่าภาคอุตสาหกรรมอื่น เช่น	○	○	○	○	○

10. What actors could play an important role in encouraging upstream oil and gas industry in Thailand to set up sectoral approaches? Please give your level of agreement on the importance of each actor*

โปรดแสดงระดับความคิดเห็นของท่านต่อบทบาทของตัวแสดงต่อไปนี้ว่ามีความสำคัญมากน้อยเพียงใดต่อการผลักดันให้ภาคอุตสาหกรรมผู้สำรวจและผลิตน้ำมันและก๊าซธรรมชาติในไทยจัดตั้งการลดการเรือนกระจกเฉพาะภาคส่วน โดย 1 หมายถึง ตัวแสดงนั้นมีบทบาทสำคัญน้อยมาก และ 5 หมายถึงตัวแสดงนั้นมีบทบาทสำคัญอย่างมาก

	1 Very low importance	2 Low importance	3 Medium	4 High importance	5 Very high importance
1.Companies themselves have special features that encourage them to participate in sectoral approaches.	○	○	○	○	○
2.Thai government authority	○	○	○	○	○
3.NGOs	○	○	○	○	○
4.Consumers	○	○	○	○	○
5.Scholars	○	○	○	○	○
6.International governmental organizations (UNFCCC UNEP etc)	○	○	○	○	○
7.International association of oil and gas industry (OGP IPIECA etc)	○	○	○	○	○

11. Among those actors mentioned in Question10, which actor in your view has the most influence on upstream oil and gas industry to set up sectoral approaches in Thailand? Please choose one actor and explain the reason in brief. (Please write in Thai or English.)*

จากตัวแสดงทั้งหมดในคำถามข้อ 10 ท่านคิดว่าตัวแสดงใดมีอิทธิพลมากที่สุดต่อการจัดตั้งการลดก๊าซเรือนกระจกเฉพาะภาคส่วนของอุตสาหกรรมผู้สำรวจและผลิตน้ำมันและก๊าซธรรมชาติในไทย กรุณาอธิบายเหตุผลโดยคร่าว สามารถตอบเป็นภาษาไทยหรือภาษาอังกฤษ

12.How do you evaluate the possibility to set up sectoral approaches in oil and gas industry in Thailand? score from 1 to 5. 1 is for the least possible and 5 is for the most possible.*

โปรดประเมินความเป็นไปได้ของการจัดทำการลดก๊าซเรือนกระจกเฉพาะภาคส่วนตามความคิดเห็นของท่าน กรุณาให้คะแนน จาก 1-5 โดย 1 หมายถึง ประเมินว่ามีความเป็นไปได้ต่ำสุด และ 5 หมายถึงมีความเป็นไปได้สูงสุด

1	2	3	4	5
○	○	○	○	○

13. Why do you think so? (Please write in Thai or English.) *

กรุณาอธิบายโดยคร่าว ถึงสาเหตุที่ประเมินตามข้อที่13สามารถเขียนตอบเป็นภาษาอังกฤษหรือภาษาไทย

14. Please give any comments or suggestions about this questionnaire or the research theme. (Please write in Thai or English.)

กรุณาแสดงความคิดเห็น ข้อแนะนำ หรือคำติชมใดๆ เกี่ยวกับแบบสอบถามหรือหัวข้องานวิจัย ซึ่งท่านคิดว่าเป็นประโยชน์ต่อการปรับปรุงงานวิจัยต่อไป สามารถเขียนตอบเป็นภาษาไทยหรือภาษาอังกฤษ

Thank you very much for your kind cooperation.

APPENDIX C: Questions for the preliminary round of semi-structured interviews

I. Interview questions for upstream oil and gas companies

Objectives of interviews

1) To cross check the data on voluntary GHG standards and GHG emission level of the companies which I have obtained from their website with the companies' CSR officers. (I have received the information of GHG standards that the companies are following by reading their 2012 CSR reports available in the companies' website.)
2) To collect primary source about climate change mitigation policy of the companies
3) To gain understanding on reasons for companies to choose particular GHG standards, and the outcome from implementing those standards
4) To be exposed to their views on the current role of Thai authorities and the future direction of Thailand climate change mitigation policy

Interview questions

1. What is your company's current climate change mitigation policy and strategies?
2. To which degree does your company currently prioritize climate change mitigation? What is your company's current target in GHG emission reduction? How is it going?
3. What approach or method are your companies applying for measuring GHG emission level?
4. Is your company following any voluntary GHG standards i.e. ISO, Greenhouse gas Protocol, standards of IPIECA, standards of API? If yes, when did you start to follow those voluntary GHG standards?
5. Can you please describe the situation of your company before following the standards? What is the turning point or situation that causes your company to follow GHG standards?

6. Why did you/ why do you choose some standards considering there are a plenty of voluntary GHG standards available? Is it because the reputation of institutes that form the standards, or the content of the standards, or because other oil and gas companies are following the same standard?
7. Does your company seek consultant with any consulting companies? If yes, how is a consulting company playing a role in your company's climate change mitigation policy? If not, why is that?
8. In case that you have followed more than one GHG standards, why is that? What is the difference or commonality of each standard? And how do you implement all of those standards together?
9. What are the requirements of the GHG standards in term of subscription criteria and implementing, reporting and verifying process? In those processes, have you experienced any difficulties?
10. What is the benefit from following voluntary GHG standards for your company i.e. technological improvement, large GHG emission reduction, low-cost implementation, international reputation or more capital investment from both domestic and foreign investors?
11. What do you think would be the reasons for other oil and gas companies to choose different standards from your company?
12. How do you project the direction of voluntary GHG standards? Do you think there should be one single voluntary GHG standards that can be applied by all oil and gas companies around the world?
13. How would you evaluate the effectiveness of GHG standards? Do you think these voluntary standards are sufficient for your company to mitigate climate change?
14. How do you perceive the role of non-state actors in global environmental conservation as such climate change, especially those who form and implement the voluntary GHG standards?
15. What do you think should be the role of Thai authorities in climate change mitigation? Apart from voluntary GHG standards, what are the other approaches for your company to

mitigate climate change i.e. state regulation? Is your company participating in any state voluntary GHG reduction project i.e. carbon footprint label?

16. How do you project the direction of state regulation of climate change mitigation in Thailand? Do you expect Thailand authority would eventually implement binding regulation on sectors to cut down GHG emission? If yes, what is your company strategy to prepare for the change?

II. Interview questions for NGOs, government authorities and academics

The questions I would like to ask for in-depth interviews are mainly comprised of two parts.

1) Their current role or responsibility related to Thailand climate change policy. This set of questions will vary from one stakeholder to another.
2) Their perception of the role of states, non-state actors in environmental governance in multi levels (national, regional and global) and climate change mitigation.

Interview questions

1. What is your current role/responsibility/project? How does your work contribute to climate change mitigation in Thailand?
2. What is your view on the current climate change mitigation in Thailand? In which degree does Thai government prioritize the climate change mitigation?
3. Do you think Thailand is on the right track with the creation of the national master plan in climate change mitigation and the establishment of Thailand Greenhouse Gas Management Organization: TGO?
4. In drafting the National master plan in Climate change mitigation, what elements are emphasized the most and which sectors are considered to be main targets of climate change mitigation in Thailand?
5. Have your ever conducted any projects/programs related to climate change mitigation with business sectors especially oil and gas companies? If yes, what is the project about? And how do you evaluate the success of the project?
6. What do you think would be the most effective approach for Thailand to mitigate climate change?

7. What is your view on the climate change mitigation at regional and global level? i.e. ASEAN agreement and UNFCCC
8. Do you think the regional and global climate change agreement will affect Thailand climate change mitigation policy? If yes, how it would be affected and to what extent? If not, why is that?
9. What is your view on the international effort to mitigate climate change such as the Kyoto Protocol of UNFCCC? In your point of view, what is the strength and weakness of the international organizations (UNFCCC, IPCC) in coping with environmental degradation?
10. What is your view on the role of non-state actors (NGOs, business sectors, research institutes) in environmental conservation in general and climate change mitigation in particular?
11. Have you ever heard of voluntary GHG standards? Which one that is the most well-known for you? And what do you know about it?
12. Recently, the business sectors i.e. oil and gas companies have become active in conducting Corporate Social Responsibility (CSR) including setting voluntarily targets to reduce GHG emission? What do you think are the driving factors for this change? To which degree do you think voluntary emission reduction targets can contribute to the national emission reduction of Thailand?
13. Some oil and gas companies in Thailand (national and multinational companies) have currently followed voluntary GHG standards as a way to mitigate the climate change by themselves. What do you think of this trend in the oil and gas companies?
14. What is your view on the recent movement of business sectors to promote the idea of "self-regulation" in a replacement of state binding regulation?
15. How do you project the direction of state regulation of climate change mitigation in Thailand?
16. Do you expect Thailand authority would eventually implement binding regulation on sectors to cut down GHG emission? If yes, when and how the process would be?

APPENDIX C (continued): Questions for the second round of semi-structured interviews

I. Interview questions for upstream oil and gas companies

Objectives of interviews

1) To collect the corporate data on company-special features and the membership of association of oil and gas industry and to investigate how these factors have influence on the corporate behavior in developing sectoral approaches.
2) To gain corporate views on set up sectoral approaches and the role of government in their opinion.

Interview questions

17. What is your company's current climate change mitigation policy and strategies? How does your company contribute to climate change mitigation?
18. To which degree does your company currently prioritize climate change mitigation?
19. Has your company's climate change policy changed in last 5 years? How does it change? And what is the factor for such change?
20. Has your company measured and reported GHG emission? If yes, please explain what is the driving factor for your company to do so? If no, will your company consider doing so in the future?
21. Has your company set the reduction target? What is your company's current target in GHG emission reduction? How is the target going? Is it becoming stricter?
22. Does your company have a research team or R&D that work on corporate climate change strategy? If yes, what are the current findings or policy suggestion from the research team?
23. Has your company been appealed for causing environmental degradation from NGOs or activities (both Thai and foreign NGOs)? What does your company response to such appeal?
24. What do you think should be the role of government authorities in climate change mitigation?

25. Has your company cooperated with any government authority or NGOs in climate change related activities? If yes, please explain the details of the project and why does your company decide to work with the government and NGOs?
26. Has your company been a member of any associations of oil and gas industry? If yes, please identify the associations and the reasons for being a member. And what sort of activities that your company pursue as a member of the particular association?
27. Has your company followed any policy suggestion or innovation on climate change mitigation from the association? Why does your company do so?
28. Has your company conducted any project on climate change mitigation with other upstream oil and gas companies? If yes, please explain the details of projects. And why does your company choose to cooperate with those companies?
29. Sectoral approaches in climate change mitigation do exist in other heavy industry such as cement, aluminum and iron&steel but not in upstream oil and gas industry? What do you think is the main reason for such absence? How do you view the possibility for upstream oil and gas sector to set up the sectoral approach?
30. What if the upstream oil and gas industry would set up sectoral approach, what role of government is viewed as needed?

II. Interview questions for government authority

The questions I would like to ask for in-depth interviews are mainly comprised of two parts.

3) Their current role or responsibility related to Thailand climate change policy.
4) The government policy (current and in the future) in sectoral approaches.

Interview questions

17. What is your current role/responsibility/project? How does your work contribute to climate change mitigation in Thailand?
18. What is your view on the current climate change mitigation in Thailand? In which degree does Thai government prioritize the climate change mitigation?
19. What is the role of Thailand as Parties of Kyoto Protocol in climate change mitigation?

20. In drafting the National master plan in Climate change mitigation, what elements are emphasized the most and which sectors are considered to be main targets of climate change mitigation in Thailand?
21. Have your ever conducted any projects/programs related to climate change mitigation with business sectors especially oil and gas companies? If yes, what is the project about? And how do you evaluate the success of the project?
22. How does the government view the operation of upstream oil and gas industry? Do you think they are doing business with good governance and environmental friendly basis?
23. Is there any regulation implemented on upstream oil and gas for climate change mitigation? If yes, what is that policy? If no, why and will there be in the future?
24. Do you expect Thailand authority would eventually implement binding regulation on upstream oil and gas industry to cut down GHG emission? If yes, when and how the process would be?
25. What is the government current policy regarding the sectoral approaches? Which sectors is the main target? And why?
26. What if upstream oil and gas companies in Thailand would set up sectoral approach for climate change mitigation, what could the government support or take part in the approach?
27. Recently, some oil and gas companies have become active in conducting Corporate Social Responsibility (CSR) including setting voluntarily targets to reduce GHG emission? What do you think are the driving factors for this change? To which degree do you think voluntary emission reduction targets can contribute to the national emission reduction of Thailand?
28. How do you project the direction of state regulation of climate change mitigation in Thailand? Does the current political situation in Bangkok affect the climate change mitigation policy? If yes, how?

III. Interview questions for NGOs

1. What is the role of your organization in climate change related policy? And what do you think is the crucial role of NGOs in climate change mitigation in Thailand?
2. Has your organization been allied with any international environmental NGOs such as Greenpeace or Friends of the Earth?
3. How do you view the climate change mitigation in Thailand?
4. How is climate change mitigation prioritized in government perspective and in the society?
5. How do you view the operation of upstream oil and gas companies? Do you think they are doing business with good governance and environmental friendly basis?
6. If Thailand would implement sectoral approaches to mitigate climate change, which sector in your opinion should be the target? And Why?
7. In your opinion, how can upstream oil and gas companies help mitigate climate change?
8. What is your organization strategy to bring awareness of the society toward low-carbon society?
9. Has your organization cooperated with any upstream oil and gas companies? If yes, in which project? If no, is it possible to do so in the future?