

How Does the Energy Industry Deal with Climate Change? - Perception and Actions of the Energy Industry on Climate Change.

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Abstract

The extent and pace of climate change is already beyond our expectation. Its impacts are now experienced in every country. There is no time to lose; not only to mitigate green gas emission for slowing down the current pace of change, but also to learn how to live with expected impacts, which were induced by previously emitted green gases. The energy industry, a motive power for economic development, is the main culprit of climate change but, at the same time, it is also vulnerable and sensitive to the change.

The paper quantitatively and qualitatively analyzes perception and actions of major energy companies and discovers good examples for responding to climate change. First, this paper explores how the key bodies in the energy industry perceive and respond to climate change. The study utilizes companies' sustainability reports including annual reports from major 77 energy companies from the fortune 500 businesses (2012), and analyzes the disclosure patterns of the Global Reporting Initiatives (GRI) indicators. It also refers to the Carbon Disclosure Project (CDP) Global 500 on the Climate Change responses. Second, this paper selects the best cases of climate change response by the industrial value chain from production to transmission and scrutinizes them. It is discovered that many companies consider climate change as a challenge as well as an opportunity, but the extent of their responses were varied. It also proposes some suggestions on climate change response policies of the energy industry. The findings of this paper have practical significance, as it is one of rare researches on a specific private sector's response to climate change. Furthermore it has policy implications for decision makers not only in the business sector but also in governments to support sustainable businesses and sustainable world.

1. Introduction

The extent and pace of climate change is already beyond our expectation. Its impacts are now experienced in every country. Rapid climate change has been severe and has created many problems throughout the world. Among the various definitions available for climate change, the definition offered by the United Nations Framework Convention on Climate Change is the most comprehensive. According to this definition, climate change is the change in the statistical properties of the climate system over long periods of time, regardless of cause. (IPCC, 2001) Moreover, climate change refers to a change in climate that is directly or indirectly attributed to specific human activity that alters the composition of the global atmosphere, and this change is above and beyond the natural climate variability observed over comparable time periods. (IPCC, 1994)

Demand for energy and associated services, to meet social and economic development and improve human welfare and health, is increasing. (IPCC, 2011) All societies require energy services to meet basic human needs and to serve productive processes. Since approximately 1850, global use of fossil fuels has increased to dominate energy supply, leading to a rapid growth in carbon dioxide (CO₂) emissions. (IPCC, 2011) Accordingly, the energy industry is being blamed for much of the observed climate change because this industry is a major source of carbon dioxide, which has been shown to contribute to climate change. However, this industry is also vulnerable to impacts of climate change, and those impacts must be analyzed to make plans not only for mitigation but adaptation to climate change. These activities will eventually increase the sustainability of the energy industry. This paper analyzes the risks and opportunities of the energy industry created by climate change, and summarizes how the energy industry copes with these risks and opportunities. This paper also highlights the current and emerging best practices within the energy industry and provides future recommendations for policies regarding climate change for policy makers and managers in the energy industry.

Companies in this sector have large fixed assets with long lifetimes assets that are vulnerable to climate impacts predicted to become increasingly severe over time. (Ceres, 2011) Therefore, it faces climate change impacts on its own operations. Furthermore, the mining companies face potentially significant risks from the physical effects of climate change, largely because the sector is very water- and energy intensive and operates in some very politically challenging countries. (Ceres, 2011) These activities will help the energy industry's sustainability. This paper is to discover the risks and opportunities of climate change in the energy industry and summarize how the energy industry copes with these risks and opportunities. To promote the idea in the industry it also highlights the current and emerging best practices. Finally it will help provide recommendations for policy makers and managers in the energy industry.

2. Research Resource and Structure

Companies that compete globally are increasingly required to commit to and report on the overall sustainability performances of operational initiatives. (Carin Labuschagne, 2003) The Global Reporting Initiative's (GRI) and Carbon Disclosure Project (CDP)

provide with very useful tool to figure out the sustainability trend. The GRI's vision is that reporting on economic, environmental, and social performance by all organizations becomes as routine and comparable as financial reporting. (GRI, 2009) Companies will disclose all relevant sustainability information using GRI guidelines, as well as additional sector-relevant indicators. (Ceres, 2011) Carbon Disclosure Project (CDP)—Since 2003, the CDP has been requesting information from corporations on their greenhouse gas emissions footprint and the risks, including physical risks, related to climate change. In 2011, more than 3,700 companies responded to the CDP questionnaire. This research focuses on the energy industry in terms of the climate change. Scope of energy industry is vast and it also has the anterior and posterior effects. Given the immense and diverse nature of this industry, this research cannot cover all corporations within this market segment. Therefore, the focus of this research is limited to corporations in the energy industry that were named on the Fortune 500 list in 2012. This includes also companies in the category of Oil, Gas, Fuels, Energy Equipment, and Services and corporations within the energy industry as defined by the GRI and the CDP. This paper explores how the key bodies in the energy industry perceive and respond to climate change. The study utilizes companies' sustainability reports including annual reports from major 77 energy companies.

3. Climate Change Risk and Opportunity

Climate change can definitely affect business operations. Indeed, these changes can present both risks and opportunities. Table 1 shows the climate change phenomena and the predicted future trend for each phenomenon. Potential impacts of climate change – on natural resources, unmanaged ecosystems, sea level rise and water resources – are hard to be estimated and make prevention actions.

Table. 1 Climate Change Phenomenon Likely to Affect to the Energy Industry (IPCC) ¹

Phenomenon	Likelihood of trend
Contraction of snow cover areas, increased thaw in permafrost regions, decrease in sea ice extent	Virtually certain
Increased frequency of hot extremes, heat waves and heavy precipitation	Very likely to occur
Increase in tropical cyclone intensity	Likely to occur
Precipitation increases in high latitudes	Very likely to occur
Precipitation decreases in subtropical land regions	Very likely to occur
Decreased water resources in many semi-arid areas, including western U.S. and Mediterranean basin	High confidence

¹ Definitions of likelihood ranges used to express the assessed probability of occurrence: *virtually certain* >99%, *very likely* >90%, *likely* >66%.
 Source: Summary for Policymakers, IPCC Synthesis report, November 2007 <http://www.ipcc.ch/>

Corporations can make decisions whether to take action or not in the face of specific results of climate change. If they decide to take action, two approaches are available, i.e., mitigation and adaptation. According to the Intergovernmental Panel on Climate Change (IPCC) definition, climate change mitigation focuses on efforts to reduce greenhouse gas (GHG) emissions and/or enhance the removal of these gases from the atmosphere through carbon sinks. (B. Metz et al., 2001) In contrast, adaptation to global warming is a response that seeks to reduce the vulnerability of biological systems to climate change effects. Even if emissions are stabilized relatively quickly, climate change and its effects can last many years, thereby making adaptation necessary. (Farber, Daniel, 2007) In actuality, adaptation is a necessary strategy for all players in the energy industry and should be used to complement any climate change mitigation efforts. Adaptation, sustainable development, and enhancement of equity can be mutually reinforcing. (Grida.no , 2001)

4. Perception of Climate Change from a Corporate Perspective

The energy industry heavily depends on natural resources, such as fossil fuels, water, and land. Moreover the energy industry will confronted with the resource management crisis. Water is one of the critical resources. Water risk was raised by business executives in the World Economic Forum in Davos, 2013. More than 1.2 billion people already face water scarcity. By 2025, two-thirds of the world population will experience water stress. (Bloomberg 2013) The issues of complex linkages between food, energy, and water will be raised more and energy sector will take more risk on their operation. Water stress will be more severe according to the IPCC scenario. In fact, 76% of the total water demand comes from the energy industry in Northeast Asia with the current pattern of energy use and energy mix. The energy companies in this study have indicated that they have adopted a heightened sense of awareness of the risks and opportunities induced by climate change. According to the CDP survey in 2012, the energy industry recognizes more climate risks (e.g., managing emissions and disclosing the alignment of the overall business strategy) than opportunities.²

The energy companies indicate a heightened sense of awareness of the risks and opportunities. According to the CDP survey in 2012, the energy industry considered climate change as a risk rather than an opportunity. Such as managing emissions and disclosing an alignment of the overall business strategy.³ Threats to business continuity due to increases in intensity and frequency of extreme events caused by climate change can be significant risks created by climate change. These extreme events can threaten the raw material supply and distribution chains, which would clearly affect the industry's ability to produce the needed energy. In actuality, adaptation is a necessary strategy for all stakeholders in the energy industry and should be used to complement any climate change mitigation efforts.

Uncertainty about climate change regulations and increased costs due to the

² Survey rate is not the same at the each industry level within the energy industry.

³ Survey rate is not the same at the each industry level in the energy industry.

introduction of carbon taxes can create significant doubt in the business environment and business operations. Therefore, the changes made by the government in an effort to address climate change risk also make an impact on the financial side of the energy companies. Moreover, in terms of environmental management, optimistic emission reduction efforts result in significant cost implications for all energy sector companies. Additionally, changes in consumer needs from conventional energy to renewable energy are changing the face of the energy industry. For a conventional energy corporation, this could possibly present a major negative impact on their revenue.

Despite the many associated risks, climate change also creates some benefits. For example, companies that are up-to-date with climate change policy changes can make additional revenue from reducing emissions, and they can be a player in the emission trading market. Also it is expected to see new market creation (ex. energy efficiency technologies, renewable energy) and it will create massive investment.

5. Disclosure Analysis

This paper is based on disclosure information collected in the form of the GRI indicator. The GRI disclosure index is composed of the items. Table 2 described and covers all corporate activities in relation to climate change. The ten indicators in the GRI index relate to the adaptation and mitigation activities associated with climate change.

Table. 2 GRI Indicators relating to Climate Change

Indicator	Explanation
EC2	Financial implications and other risks and opportunities for the organization's activities due to climate change.
EN2	Percentage of materials used that are recycled input materials.
EN5	Energy saved due to conservation and efficiency improvements.
EN6	Initiatives to provide energy-efficient or renewable energy-based products and services, and reductions in energy requirements as a result of these initiatives.
EN7	Initiatives to reduce indirect energy consumption and reductions achieved.
EN10	Percentage and total volume of water recycled and reused.
EN18	Initiatives to reduce greenhouse gas emissions and reductions achieved.
EN13	Habitats protected or restored.
EN14	Strategies, current actions, and future plans for managing impacts on biodiversity.
EN26	Initiatives to mitigate environmental impacts of products and services, and extent of impact mitigation.

Figure 1 shows the percentage of energy industry companies on the 2012 Fortune 500 list that used the GRI indicators for their sustainability reporting. It is worthy of note that the general energy industry has a high rate of reporting. Nevertheless, engineering companies report at the minimum rate. Also, note that the companies that published sustainability reports without reporting the GRI indicator were not included in this quantitative analysis.

Figure 2 shows that the disclosure rate in the energy industry by sector. The disclosure rate is very high in the oil and gas equipment industry, whereas the pipeline industry has the lowest disclosure rate as it is associated with many environment impacts and sensitive issues. The disclosure patterns for environment information and climate change information is similar in most segments of the industry, but the reports from the electric, mining/crude oil, and petroleum refining segments reveal more climate change activities than general environmental activities.

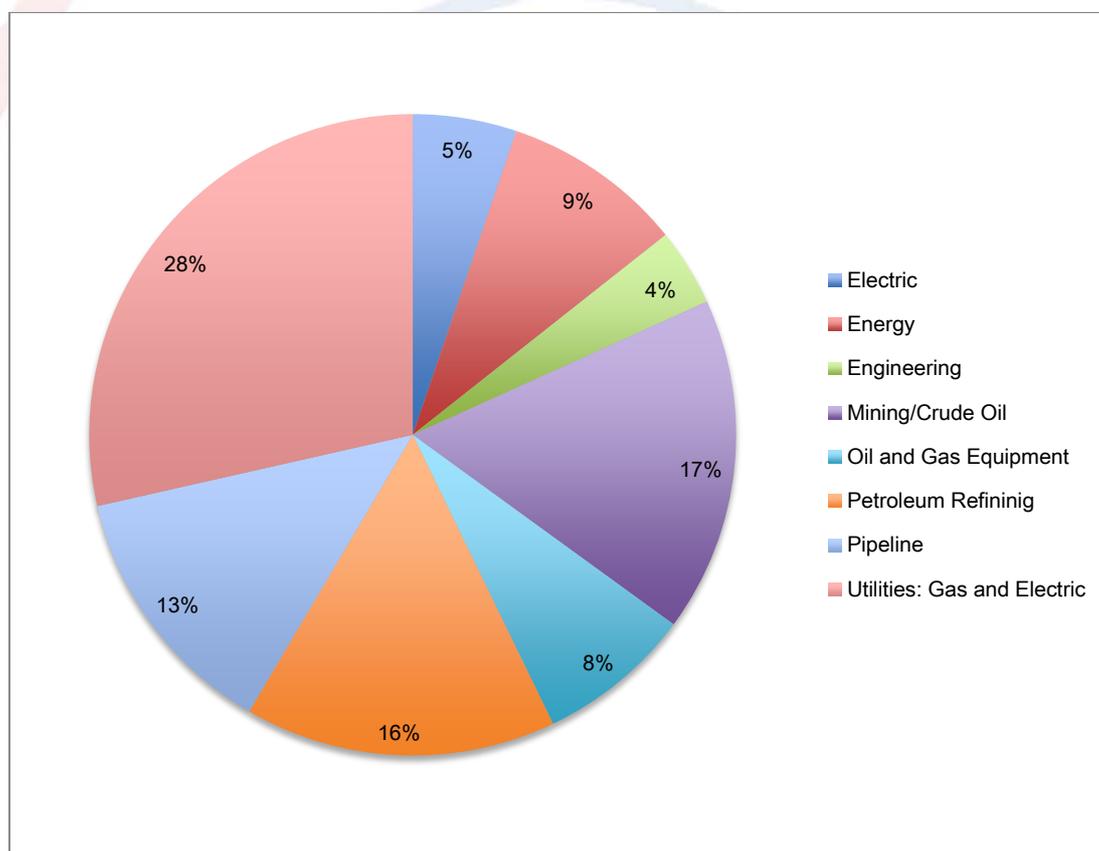


Figure 1: Reporting Rate by Sector in the Energy Industry

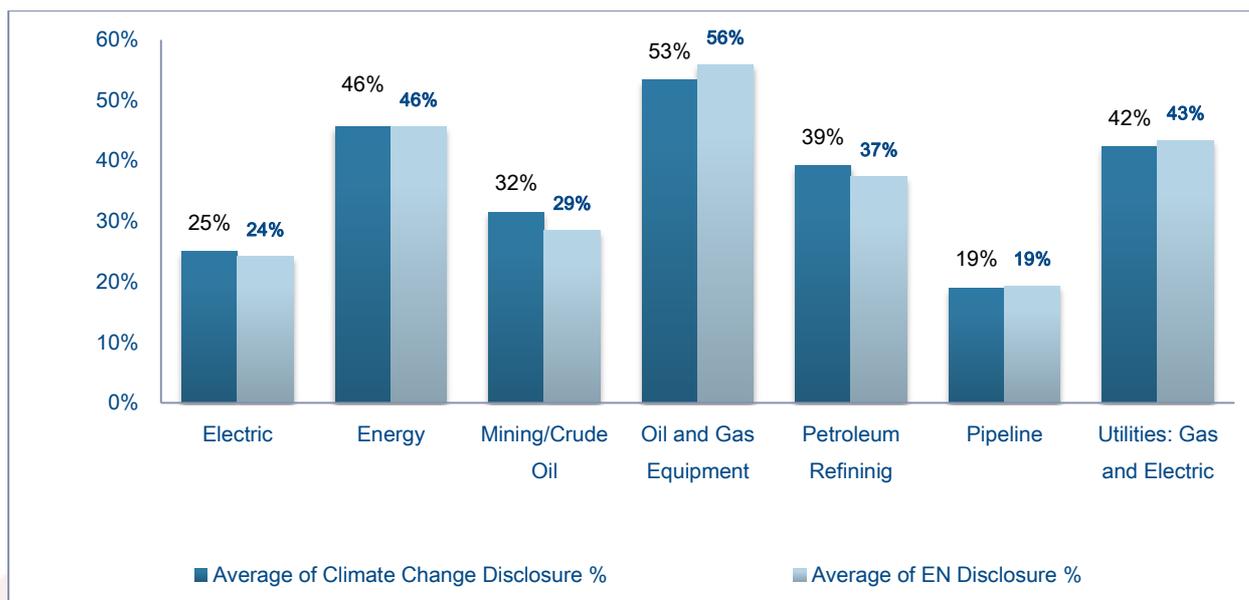


Figure 2: Comparison of Disclosure between Climate Change and Environment by Sector

The nature of the disclosure can be categorized into the following four categories: recognition, adaptation, mitigation, and the others. The average of adaptation disclosure in the energy sector is higher than the mitigation disclosure. The percentage of material used is the lowest disclosed indicator. Recognition of climate change is also not highly disclosed as it is an initial step to respond to climate change. Companies often report to recognize climate change in a certain year, and they only report to the follow-up measures in the following years. Adaptation and mitigation activities are often treated as the activities of risk management, and new market development and creation in the energy industry.

Figure 3: Disclosure Rate By Category (i.e., recognition, adaptation, mitigation, and the others)

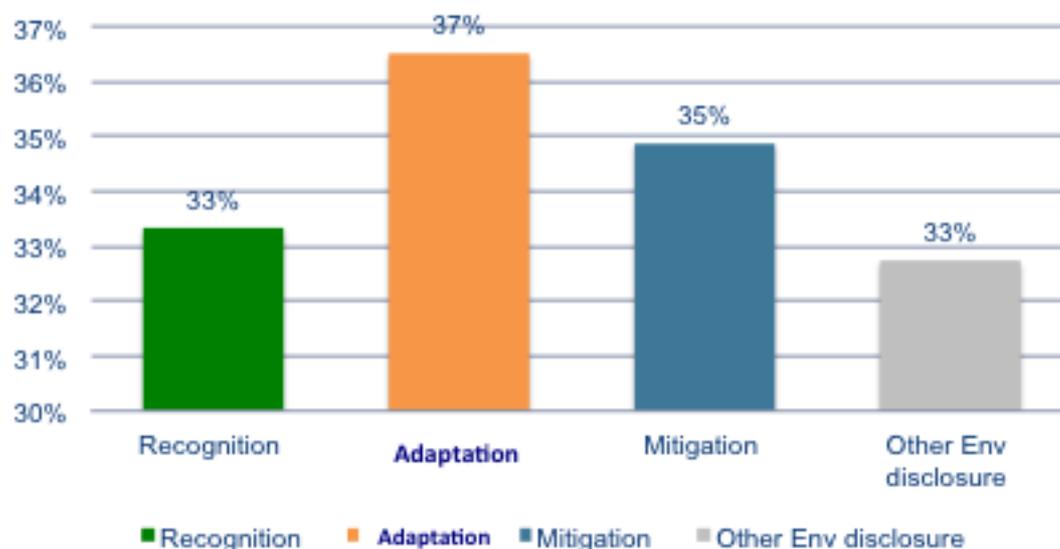
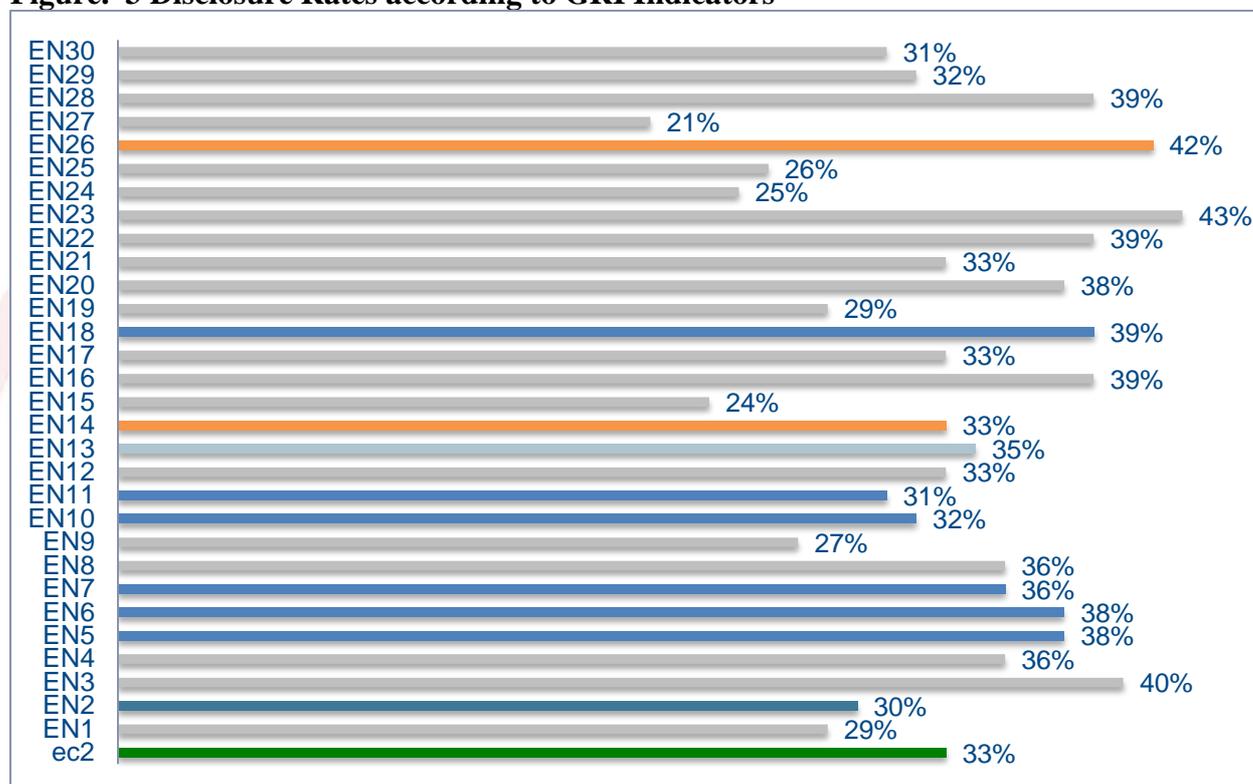


Figure 4 shows the disclosure rate for each indicator. Companies are very active in reporting EN 27 and EN15. Among the adaptation indicators, EN 26 got the highest disclosure rate. In terms of mitigation, EN 18 had the highest disclosure rate, and EN2 had the lowest.

Figure. 3 Disclosure Rates according to GRI Indicators



6. Action Analysis - Adaptation/Mitigation

This paper analyzes the self-reported information in relation to climate change of the Fortune 500 energy corporations. Although the presented data is based on limited information, it illustrates the level and scope of activities on climate change within the industry. Figures 5 and 6 show some companies' activities related to climate change adaptation and mitigation. It is challenging to illustrate their activities as its extent and pattern are varied. However, to indentify the difference among the companies, the paper categorizes the companies according to their business type (e.g. upstream, and downstream), and pays attention to the difference between the categories. There is some limitation in this analysis. First, the boundary between downstream and upstream is unclear. Second, it is difficult to assess the companies' activities as some of them are only pledged and not yet proved to be implemented.

⁴ Fortune 500, 2012 Oil and gas and utility industry, 38 out of 72 were only eligible produced the reliable information, 2010 -2012 data

Consequently, more activities related to adaptation are found than the activities in relation to mitigation. For the adaptation strategies, weather is a very important action variable. Such companies as EVN conducted risk site assessments. The facilities of Encana, Wood Group, and FirstEnergy are well suited to endure potential temperature and weather-related shifts. Moreover, some companies took action on adaptation in their business plans by implementing employee training and resource management. Based on their recognition that water will be affected by climate change, Transocean and Sempra Generation implemented water recycling in effluent processing to allow the reuse of residual water. Exxon spanned multiple industries and developed new technologies that can improve resilience to climate change. Occidental Petroleum adopted a long-term view of research on climate change and the potential human influences on the climate. Furthermore, some companies (e.g., the EDF Group) even tried to promote energy efficiency with the end user.

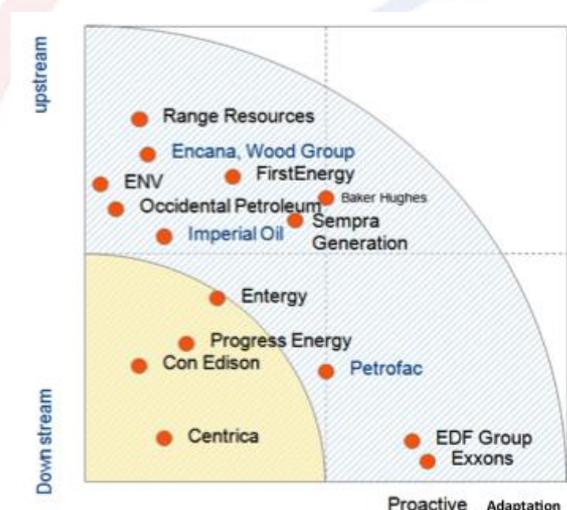


Figure 5. Adaptation Activities Analysis

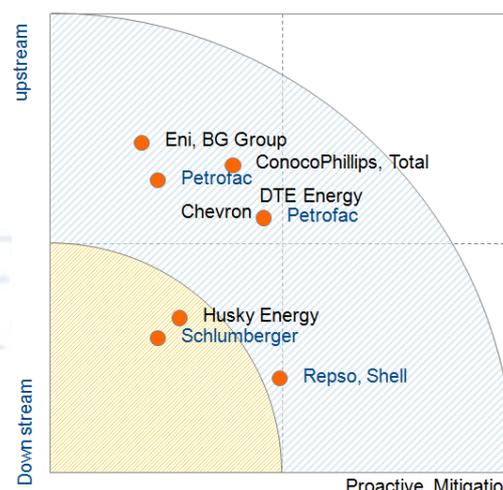


Figure 6 Mitigation Activities Analysis

Mitigation related activities were not reported as much as the adaptation related activities, but some promising activities was found in the disclosed information. Profac, Chevron, and British Gas expanded their operations into the renewable sector. CoconoPhillips diversified their energy sources. In terms of the carbon issues, Schlumberger, Husky Energy, Eni, and DTE Energy actively used carbon capture and storage (CCS) technologies.

7. Findings and Discussions

Climate change will likely impact the production, demand, and distribution of energy. As the energy industry has contribute to increasing CO₂, the action made by the energy business for climate change can help to mitigate the speed of climate change over all. At the same time, the energy industry is the one to be prepared for responses to this rapid change in order to survive. It is encouraging that this industry is showing

signs of recognizing the risks and opportunities induced by climate change. Adaptation and mitigation actions are slightly propagated in the oil and gas industry. Even though there are some recognition and engagement actions, by the nature of corporate pursuit of profits, their actions are very limited.

According to the Environmental Protection Agency (EPA, U.S.), climate change will likely impact the production, demand, and distribution of energy. Although the energy industry has contributed to the increase in carbon dioxide in the atmosphere, the actions taken by the energy industry in an effort to address climate change can help to mitigate the overall speed of climate change. Furthermore, this industry needs to be prepared for these rapid changes in order to survive. The fact that this industry is showing signs of recognizing the risk and opportunities induced by climate change is encouraging. However, adaptation and mitigation actions in the oil and gas segments still are few. Even though we can identify some prevention and engagement actions, these actions are limited due to their impact on profits. Nevertheless, mitigation and adaptation actions will improve corporate sustainability. In conclusion, to promote actions on the industrial level, strategic alliances are needed. Additionally, stakeholder management, including customers, is needed. Moreover, some actions are also needed on the policy making level. Global agenda setting, and quality and quantity assessment in terms of mitigation and adaptation are needed. The GRI index is fairly a good indicator and can be used generally to share the company information with the related stakeholders. Political power and market power is very essential to make a real change. The industry by itself is difficult to be changed. Therefore, appropriate incentives as well as supports from outside are necessary for the industry to be change. Especially, political stability can act as an incentive. Furthermore, carbon taxes and subsidies for low carbon technology can also help the overall corporate strategy. If the carbon trading market is normalized and fully established with various stakeholders including the corporate that emit carbon dioxide, those corporate will be more active on these issues. These components are interlinked with one another. Last but not the least, education on sustainability and climate change to the public (e.g., stakeholders, customers, and communities) is also important. Many companies have mentioned that the change in consumer's attitude is one of the highest risks associated with climate change. This type of education will be eventually a help to the corporation's business.

8. Concluding Comments and Research Implications

One of the more significant findings deducted from this study is that many companies in the energy industry starts to consider climate change as a challenge as well as an opportunity, but the extent of their responses were varied. The findings of this paper have practical significance, as it is one of rare researches on a specific private sector's response to climate change. Furthermore it has policy implications for the decision makers not only in the business sector but also in governments to support sustainable businesses and sustainable world.

To date, little research relating to climate change adaptation and mitigation in the oil and gas industry has been published. There is no unified method to check corporate actions related to climate change. Cost-benefit analysis is only applicable if the variances of both costs and benefits are finite. In the case of climate change, the

variances of the net present marginal costs and benefits of greenhouse gas emission reduction need to be finite. Finiteness is hard, if not impossible to prove. (Richard, 2003) However, an experimental and trial analysis can be initiated first, and it will eventually be a help to make the market more climate change friendly.

Even though this study could serve as a good start toward creating a research model, it is limited in terms of the quality and quantity of the data used. This research is entirely based on corporate sustainability reports. It must be noted that self-reports from corporations can be biased. Also, there is a possibility that some corporations may be active in these issues without reporting their activities. Furthermore, the disclosure information reported may not accurately reflect their actual adaptation or mitigation actions. Indeed, the quantity of information does not necessarily relate to the quality of action, and the reporting culture and rules vary according to the source of energy and the region in which the energy is produced. The current indicator frameworks that are available to measure overall business sustainability do not effectively address all aspects of sustainability at operational level, especially in developing countries such as South Africa. Social criteria, specifically, do not receive due considerations. (Carin Labuschagne, 2003)

The time period for which the data represents is also very limited. In fact, the corporate sustainability report covers a period no longer than 5 years. Most of companies also publish the reports less than two times. Lack of available information makes difficult for this research to figure out a significant trend of the energy industry. Moreover, comparing the actions of the companies is also difficult due to time and regional variations. This research used the sustainability report that has been published for the past 3 years. Nevertheless, the time period for the data collection is hard to coordinate for all of the companies because the regional and national laws do not apply to the each company in the same manner. Lastly, this paper is based on the energy companies on the Fortune 500 list; therefore, it is not a good representation of the renewable energy industry, which is still in its infancy.

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