

**Climate Change and Sustainability Strategy: MNCs Performance Assessment**

[Impact of Climate Change on Business Sector]

Presented By

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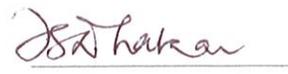
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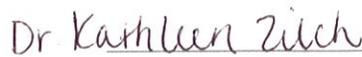
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### **Abstract**

Climate change poses many challenges for business operations worldwide. The study evaluated multinational companies (MNCs) and the implications of climate change on their business operational activities. Moreover, the study adopted a mixed-methods research design in a bid to evaluate sustainability strategies embraced by these business organizations purposely to counter climate change risks. Two methods were adopted for this research. First, this study utilized the quantitative method where the Natural-Resource-Based View (NRBV) concept was adopted to investigate whether companies are complying with the implementation of strategies geared towards reducing its impact on climate change compared to their competitors whose strategies are less proactive. This study also embraced, the Return on Assets (ROA) and Asset Turnover (AST) for assessment purposes given their distinctive nature as financial parameters. The criteria used to select companies for this study was based on their best practices that met the requirements of the MSCI ESG Global Indexes, like, Climate Index, Environment Index, Pollution Index, Clean Technology, and Sustainability Index. The companies for this study were selected from industries located in the United States, Japan, , and some European and Asian countries.

Findings for the first part of the study reveals that, United States companies, the proactive MNC's financial parameter (mean AST) was significantly lower than the less proactive MNC's. While, in the Japanese, Europe, and the Global group samples of the proactive MNC's, financial parameter (mean ROA) was significantly higher than less proactive MNCs. Remaining Asian group sample show, no significant differences in mean ROA or the mean AST across proactive and less proactive MNC'S.

Second, the study also utilized a qualitative method where research participants shared their different experiences, viewpoints, ideas, and thoughts on climate change were sought. The methodology also entailed the selection of 108 companies to help understand the impact of climate change on business and the sustainability strategies adopted to cope climate change risks. Data collection was conducted through self-administered open-ended questions with data analyzed qualitatively and quantitatively through thematic and descriptive methods respectively.

In this part it was found that slightly more than half of the subjects were awareness of on climate change while the rest had no idea on climate change or were uncertain about the concept. By contrast, about three quarters of the subjects were not aware about the difference between climate change adaptation and mitigation; a quarter of them had some knowledge on the difference while only about a tenth of them were well versed with the differences. 45.37% of the subjects agreed that their companies were proactive in climate change adaptation, 28.70% strongly in agreed, 14.81% were uncertain and 10.19% disagreed. Only 1.85% of the subjects strongly disagreed. Moreover, 60.19% of the subjects disagreed that climate change affects business while 40.74% supported the idea. 56% of the companies did not have the climate change adaptation plan versus 44% that had. Additionally, 72.22% of the companies did not have the sustainability strategy for climate change versus 27.78% that had. Regarding knowledge sharing on mitigation and adaptation with partners, slightly more than one third of the companies shared their knowledge with partners compared to slightly more than half of the companies that did not. The study recommended future research to explore on factors contributing to this practice in order to facilitate effective climate change management.

**Key words:** *Climate change, mitigation, adaptation, NRBV, and sustainability strategy.*

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## CHAPTER ONE: INTRODUCTION

### 1.1 Background of the Study

Human activities have changed the chemistry of the atmosphere and oceans, with devastating consequences. Business organizations operations are one of the main causes of this challenge, they support the production of increasing greenhouse gas emissions (Wright and Nyberg, 2017).

In any given society, climate changes are inevitable. When they take place, they are expected to result in major transformations on the natural systems as well as the man-made systems already in existence within a certain region. Climate changes also result in an increment in risks for business entities, assets, individuals, economies, and infrastructures. The impact is timeless and the ambiguity on how to deal with climate changes increase with increment in the uncertainty of the extent of the impacts. This is because it can go beyond the policy planning cycles by the government institutions and the investment decision cycles within the private sectors (Parry, Cansiani, Palutikof, & Hanson, 2007).

Climate change is characterized by institutional failures. There is neither an enforceable global agreement nor a market ethics. Climate change is an international business issue, as its institutional failures occur differently in different countries (Pinkse and Kolk, 2011). Climate changes pose significant challenge to the business operations within the national and even at the international levels. As a result, this has created the need to have the private sectors actively involved. This is based on the fact that survey results done in the last few years have showed that government entities are poor in making decisions that need them to adapt to changes. In fact, they are ranked number five in global decision-making regarding risks that have highest impact.

However, the role played by private sectors and their impact in delivering developmental assessments that are climate resilient are poorly understood. More assessments should be carried out to determine how they can increase the risk and vulnerability of businesses and government entities to climate change (Barnett & Adger, 2007).

Therefore, for firms in the modern times, adaption to these changes is important and in the modern community, the adaptation to climate changes needs the involvement of all crucial actors and participants within the society. In the recent past, most scholars and stakeholders within the society were only concerned with the government and communities. However, this has drastically changed with growing changes that necessitate the involvement of business entities in efforts to adapt to climate change. This is because they have the potential to promote projects in the monetary aspect, enhance technology, deploy innovative solutions, and develop scales that are cost effective for convenient adaptive mechanisms in the modern times (Parry, Cansiani, Palutikof, & Hanson, 2007).

As a result, the move to involve business entities in climate change and development of adaptive measures, several MNCs have begun taking measures that enable them to adapt their basic operations to the climate change. To some of these MNCs, their engagement in adaptation measure to climate changes include efforts to limit the impact on their potential supply chains, efforts to enhance the efficiency of resources, develop the production and enhance the use of viable raw resources, and the provision of support to the suppliers, the clients, and the communities in their activities to adapt to the climate changes (Epstein & Rejc, 2014).

In a report regarding climate changes, Porritt (2005) explains that the private sector and industry is quite diverse as it incorporates all the units and entities as well as institutions that are

privately owned and not within the public sector. In addition, this private sector also includes firms that are not meant to make profits and incorporated under the government. They are different in sizes depending on the location, and purpose on which they were incorporated. In fact, some are single business entities owned by an individual while others huge corporations that control other smaller firms, or branches, as well as subsidiaries operating across nations. These huge corporations are also known as multinational corporations (Parry, Cansiani, Palutikof, & Hanson, 2007).

For the purpose of surviving and operating effectively within the community, MNCs are required to develop adaptive characteristics that influence their capacity. This is because the adaptive characteristics enables them to become aware of the weaknesses, it also increases their ability to evaluate their risks, make concrete decisions, and be able to implement changes that make them take measures to adapt to conditions. The adaptive capacity also enables the firms implement measure in response to effects that might arise following climate changes (Peattie & Belz, 2009).

However, not all given corporations, MNCs, are able to develop enough adaptive capacity to enable them to adapt to climate changes that affect their operations as required. As a result, some government entities in developed nations have been able to set aside millions of moneys that enables them run innovative projects that includes the firms within the private sector to carry out activities that help in reducing the risks and uncertainties of a country. This has in fact been made possible within investment funds (Asian Development Banks, 2013).

The nature of MNCs offers them the ability to function and transfer resources as well as assets across various nations and sectors. Therefore, they act more like suppliers of most of the

credit that is needed to facilitate innovation, technology, and economic growth. In many countries and across numerous sectors, the MNCs are viewed as crucial partners who can supply the needed resources and knowledge that will in turn facilitate adaptation to environmental changes. In any case, MNCs have higher level of exposure to environmental changes and more specifically, the climate changes following their active involvement in global trade (Barnett & Adger, 2007).

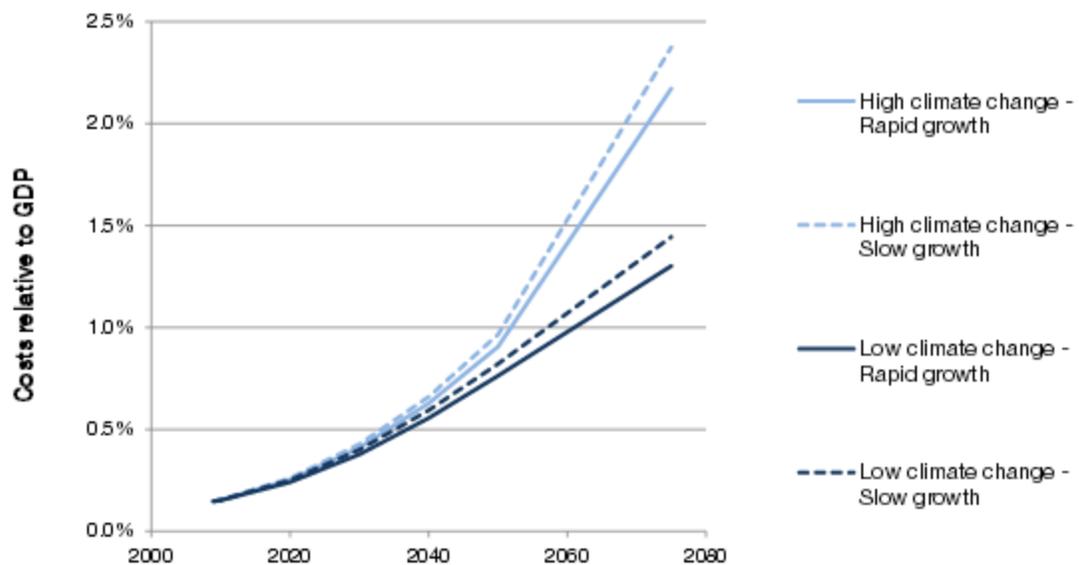
In this paper, the author seeks to focus on establishing and exploring sustainability strategy and climate change that affect any business in any part of the world. This will be achieved by assessing the performance of MNCs in the modern times. The paper will determine whether the MNCs are responding positively or as expected to the calls for action following climate changes. It will examine the concept derived from the Natural-Resource-Based View (NRBV) concept where Firms recognized for their proactive approaches in pursuing climate change strategies will have their accounting performance at higher levels when compared to firms with less proactive strategies. Also, it will examine the sustainable strategies that they have pursued to implement in the recent past that will enable adaptation to climate change possible for all firms, institutions, and government entities in the modern society.

### **1.2 Significance of the Study**

Recent studies on climate change reveal that there is conclusive evidence to suggest that the climate and the environment in general are constantly changing in the modern times. In fact, based on this evidence on the climate change, numerous businesses have started thinking of alternative measures that could slow the impact of the changing climate while enabling them to remain in service and in operations. Some of them have devised mitigation measures and others

introduced mechanisms to cope with the dynamic nature of climate such as the development of greenhouse gas emissions. However, others have realized that even with the mitigation programs and projects, climate changes are unavoidable, and it is better to adapt measures that help in coping with the situation (Parry, Cansiani, Palutikof, & Hanson, 2007).

In a report released in 2011, the climate changes are costly to the business entities and government organizations in the recent past. In fact, the report that was from Canada revealed that around \$5 billion was spend in 2010 following the climate changes. The report further expresses its fears that this could only be the beginning and the climate changes would become more costly in the future. This is with the cost increasing to about \$20 billion annually or even more by the year 2020. Hence, in order to lower the cost, the report suggested adaptation mechanisms that could drive the cost down (Epstein & Rejc, 2014).



**Figure 1. 1: Expected average annual costs of climate change in Canada relative to GDP**  
(Source: Parry, Cansiani, Palutikof, & Hanson, 2007)

Some of the steps that firms and businesses are undertaking in the modern times in efforts to reduce the cost of controlling the impact of climate changes include the introduction of mitigation and adaptation measures. As earlier stated, these measures are convenient as they enable business entities as well as government institutions to develop strategies that would be beneficial to their basic operations (Epstein & Rejc, 2014). According to Parry, Cansiani, Palutikof, and Hanson (2007), the two issues, adaptation and mitigation, are related in very many ways. This is because for instance, their strategies could lead to co-benefits for firms.

However, what exactly are the changes that business entities and government firms should seek to adapt to in light of the changing climate conditions. This is a question in the mouths of many investors, business owners, technicians, policy makers, and innovators in the modern times. In fact, most seem unsure of what the exact climate changes could be that could result in serious loses as well as damages to the operations of businesses, economic grow, or developments within a region (Epstein & Rejc, 2014).

In some of the reports released since 2010, some of the climate changes that current community need to be prepared for include the increment in temperatures in the oceans and on land, the occurrence of extreme events that have been registered as frequent in the last few decades and whose occurrence seem common in many countries, and the determinant of the availability of water for use by the human race (Epstein & Rejc, 2014). Are these changes are taking place in the modern times and it is crucial for individuals operating businesses in the modern community to be ready to adapt to these changes.

Some of the projections suggest that for starters, the temperatures will be expected to increase annually. As a result, global warming is inevitable and on average, the temperatures will

increase by about 0.2°C for every two decades. This is a global situation and it is expected to be worse as warm seasons will be longer with the range of increment being about 2 °C to 4.5 °C (Peattie & Belz, 2009). The projections further suggest that the sea level is expected to rise further in the near future, the end of the 21st century. This is based on the evidence by recent scientific studies that claim that the rise will be estimated to be between 18 cm and 60 cm. It is based on these scientific findings and estimates that it is crucial for businesses to develop mitigation or adaptive measures (Porritt, 2005).

Anyway, the adaptive and mitigation measures need to be considered across all nations as there is no region that is completely sealed from climate changes. In fact, in some regions, the climate changes could have more serious impacts than in other regions. For example, in North America, the increment in temperatures in the western mountains is expected to create more cases of winter flooding (Peattie & Belz, 2009). In summer, the climate changes will result in scarcity of water available for use by human beings as well as by animals and this will create an increase in competition for the limited water resources that are currently available. Within the same region and its surroundings, the heat waves are also expected to increase in urban areas and this situation will result in an increase in the risks to health conditions (Epstein & Rejc, 2014).

For the communities that reside at the coastal regions, they are expected to be at higher risks due to possibilities of flooding. This will be as a result of combined effects of rising of the water sea levels and the availability of stormy weathers. To the infrastructure, the situation is expected to be serious and risky as they are likely to become less stable every year and more so in the northern region, permafrost will present greater risk to the stability of the infrastructure (Peattie & Belz, 2009). However, on a brighter side, scientists claim that crop yields are expected

to increase. This is not for all types of crops, but rather, for some grains and the situation is expected to vary depending on the region in question (Parry, Cansiani, Palutikof, & Hanson, 2007).

Due to the recorded climate changes, businesses are expected to respond to these serious effects as they will affect the business environment. This is due to the fact that climate changes will be accompanied by physical effects that have direct impact on the business environment. For example, the changes in hydrological cycle will create a reduction in availability of water in some given regions across the globe. As a result, this will trigger the lack of adequate water to grow some crucial crops that run businesses and industries in given regions and thus interrupting business operations (Peattie & Belz, 2009).

Therefore, in order for some MNCs as well as businesses to be able to survive in the near future and secure their long-term dreams and strategies, they need to carefully carry out assessments on projections and climate changes and in the process, examine the potential implications of each of the likely events to their business plans, and business operations (Parry, Cansiani, Palutikof, & Hanson, 2007).

### **1.3 Problem Statement**

As earlier explained in the previous paragraph, business entities and government organizations are already in a critical position where their operations are at risk. This is due to the dynamic nature of the modern business environment and with the changes that are likely to be introduced by the changing climate conditions, the risks and opportunities for businesses will add a new dimension for decision makers at these business firms to consider. As a result, they will be expected to identify and determine the best materials as well as processes that could be

used to enable proper adaptation for the firms. They will also be expected to identify resources to open up opportunities and limit risks associated with the climate changes. In any case, major challenges for numerous business firms in the modern times include the estimation of the cost as well as the evaluation of the benefits that will be associated with these risks and opportunities (Peattie & Belz, 2009).

In addition, businesses are posed with the challenge of evaluating the wide range of climate as well as physical effects associated with the changes witnessed in the business environment in the modern times. This is because in order for them to be able to understand the changing effects and curb the business impacts, they are expected to first carry out evaluations on how the climate changes are likely to affect them. This could be carried out by first carrying out studies into past events and climate related occurrences that have been documented over the years. For instance, in focusing on a certain company within the manufacturing industry, the decision and policy makers within this named company could seek to look back at the records on reports of climate related events that have in the past hit the company. Then, in answering question such as, has the company been affected by the drought, storm, extreme cold season, unexpected hot seasons, or increased precipitation level? They could have a clear starting point on how to predict the future impacts of the climate changes to their company (Peattie & Belz, 2009).

The next crucial step that the modern business operators should seek to consider includes the basic information on the expected climate changes that are likely to occur within their country or region or across the globe. This information is very crucial and it forms part of key steps in adapting to climate changes. Then, in using some tools and frameworks that have been

devised to analyze risks and opportunities, a decision as well as a policy maker within a given company is expected to estimate the issues that the company could face in future. They will also be able to evaluate the vulnerability to which the firm has been exposed to and which is controlled by the magnitude of the effect of the event if it happens to take place, and the possibility of the event happening (Peattie & Belz, 2009).

#### **1.4 Objective of the Study**

As earlier stated, the main focus of this study is climate change and sustainability strategy and the paper seek to explore the business operations of the MNCs and via performance assessment, determine whether these firms are able to act as they are expected in the modern times. This is in light of environmental changes as well as the dynamic nature of the business environment. In any case, research has revealed that corporate executives in many MNCs may find themselves asking about the issues related to adaptation to a changing climate a matter that some of them might consider to be beneath them or for junior managers. However, there are a number of reasons why they should concern themselves with adaptation to changing climate. This is because for instance, the adaptation to climate changes have numerous and almost immediate results that are beneficial to a company. Further, the adaption to climate changes helps with the firm's positioning with regards to the long-term strategic plans.

For example, in the business environment, investments that help in the proper management of the basic business operations run numerous risks that range effects of changes in weather, availability of too much or scarcity of water, and impacts resulting from environmental shifts. All these factors become even more justified in a situation whereby the climate changes take place. For instance, in a case on environmental shifts, it was noted continued efforts that

were intended to reduce water withdrawals from their source, the river, for the purposes of a firm's production activities not only resulted in reduced input costs for the company, but they also prepared the company for a situation of reduced water availability in the future following continued climate changes.

Such a scenario for adapting to climate changes in the short-term cases accounts for greater benefits in a company. This is because it results in not only the value of infrastructure investments rising, but also creates the chances for management team to protect their clients against possible losses, the employees from possible lay-offs, and the communities in which they operate as these people, directly or indirectly relies on them for their survival.

In any case, for any multinational company, stakeholders as well as the shareholders do expect more from the market. In addition, in the recent past, results from climate change studies have revealed that business regulators, business lenders, potential and existing investors, and local as well as international insurers are very much interested in issues related to climate change. In fact, they increasingly expect more information and action to be taken by firms, business, policy makers, and other relevant decision makers in the modern business environment. Their reasoning is based on the fact that in the modern times, changes in the climate conditions are continuously being considered to be measurable. Therefore, this implies that business corporations are supposed to be able to disclose them in their management reports as well as financial records every year.

Top management teams are also getting involved in issues regarding climate changes as soft costs are no longer insignificant and therefore, it is hard for financial analysts in businesses to manage what they have been unable to quantify. However, the value of the reputation of a

business enterprise is quite huge since negative feedback on the reputation of a firm could result in sharp decrement in the share prices and increment in the cost of borrowing for the firm in question.

Therefore, to ensure that they maintain the image of company and its reputation, the top management officers might choose to engage in adaptation to climate and in the process, demonstrate that the firm's leadership is in control. Further, the move could also be crucial in educating clients, employees as well as the society on the importance of taking actions on matters that directly affect us. In any case, the business environment presents numerous competitive opportunities following any significant changes in climate. Some of these include the availability of new opportunities to venture into new markets for competitors, development of new technologies as well as of new products and services. As a result, this could enhance competitive advantage and it might become a disadvantage to the multinational firm if a competitor manages to outrun the firm.

In any case, the adaptation to climate change is the process in which a firm, business unit, government entity or organization adjusts to the real or to the expected climate conditions as well as to its effects. This is according to the Intergovernmental Panel on Climate Change, (IPCC) that also reveals that the proof that climate conditions are changing in the modern times are unmistakable. Nevertheless, what does the matter of adapting to climate change mean for business entities as well as for individuals?

The main challenge that has so far been noted in the studies carried out on adaptation to climate change in businesses has been the wide use of terminology by the firms. This is especially when they are describing their reactions to the risks posed by climate change. Some of

them in fact use terms such as resilience, business continuity and enterprise risk management while other could use flood risk management. Therefore, in the modern times, scholars seeking to get information by searching for resources using keywords such as adaptation may not get the information they are seeking for in libraries. In any case, many researchers have revealed that some of the actions that business entities undertake while seeking to curb the impacts of climate change might not be adaptive actions but actions to improve their business resilience or to manage the business environment or control the climate risks.

As a result, there is need in the modern times to seek for clarity on the actual definition of the adaptation to the climate change for MNCs or any other business firms. This is crucial as it would result in clearance of the confusion that currently exists amongst business firms. Particularly, the connection as well as the differences between the adaptation and mitigation should be made clear with regards to the business operations of a corporate entity. If such an action is not taken, in the near future, like it has happened in the past five years, firms will be taking mitigation measures and confusing them for adaptation actions.

For instance, in a survey carried out in Canada back in 2009, it was noted that almost half of business units within the country that had declared in their reports that they had carried out adaptation measures had in fact only performed mitigation measures. To them, mitigation measures were the adaptation action expected of them. Others had overlooked the mitigation actions as well as the adaptation measures. This is a clear indication of the need to seek for clarity in the modern times, and for this to be clear to ensure that scholars are able to access the information for future studies.

Furthermore, it is crucial for modern time scholars to consider whether the act of adapting to climate change for a firm, investor or government entity means anything new or anything different. This is because currently, in anticipating and responding to the risks associated with business environment is considered to be a usual activity by numerous business firms, corporations, and investors. This is despite their efforts to react to the other potential and external alterations as well as stressors that might take place within a business. For instance, to the industrial structures and conditions within an institutional that might suggest that corporate risk management is associated with the adaptation of a corporate to change.

Actually, many MNCs do seem like they are integrating the risks related to climate change together with the risks associated with managerial operations or processes and plans associated with business continuity. This trend needs to be changed in the modern times as while the challenges could seem or appear to be related, they are different, and they should be taken as such. Further, poor creation of measure that help in adaptation to climate changes in the multinational corporate business environment could in return represent a major risk for the future of the firm. It might also present additional challenges for the business entity that might be beyond and more serious compared to impacts related economic changes, policy alterations, legislative restructuring. This is due to the fact that climate change is complicated, irreversible and non-linear due to the uncertainty nature of its impact to the business environment.

Moreover, many scholars have described the climate changes and adaptation to its impact as a risk multiplier for MNCs and in the modern business environment, entities, as well as the management team are yet to fully understand the meaning of this factor. They are also yet to grasp the meaning of its impact on all parts of their business operations and in particular their

supply channels. This explains why in the modern times, there is less and less research that has been presented to the future generation on sustainability strategies, as well sustainable management means for MNCs and big firms. In addition, little research resources exist on means through which firms could be creative, innovative, and robust in ensuring resilience within their organizations.

This paper will seek to detect this deficiency and it seek to ensure that it offers the information required for performance of MNCs in the modern times via a comprehensive literature review, the paper will offer feedback, responses and information that explains sustainable strategies and management activities for climate change within a company. Via a performance assessment mechanism, the paper shall ensure that it investigates the operations of a given multinational corporate with the aim of explaining and exploring its means of adaptation to the climate changes that are witnessed in the modern times.

## CHAPTER TWO: LITERATURE REVIEW

### 2.1 Introduction

According to Intergovernmental Panel on Climate Change [IPCC] (2007), climate refers to quantifiable climate variables changes over extended time period, usually for a decade or longer period. This definition highlights that the concept of climate change that entails both global warming and the weather patterns-related changes that lead to frequent extremes as well as natural catastrophes. While climate variability results from natural climate changes, climate change is caused by anthropogenic activities. It is also stated that climate change results from global warming, and it is a universally accepted reality that affects human life in various ways such as business operations plus the environment itself (Stern Review, 2006).

The ongoing discussion about climate change mainly concerns two extremes of the debate centered around the question of authority and which voices will be heard as well as in which manner the issue of climate change should be defined. At the one extreme (complexity), the climate is classified as a complicated, detailed, and chaotic system with a long history of changes, and the existence of several knowns and unknowns is stressed within this context. At the other extreme (simplicity), the climate system is classified as being well understood, predictable, and unproblematic (Porter, Kuhn and Nerlich, 2017).

As a matter of fact, businesses are compelled to carry out their operations from a more vigorous, risky and climate change-prone environment in which institutional and resource-based as well as supply chain plus stakeholder views are relevant for characterizing and understanding strategic responses of an organization to sustainability issues (Kolk and Pinkse, 2007).

According to IPCC (2014a), climate change not only causes major impacts on both human plus natural systems but also increased risks to individuals and businesses as well as to

infrastructure, assets plus economies. There is no single intervention that can deliver climate change adaptation but rather cross-cutting sectorial efforts and timescales. The situation is even compounded with the uncertainty as well as long-term timescales associated with climate change impacts that extend beyond decision cycles of normal investment in private sector and governmental policy planning cycles (McKenzie, Mitchell, Leavy, Greeley, Downie and Horrocks, 2008). As mentioned by Sussman and Freed (2008), business can be affected by three types of risks related to climate change, namely: risks to core operational risks, value chain-related risks and broader change economic and infrastructural related risks. In addition, climate change mitigation together with adaptation policies may indirectly affect business operations. It is imperative for businesses to approach climate change as a market-related issue since climate change regulations affect energy prices and availability, among others, and thereby cause a ripple effect in the entire value chain. Most importantly, there is need for companies to consider market issues as well as relevant market strategies during formulation of climate change policies (Hoffman and Woody, 2008).

The private sector comprises of all entities without public sector ownership and control, incorporated under law with a view to make profits. Private corporations vary by size, location and economic sector in which they operate. While some are local single businesses, others are MNCs with a parent company in charge of assets as well as equity capital of all operational subsidiaries, associate enterprises and branches in various countries. All MNC must possess the capacity to adapt to climate. Berkhout, Hertin, and Arnell, (2004) argued that adaptive capacity determines extent to which a business is informed of its vulnerability, and enables it to evaluate, take decisions as well as implement adaptation measures on the basis of anticipation or as a

response measure to impacts of climate change. This suggests the need for building adaptive capacity through creation of relevant information and regulatory, institutional plus managerial conditions prior to undertaking adaptation actions.

It is noteworthy that some corporations do not have adequate capacity for delivering climate change adaptation for their operations and the surrounding communities. In such cases, governments or MNCs can higher experts to engage the private sector in reducing climate related exposure. This is consistent with case of Climate Investment Fund in the USA that allocated over USD29 million to “contribute to the financing of innovative programs and projects that engage the private sector in activities associated with reducing countries’ exposure to climate and the associated uncertainty” (Climate Investment Funds (CIF), 2014).

Dealing with the problem of climate change requires international cooperation and coordination. Strong incentives exist for countries to take the opportunity of a free ride, while the absence of a strong international authority able to impose cuts in emissions makes this a challenging problem to manage. For example, developed countries prefer to simply sign bilateral investment treaties with developing and emerging countries rather than submit to a global investment regime that is supported by an international organization (Hilmansson, 2018).

Evidence shows that MNCs are different from other companies since they have the ability to operate as well as transfer resources across countries or sectors, besides the role they play as investors in innovation and the economic growth. Indeed, MNCs are believed to be endowed with the adaptation resources and know-how for sharing (Berkhout, 2012; Hart, 2013; United Nations Framework Convention on Climate Change [UNFCCC], 2013; United Nations Global Compact and United Nations Environment Programme [UNEP], 2012). Moreover, they

experience an exposure level to climate change partly from their coordination role of about 80 % of global trade through their globally owned value chains.

There is much evidence on the growing recognition of the climate challenge magnitude locally and internationally, prompting the need for the private sector to get involved (United Nations Framework Convention on Climate Change [UNFCCC], 2013 & 2014). In a study involving global decision makers, the findings ranked failure by business and governments to implement adaptation measures in position five of the global risks that pose highest impact (World Economic Forum [WEF], 2015). In spite of the situation, there is poor knowledge on the role as well as the impact contributed by the private sector towards delivering adaptation, particularly climate-resilient development. Moreover, little has been done to assess the potential of private sector action in increasing risks and negative adaptation. That is, actions associated with increased vulnerability to impact of climate change.

## **2.2 Impact of Climate Change on Supply Chain Management (SCM)**

Climate change has continuously altered the provision, timing as well as the location of ecosystem-related functions across landscapes. For example, ecosystem functions like soil nutrient recycling and the timing plus flows of water volume function as ecosystem services when translated into valuable processes, materials or commodities by humans. Typical examples of service ecosystem include crop production that benefits from the former ecosystem function together with flood protection that manages the function of the latter ecosystem. Climate change will continue to cause positive and negative impacts on the provision and welfare-enhancing services value across the globe.

Climate change drivers such as environmental treaties to shareholders' value as well as changing buying patterns of the customers continue to present threats and opportunities to businesses and the associated supply chain networks. In response to this, leading companies in various sectors are taking actions by implementing more robust strategies for climate change. Furthermore, many top companies are industries come from their supply chains, many leading companies engage their suppliers in managing Greenhouse gases (GHG) emissions with a view to reduce emissions beyond their operations. There is evidence on incorporation of climate change in suppliers' selection methods and suppliers' engagement in the implementation of carbon management strategies aimed to reduce GHG emissions within the supply chains (Carbon Disclosure Project, 2012).

When suppliers are pressured by environmental regulations or by their customers, they are more likely to implement both external and internal low carbon supply chain management practices. In particular, customer requests to decrease GHG emissions are, in general, very effective in triggering appropriate action among suppliers (Damert, Feng, Zhu & Baumgartner, 2018).

### **2.3 Corporate Climate Strategies**

Corporate climate strategies describe the pattern of activities employed in responding to climate change in a given time period (Sharma, 2000). Bansal, Kim and Wood (2018) argued that large-scale processes, such as those related to climate change initiatives, require a broad attentional focus or they are in danger of escaping organizational attention. The IPCC represents more than 800 of the world's most distinguished climate scientists, who have repeated their messages about the impact of climate change with increasing intensity over the last two decades.

Nevertheless, few companies have responded adequately to the demands to adopt practices to mitigate climate change, even though individual managers are involved in the climate change issue. The authors add that when companies hesitate to act on enhancing sustainability, it is not because individuals in the company do not care, but rather because the company has not established the appropriate procedural or communication structures to pinpoint the specific issues (Bansal, Kim & Wood, 2018).

According to IPCC (2007), companies may address direct climate related impacts through mitigation together with adaptation measures. Mitigation aims to avoid and/or reduce emissions with a view to reduce/delay many climate change related impacts. Evidence shows substantial economic potential related to mitigation measures (IPCC, 2007), including prospects of annual reduction in costs. On the other hand, adaptation offers the second approach to climate change. The aim for this strategy is to reduce short- and long-term vulnerability (IPCC, 2007). Adaptation activities are influenced by multiple drivers, and they are usually embedded widely in development context. There are limited comprehensive estimates related to adaptation costs and benefits globally. Aside this limitation, there are promising possibilities for implementing feasible adaptation options in some sectors where the cost is low or the benefit-cost ratios are high. In addition, there is a possibility to achieve higher benefit-cost ratios through implementation of adaptation measures during early stages.

#### **2.4 Political and Market Strategies for Addressing Climate Impacts**

The pattern of climate activities in companies such as mitigation plus adaptation measures is such that it forms part of their climate strategies. As noted by Kolk (2008), these patterns are related to political and market approaches. There is sufficient evidence that

companies develop political-related corporate climate strategies as the response measures to regulatory constraints or increasing NGOs pressure following the Kyoto Protocol adoption (Kolk & Levy, 2004; Kolk & Pinkse, 2007a). In most cases, companies attempt to influence the process of regulation towards market-based instruments through collective action, besides inducing self-regulation (Kolk & Pinkse, 2007a). The observed variations across political strategies of corporate climate are usually attributable to regional differences in terms of regulatory approach (Kolk & Pinkse, 2005). Moreover, the varied emission trading schemes in scope or enforcement cause divergent institutional constraints related levels across locations (Pinkse & Kolk, 2007). For example, the emission trading scheme by the EU, which influenced the activity level of European companies unlike the US-based companies (Kolk & Pinkse, 2005; Pinkse & Kolk, 2007). Similar trend cuts across the financial institutions. With increasing government support, the Kyoto Protocol spread widely while business gradually shifted from political to greater market strategies (Kolk & Pinkse, 2004). However, many companies continue to focus on risk management, especially the impacts related with the changes in weather patterns largely because the climate change induced economic costs are easily identified compared to benefits derived from business opportunities (Wellington & Sauer, 2005). Business opportunities may be created from lower costs as a result of higher energy efficiency, low-energy product demand-related changes as well as from innovative products and processes (Jones & Levy, 2007; Kolk & Pinkse, 2004). On the other hand, research and development investments geared towards new products is associated with high risks due to frequent need of new capabilities, undermine the position held by existing companies, and create market opportunities for new entrants (Wellington & Sauer, 2005).

The actual climate change response by companies depends on their sector, exposure to climate related risk, perceptions of business leaders towards climate change as well as their individual capabilities (Jones & Levy, 2007). In addition, climate change response is motivated by profit, competition for credibility, climate policy leverage and ethical considerations, etc. However, evidence shows that relatively few companies are translating the attributable climate change significance into corporate action (McKinsey, 2007). Indeed, research reports show that most corporate climate activities appear to be inconsistent and ambiguous as well as heterogeneous with limited scope (Jones & Levy, 2007) which suggests the need to effectiveness through integration of climate strategy of companies into their overall business processes as reflected the frameworks for assessing climate strategies at corporate level. These findings support the case of production industry which usually employ such frameworks (Kolk & Levy, 2004; Kolk & Pinkse, 2004, 2005; Pinkse & Kolk, 2007).

### **2.5 Adaptation of MNC to Climate Change**

IPCC (2014b) defines climate change adaptation as “the process of adjustment to actual or expected climate and its effects” (p.1132.). In the context of business, various terms are used to describe response actions to climate risks, including business continuity, enterprise risk management and flood risk management, among others. Agrawala, Carraro, Kingsmill, Lanzi, Mullan, and Prudent-Richard (2011) noted that various actions may be performed by businesses in order to promote and manage environmental as well as climate risks constitute their standard processes of risk management rather than explicit adaptation. There is sufficient evidence that the collaborations as well as distinctions between adaptation and mitigation remain unclear in the corporate context (United Nations Global Compact and United Nations Environment Programme

[UNEP], 2012). For instance, survey study revealed that out of 40% of businesses that claimed to be implementing adaptation measures, 73% described mitigation actions compared to 18% who described adaptation actions, and the collaborations between the two components were largely overlooked (National Round Table on the Environment and the Economy [NRTEE], 2012).

Another important issue to be considered pertains whether as well as in what way climate change adaptation means anything new or rather different for businesses. Many companies approach anticipation and risk response as a usual business, besides response other external changes or stressors like industry structures plus institutional conditions. This indicates corporate adaptation is a component of risk management at corporate level. There is a body of evidence to suggest that adaptation involves stages of generic risk management of identifying, assessing plus response to the risks (Berkhout, Hertin and Arnell, 2004). Apparently, many companies incorporate risks of climate change into their risk management or rather business continuity plans as well as processes. In a study involving UK FTSE 100 companies, there were only 10% of the companies that had a specific risk management process of climate change compared to 88% that had integrated their risk management into multidisciplinary company-wide processes of risk management (CDP, 2012). As a matter of fact, this trend appears to cut across business entities as seen from the findings by Crawford and Seidel (2013) involving 100 companies of S&P Global that most of the companies reported extreme weather risks related changes caused by climate change in their business continuity plans as well as processes. In spite of this, climate change adaptation remains a potential challenge to business beyond economic, policy and legislative change adaptation since it entails a complex, non-linear and potentially irreversible changes of environment with uncertain impacts (Linnenluecke, Griffiths, and Winn, 2012; Winn,

Kirchgeorg, Griffiths, Linnenluecke, and Günther, 2011). Although there is a possibility to employ traditional strategies of risk management to the impacts and anticipated to quantified changes, there is still need for new approaches to address the discontinuous climate change related changes (Winn, Kirchgeorg, Griffiths, Linnenluecke, and Günther, 2011). There is also the likelihood of viewing climate change as the ‘risk multiplier’, which is yet to be fully understood and thereby impact on the entire business, especially their supply chains (Gledhill, Hamza-Goodacre, and Low, 2013). Only few studies of sustainability management have focused on creating innovative, robust and resilient organizations (Winn, Kirchgeorg, Griffiths, Linnenluecke, and Günther, 2011).

Literature analysis reveals various studies that show organizational capabilities as the determinant of the benefits firms derive from pollution prevention strategies. According to empirical studies on the link between environmental-financial performances by King and Lenox (2002), there are high possibilities for firms with strong innovation capabilities to benefit from pollution prevention, and more those that ensure continuous improvement. In a cross-industry study on environmental-financial performance link among 243 American firms, it was reported that pollution prevention strategies demand new competency development among companies (Russo and Fouts, 1997). The authors concluded that investment related to environmental capabilities offer benefits during growth periods of industry, largely because growth could help in decreasing the risk associated with such investment.

More recently, availability of data facilitated researchers to carry out more extensive study on the association between capabilities of pollution prevention, environmental performance plus financial performance. Data from government sources like the U.S.

Environmental Protection Agency's Toxic Release Inventory as well as that of ratings agencies like Kinder, Lydenberg, Domini Research & Analytics (KLD) have facilitated environmental performance studies through which researchers have tested causality on the relationship between environmental-financial performances as opposed to earlier studies. Through this research, it is possible to uncover clear evidence on the antecedents related environmental capabilities through illustration on how firms develop capabilities as a response measure to stakeholder pressures, with varied perception depending on different eco-efficiency levels (Chatterji & Toffel, 2010). This suggests the importance of understanding these antecedents for inquiry of research questions such as why some firms pursue more proactive environmental measure as opposed to others.

## **2.6 Factors Influencing Climate Change Adaptation in MNC**

There is much evidence on the importance of understanding the drivers and motivators of the MNCs and the entire private sector to implement climate change adaptation since it allows policy makers to create and support necessary conditions that boost corporate adaptation, which may also allow other players such as non-profit and international organizations together with governments to partner with businesses in addressing climate change adaptation (Hoffmann, Sprengel, Ziegler, Kolb, and Abegg, 2009; NRTEE, 2012). Literature shows that action for private sector adaptation is motivated by various external and internal drivers to a business (Agrawala et al., 2011; Crawford and Seidel, 2013; Hoffmann, Sprengel, Ziegler, Kolb, and Abegg, 2009; NRTEE, 2012). However, this classification is slightly artificial since the internal capabilities and business processes are determined by and fitted onto their corresponding

external social plus institutional environment (Berkhout, 2012; Linnenluecke, Griffiths, and Winn, 2013).

### **2.6.1 Internal Factors**

Evidence shows the role of internal factors together with capabilities in influencing decision of a company to implement climate change adaptation (Berkhout, 2012; Linnenluecke et al., 2013). Among the motivating factors companies may opt for include cost reduction, reduced disruption in production and services, increased profitability plus improved entrepreneurial ability. Park and Noh (2018) conducted a study to investigate the relationship between climate change and the cost of capital. Their findings showed that companies facing a higher risk of climate change have a higher cost of capital. They also suggested that companies actively manage their climate change risks as part of a more sustainable management strategy and a more efficient financial strategy.

The role of key decision makers like executives, managers or agents of lower level contributes significantly in influencing a pro-environmental behavior of the company (Linnenluecke, Griffiths, and Winn, 2013). It is well established that internal champions play a significant role in identification and communication of climate risks or opportunities, besides supporting adaptation decision-making. However, little has been done to investigate the nature of response to climate change by decision makers and their role in influencing company-level action (Linnenluecke et al., 2013).

Only a few frameworks exist to address the question of which factors influence decision-makers' perceived importance of climate change and the relevant adaptive actions. To fill this gap, Bremer and Linnenluecke (2016) explored the personal determinants of how adaptation is

perceived by organization decision-makers. Findings from this study showed that encouraging pro-environmental attitudes tends to increase the perceived importance of and support for adaptive measures in organizations. Therefore, a greater awareness of pro-environmental issues increases the perceived risk of climate change and the impacts it can have on the planet.

In a review of responses of private sector to climate change, it was reported that organizational characteristics affect experience of companies, interpretation and response to climate related risks (Pulver and Benney, 2013). In their views, the authors argued that there was a correlation between foreign ownership and firm size as well as export orientation and financial performance with environmental performance, and that they are potential corporate engagement predictors of climate change. Notwithstanding the focus of these factors on mitigation aspects, they play a critical role in the approach of a company to climate change adaptation.

### **2.6.2 External Factors**

There are many businesses that have been experiencing direct to indirect climate impacts, which is bound to increase in future (Agrawala et al., 2011; CDP, 2012). These climate impacts constitute the main predictors for climate change adaptation in private sector with the recognition of these risks by businesses in their investment decisions. Previous studies recognize the benefits of previous exposures to extreme weather events and gradual or average climate changes as the core predictors for action (Crawford and Seidel, 2013; NRTEE, 2012). Other studies suggest the role of awareness on possible impacts of climate change as the driver for corporate adaptation and responses of potential adaptation (Hertin, Berkhout, Gann, and Barlow, 2003; Hoffmann, Sprengel, Ziegler, Kolb, and Abegg, 2009; Linnenluecke, Griffiths and Winn, 2012). Despite the increasing awareness on private sector climate risks, Agrawala et al., (2011) reported that only a

few businesses that participated in the survey performed risk assessments while few of them had evaluated options to adaptation, suggesting that climate risks awareness alone cannot be sufficient to drive large-scale private sector adaptation action.

There is also the role of regulatory plus legal drivers in influencing private sector engagement through encouragement or demand of businesses adaptation action. Studies involving water supply companies in both England and Wales revealed a critical role played by the regulatory environment to encourage adaptation action since it was a requirement for the companies to adapt climate change in their assumptions for water supply as planned for 25 years (Arnell and Delaney, 2006). Moreover, financial disclosure rules may demand companies to disclose the impact of physical risks associated with climate change on their financial situation. For example, the disclosure rules and guidelines apply on exchange-listed companies in the US to Australia, Denmark and South Africa as well as Sweden and UK (Crawford and Seidel, 2013). There is also evidence to show the role of governments in encouraging adaptation across MNC through provision of credible and readily accessible evidence-based scientific information as well as models, tools, new products or services development, and through establishment of public-private partnerships (Agrawala et al., 2011; Crawford and Seidel, 2013; UNEP, 2012). For example, it was reported by the UNEP (2012) where the Spanish government provides support towards new technological developments for improved management of water resource through CETaqua-a public-private partnership comprising of the government as well as a university and the Agbar water company.

Another critical driver for private sector adaptation is the reputational, corporate citizenship and stakeholder/investor pressures since they have the potential to facilitate the

responsive rationale. Evidence shows that stakeholders such as the insurers and banks to investors, regulators and civil society organizations to governments and customers, may pressurize companies to address risks related to climate change (Crawford and Seidel, 2013; NRTEE, 2012). A Global Framework for Climate Risk Disclosure was published in 2006 by institutional investors to guide companies on climate change reporting, and to encourage reports on business and operational related material plus physical impacts resulting from climate change and the proposed adaptation response actions to these impacts as well as the associated costs for such actions (Crawford and Seidel, 2013). Nonetheless, some schools of thought argue that reputational drivers together with corporate citizenship may not drive strategic adaptation but rather cause superficial to cosmetic changes (Agrawala et al., 2011; Pulver and Benney, 2013).

Market related factors have also been shown to play a critical role in private sector adaptation in response to changing demand, new product, service development, access to new markets as well as utilizing new business opportunities associated with climate change (Agrawala et al., 2011; CDP, 2012). According to IPCC (2014a), adaptation refers to the adjustment process to actual, or rather expected climate and the related effects. There is wide recognition by various sectors that adaptation offers new business opportunities such as the agricultural and consulting to water plus insurance sectors. A typical example is the insurance sector which has a range of the leading global insurers as well as reinsurers and embrace adaptation for new growth markets. This view supports what was reported by the UN Global Compact & UNEP (2012) consider strategic engagement on climate change adaptation as a business opportunity since they recognize how their operational and success ability relate with

the well-being of those who form part of their value chain such as the suppliers, employees, customers and the target population within their operational areas.

Hamprecht and Schwarzkopf (2014) discussed the role of subsidiaries in supporting MNCs in developing climate change strategies. They argued that a subsidiary is more likely to implement climate change initiatives when it is pressured to do so by its host country stakeholders, while the parent MNC can further benefit from a subsidiary that has developed its own values.

#### **2.6.2.1 Climate Change and Managing GHG Emissions**

One of the external factors influencing climate change adaptation is the reporting of GHG emissions. Firms are increasingly being pressured to report the impact of their actions on climate change. The Carbon Disclosure Project (CDP), which covers 35 institutions and is the largest non-profit organization in its field, aims to promote reliable reporting by firms. It is a voluntary self-reporting project that was initiated to allow firms to address the issue of climate change while enabling investors to address the risks involved with their investments. The CDP sends a questionnaire to leading corporations on the risks and opportunities inherent in climate change, GHG emissions, emission reduction plans, targets, strategies, and corporate governance.

When companies frame climate change impacts as threats or opportunities this influences the use of planning and performance measurement as well as the incentivization in managing emissions. Usually, companies perceive carbon emission issues as a risk when attempting to achieve organizational objectives. However, studies examining the relationship between the external and internal reporting of emissions have generally utilized qualitative research, and the use of accounting practices in managing carbon emissions has generally been limited, even

though the cost enforced by a carbon tax and the uncertainty associated with climate change are significant. Furthermore, the regulatory requirements also have a significant influence on companies' responses (Kumarasiri & Jubb, 2018).

Recently, Kumar and Firoz (2018) reported that markets are likely to respond negatively to firms' carbon information disclosure. Investors may perceive carbon disclosure as bad news, as they are concerned about potential costs facing firms from addressing climate change. However, investment in low-carbon technologies, proper emissions disclosure, and compliance with environmental regulations can produce a favorable financial performance and have a positive return on the firms' stock. In contrast, companies with high GHG emissions and high energy consumption have been shown to have higher capital costs (Park & Noh, 2018).

To enhance the competitive advantages of U.S. firms and increase the domestic political support for establishing a carbon tax, the United States created the border carbon adjustments (BCAs) as part of a carbon tax. Some U.S. firms use more energy than non-U.S. firms, while these U.S. firms compete in international markets. Their products are thus referred to as energy-intensive and trade-exposed (EITE). The GHG tax (a carbon tax) is currently imposed in the United States, but not comparably in other countries, which could put U.S. made EITE goods at a competitive disadvantage. By implementing the BCAs, both U.S. and foreign firms could face the same GHG tax cost of producing for consumption in any given country, which could have significant implications for non-conforming firms worldwide. Applying the BCAs could have three results: preserving the competitiveness of U.S. firms, reducing emissions, and pressuring international trading partners that implement less climate change strategies into conforming (Morris, 2018).

### **2.6.2.2 Climate Change and the Role of Brand Strategy**

Companies are increasingly realigning their corporate compasses to address various global challenges, including climate change, resource scarcity, inequity, and poverty, through their core business models. They are beginning to consider sustainability as a business opportunity rather than as a risk, and they are asking what competencies they exclusively possess as a business that could help them to address these urgent global challenges. Nowadays, brands are expected to deliver not only superior products and services, but also sustainability. Furthermore, successful brands that are built to last have proven to be resilient to changing global dynamics, thereby creating successful brand promises (Hicks, 2013). Companies that own successful brands have a large and loyal following among consumers, and they have the power to induce modifications, or even large shifts, in their consumers' lifestyles, values, and attitudes. Therefore, environmentally friendly brands are an unavoidable element of a sustainable marketing strategy and concept. Maximizing a brand's impact requires a comprehensive green branding strategy, and this calls for multiple adjustments to the organizational culture and marketing policies (Grubor & Milovanov, 2017).

### **2.7 Adaptive Response Activities Associated with MNCs**

There are various proposals of typological adaptive action for adaptation processes. One of the common categories distinguishes anticipatory or proactive adaptation from reactive adaptation (Smit, Burton, Klein and Wandel, 2009). While reactive adaptations comprise of response actions that require urgent response such as during climate related hazard and extreme events (e.g. flooding), proactive adaptation is being recognized as the urgent measures in the corporate world for reducing or eliminating adverse climate impacts while exploiting the

associated beneficial opportunities. A classic example of pioneering proactive responses by MNC is a software system developed by IBM's for collection and analysis of weather, rainfall as well as water-level data required by local government for making evidence-based emergency decisions on flood threats plus evacuation plans (Forstater, Huq and Zadek, 2009). However, evidence shows that such proactive business actions face perceived uncertainty regarding the magnitude together with timing of impacts to absence of policy or regulatory incentives (NRTEE, 2012). In contrast, reactive approaches remain dominant, especially with the corporate perception that they are sufficient (Kolk and Pinkse, 2005). The basis for this perspective is that there are adequate existing management structures to manage climate change related risks and that handling slow onset of climate changes is similar to extending obvious incremental adjustments to different changes and risks (NRTEE, 2012).

There are three subclasses of adaptation processes: no adaptation actions to no regret or rather 'soft' adaptation measures, and the 'hard' adaptation measures implementation (Agrawala et al., 2011). Simply stated, adaptation responses by MNC range from indifferent to 'wait and see' and active. For companies that are yet to implement any adaptation measures ('no adaptation' response), the situation may be explained by various factors that are often company specific. For example, the deferment of adaptive action by some business executives while others may overlook any immediate adaptation due to lack of significant business climate risks despite the incremental to long-term nature associated with some adaptation measures in combination with economic pressures (NRTEE, 2012).

Literature analysis shows that no regret or soft adaptation activities have the potential to address concerns of the current climate variability, besides the benefits they share with existing

operations and the flexible support to climate variability as well as risks. There is a possibility of their implementation regardless of predictable impacts of climate change. In most cases, such measures entail adaption of the existing procedures as well as operations to rather more flexible or tough climate change such as early warning systems to insurance schemes or ‘green infrastructure’ like restoration of wetlands. Although soft adaptation measures are more expensive than hard structural measures (Markandya, Galaragga, and de Murieta, 2014), some of them are more easily reversible and suitable for companies engaged in uncertain climate or policy contexts. According to Agrawala et al., (2011), no regret/soft adaptation is the most common response measure in private sector companies. ‘Hard’ adaptation actions are usually meant for a specific adaptive purpose, besides its characteristic actions like adjusting infrastructure together with technology, which demand significant investments (Markandya, Galaragga, and de Murieta, 2014). Hard adaptation measures are commonly implemented in industry sectors like mining, which rely on fixed assets that are also long-term (Gledhill, Hamza-Goodacre and Low, 2013). Of note, no regret, soft together with hard adaptation measures may be concurrently implemented in MNCs.

There is much evidence to show the approaches taken by how MNCs in addressing climate change risks. In a study involving 136/500 Global S&P companies, Kolk and Pinkse (2005) noted a useful distinction between ‘cautious planner’ and ‘explorer’ corporations of MNCs with regard to their emergent strategy of climate change response. Based on their findings, majority (67%) of corporations were found in the category of narrow ‘cautious’ range (i.e. between little and no specific measures of climate in place) to ‘emergent’ planners (i.e. early stages during which they are considering to implement a more comprehensive as well as concrete

climate strategy). Only 5% of corporations were found under definitive cluster of ‘horizontal explorers’ (i.e. exploring while entering new markets plus opportunities, including partnerships). Most common adaptive responses of MNC are either cautious or emergent planner with strong internal focus.

As noted by NRTEE (2012), some climate risks trace their origin internally; some emerge from supply chains while others originate from external risks like shareholder expectations or regulatory markets. In view of this, it can be argued that MNCs are faced with a mix of risks that prompt internal, external or both responses. There are various cited methods employed in managing physical risks of climate change across MNCs such as conventional business continuity (i.e. emergency preparedness plans) to specific assessment of environmental vulnerability, investigation of upgraded equipment/infrastructure, risk transfer through insurance policies, and specific climate change research/forecasting models in combination with conventional activities of risk management (Crawford and Seidel, 2013; Hertin, Berkhout, Gann, and Barlow, 2003). According to oil and gas assessments, climate risk management forms the core part of decision-making frameworks across such industries since a number of them undertake the risk management methods stated before, with or without stating adaptation (Gasbarro, 2013). Although numerous companies employ their current risk management frameworks to address climate change adaptation, there is a possibility that they do not deliver lasting solution to future climate risks (Crawford and Seidel, 2013). Of note, the foregoing physical methods of climate risks management are also applicable to non-physical risks like market or finance risks.

Other various cited private sector response measures to climate change include risk management strategies and analyses of climate change sensitivity, operational practices related changes; political arenas activities; corporate governance related changes; public awareness campaigns and capacity building, launching into new product markets or diversification; maintaining existing suppliers with a view to minimize climate impacts, geographical diversification and relocation, inter-firm co-operation; and research collaborations/partnerships and collaborations with a view to strengthen adaptation (Agrawala et al., 2011; Crawford and Seidel, 2013; Linnenluecke, Griffiths, and Winn, 2013; Pulver and Benney, 2013; Sussman and Freed, 2008) . Overall, these adaptation responses may further be interpreted as material (e.g. taking loans to invest in adaptation measures, taking insurance, infrastructure investment, etc.) or non-material such as capacity building or changes in policies as well as institutional frameworks, both of which can be concurrently implemented.

Another classification of the foregoing response entails disaggregation into various specific adaptation actions based on MNC sector as well as region and other specific factors of the firm like company size plus history, product type as well as complexity and configurations of supply chain. A typical specific adaptation response within consumer products sector is India Unilever, which transformed laundry detergent in such a manner that it required less rinsing accompanied with about 14 billion saved liters of water within the water sector of its geographical area of operation. Similarly, Siemens was reported to work on technology that would reduce the cost as well as energy intensity of converting sea water for drinking (Forstater, Huq and Zadek, 2009). More frequently, achievement of such specific adaptation measures takes collaborative ventures between the business and the public or actors from third sector.

There is evidence on some MNCs within the insurance industry that have explored climate change issue through collaborating with scientists as well as public engagement in policy debates, and assessment of climate impacts on plus their own products related opportunities. Again, this is achieved by individual business, sectoral initiatives like ClimateWise or UNEPFI's Insurance Working Group and through industry organizations like Chartered Insurance Institute to Geneva Association or national trade bodies. As noted by Surminski (2010), there are some insurers who are engaged in activities aimed to reduce risk through climate adaptation. Such initiatives are awareness creation on disaster risks, governmental action promotion, development of new modeling together with risk assessment capabilities or supporting individual action provision of incentives and information to financial support or policy related terms and conditions.

Similarly, there is a growing body of evidence that MNCs and private sector are increasingly partnering with various stakeholders such as the state, local communities or other businesses in their adaptation responses (Agrawala et al., 2011; NRTEE, 2012; UNEP, 2012). For example, the R4 Rural Resilience initiative, which collaborates with Oxfam, WFP plus Swiss Re with a view to facilitate poor farmers as well as other food-insecure households in the management of weather together with climate vulnerability via a comprehensive to affordable program of risk management for developing long-term resilience (World Food Programme and Oxfam, 2012). There is also evidence on other MNCs like SABMiller and Nestle with strong partnership ethos geared towards support of improved resource management related decisions as well as promotion of local knowledge sharing with the surrounding communities in their geographic operational areas (Wales, 2014).

Although public-private collaboration in matters of building and climate change adaption are mostly effective with existing linked objectives within the target sector, scale-up opportunities of such co-operative arrangements are underutilized (Kolk and Pinkse, 2008). As noted by York, Vedula, and Lenox (2018) in a study to address climate change and the adoption of voluntary standards, government support can help encourage the adoption of voluntary standards. Private efforts certainly play an important role, but the efforts of policy makers and environmental entrepreneurs are often significantly reduced by the regional logics.

In a study by Wright and Nyberg (2017), the authors developed a model to explain how the climate change response of businesses is converted into a comfortable concern for doing business as usual. Their in-depth study of five major Australian corporations over ten years (2005–2015) identified three main stages in the corporate translation of climate change as a business concern: framing, localizing, and normalizing. In the framing stage, each of the five companies engaged with the issue of climate change during the early years due to public and external critique. In the localization stage of dealing with climate change, the five companies involved translated the corporate acknowledgment of climate change into tangible practices, which included a focus on the development of new products and services. The normalizing stage began when the localization of the framing of climate change shifted the business fortunes, internal corporate politics, and external discourses, which resulted in further criticism. Managers, other shareholders, and financial analysts gradually questioned the ability of activities and practices to satisfy market needs, such as reduced costs, higher revenues, and profitability. This evaluation created the normalizing stage, whereby the compromises between the market and

social/environmental discourses were broken. Subsequently, the corporate executives requested a realignment of climate initiatives with the market discourse of maximizing shareholder value.

### **2.8 Impacts of MNC Adaptation**

Literature is full of evidence on limited efforts towards evaluation of climate change adaptation across the private sector, and particularly the MNCs (Goodall, 2008). Among the cited challenges facing MNCs to perform outcome evaluation is lack of incentives to encourage companies to share their information on climate risk exposure as well as the response actions due to the sensitivity attached to it in terms of their competitiveness (Agrawala et al., 2011).

Although there are various case studies together with illustrative examples, there are no comprehensive measures for calculating the impact related to adaptation activities. Besides, it is inherently difficult to measure as well as track to climate in general (Wilby and Vaughan, 2011). Moreover, the interplay attributable to different actions as well as difficulties related to definition of baseline conditions in absence of the interventions complicate impact attribution to a specific adaptive response. For instance, reduced damages due to flooding could be attributed to changes related to planning control, new flood defense construction or a natural variability artifact in flood regime (Wilby and Vaughan, 2011). Other challenges relate to distinction between private effects and those of society, with a possibility of poor adaptation in private actions.

Given that climate change adaptations may be similar to as well as tangled with various strategic options faced by MNCs during adaptation to external pressures, they may be integrated with standard risk management and planning processes (Agrawala et al., 2011; Berkhout, Hertin and Arnell, 2004). From the perspective of theory of management and organization, organizational adaptation may involve enhancement of organizational performance by adapting

directly to the existing/expected contingencies as well as promoting adaptive capacity (Berkhout, Hertin and Arnell, 2004). Evaluation framework for internal climate change adaptation outcomes of MNCs could encompass different tools of quantitative and qualitative assessment or performance indicators linked to corporations' performance and to its adaptive and responsive ability to changes in external conditions.

Performance indicators may range from losses avoided and reduced insurance costs to exposure change due to changes in production location, and the business sustainability during climate change impacts. Literature documents companies that report performance, continuity of business and the ability to address needs of customers as one of the key objective as well as adaptation response related outcomes (Arnell and Delaney, 2006; Crawford and Seidel, 2013; UNEP, 2012). A study by Arnell and Delaney (2006) provides typical examples of water supply companies based in England as well as Wales which reported their aim of climate change adaption as the continuity to provide current standardized service, and to ensure necessary standards enhancement. Evaluating of adaptation ability could range from changes for climate change risk prevention; the recovery capacity of climate impacts related losses; and the capability of pursuing adaptation related opportunities (Berkhout, Hertin and Arnell, 2004).

Some companies employ a mixture of objectives in their adaptation responses to address both performance and ability to adapt. For example, Merck (the health company) developed a global strategy for water and water policy in its entire supply chain to address potential water supplies related changes. In addition, the company has implemented planning for business continuity in order to respond to supply or production interruptions caused by exceptional weather events (CDP, 2012). Although this strategy has provided some tested and successful

indicators of adaptation responses, they certainly do neither provide a comprehensive picture of flexibility nor adaptive capacity of a company. Notably, much relies on location, business activity type, and company size, suggesting an opportunity for further analysis in the area. According to Agrawala et al., (2011) measuring the approach taken by a company to benefit from climate opportunities appears obvious, based on indicators like products and services geared to address 'adaptation needs' (e.g. resilient building materials, services for flood risk management, water conservation technologies and new agricultural products).

MNCs' adaptation responses may impact on the communities as well as regions and countries in their area of operation. Analyses of external outcomes related to MNC adaptation should be analyzed on the basis of their influence to build flexibility together with reduction of vulnerability to communities they affect. Moreover, there is clear evidence that companies are aware that their efforts for internal adaptation are likely to deliver less value under circumstances where the surrounding communities together with infrastructure cannot withstand future climate impacts. Most evaluation approaches to adaptation are centered on costs of adaptation or vulnerability together with risk management (UNFCCC, 2008). MNCs have the potential to impact significantly on the entire societal resilience as well as adaptive capacity due to their direct sizeable share within the local economy, and their supply chains, more so in developing countries. No studies directly exploring external outcomes of the MNC adaptation have been identified in the review. The UN Global Compact and UNEP (2012) report involving 10 case studies on external outcomes due to adaptation responses by Caring for Climate together with CEO Water Mandate initiative revealed beneficial external outcomes towards the wider communities in addition to the internal outcomes related to their adaptation responses. Coca-

Cola, for instance, applies a method for calculating and quantifying community water partnerships related benefits. Due to its efforts of water stewardship in India, the company has achieved equilibrium in the groundwater used for beverage production and that replenished by the company to communities, illustrating internal and external adaptive outcomes.

Evaluation of MNC adaptation external outcomes should be based on potential failures of adaptation. For instance, building more industrialized houses presents better control measure against climate conditions in construction, while prefabrication may introduce new vulnerabilities. Hertin, Berkhout, Gann, and Barlow (2003) emphasized that a higher standardization degree in building industry contribute to reduced responsive ability to diverse climate conditions within the region with increased likelihood of vulnerability to long-term temperature rises. Similarly, the efforts of MNC to reduce climate risks exposures through changing location and supply may adversely impact on communities that rely on linkages of supply chain for jobs and land for production of food (Forstater, Huq and Zadek, 2009). Such negative outcome evaluation may not be considered by MNCs since they fall outside their adaptation responses objectives. This presents an important opportunity for policy makers to ensure positive adaptation responses by MNC.

### **2.9 Natural-Resource-Based View (NRBV) of a Firm and its Impacts**

Few studies have explored how MNCs are thinking about the connection between climate change and their business strategies or explore the link between firms' sustainability and the environment or the natural resources they are utilizing. This problem has become even more complex with the growth and globalization of business models, which requires the access to more competitive and environmentally restricted resources.

One key model that analyzes the internal and external factors affecting the firm's sustainable competitive advantage is the one discussed by the Resource-Based View theory of the firm (RBT) theory (Grant, 1991). According to this theory, valuable, costly to duplicate firm resources and capabilities provide the source of sustainable competitive advantage. But according to Hart (1995), the RBT ignores the constraints imposed by the natural environment. Hart argues that one of the important drivers of new resource and capability development for firms are the constraints and challenges posed by the natural environment.

Building upon RBT, Hart (1995) proposed a Natural Resource-Based View (NRBV) of the firm as a conceptual framework to explain the relationship between firm's sustainable competitive advantage (SCA) and the natural environment. It's another contribution to combine the internal and external perspectives under the resource-based view of the firm. The author posited that *"it is likely that strategy and competitive advantage in the coming years will be rooted in capabilities that facilitate environmentally sustainable economic activity-a natural-resource-based view of the firm"* (p.991). According to NRBV, there are three main strategic capabilities: pollution prevention to product stewardship as well as sustainable development. Each strategic capability draws from different competitive advantage source, and comprise of different associated environmental driving forces with different key resources (see Table 2.1).

Pollution prevention aims to prevent waste plus emissions as opposed to their management upon generation, which is low-costing. For example, the pollutants removal from production process may promote efficiency through input reduction, simplified process, and compliance and liability cost reduction. Product stewardship builds on pollution prevention by including the complete value chain ("life cycle") of product systems of the firm. Stakeholder

engagement can promote effective integration of the environmental issues into the processes of product design as well as development. Product stewardship is likely to increase competitive advantage by strategic preemptions such as securing exclusive resource accessibility (e.g., green raw materials) and by establishing advantageous standards, which are critical to the company.

On the other hand, sustainable development strategy is unique from pollution prevention and product stewardship strategies in two ways: first, it aims to cause less environmental damage to the extent that ensures continuous sustainability into the future. Second, the strategy not only focuses on environmental concerns but also on economic as well as social concerns. Sustainable development strategy needs the awareness of the link between economic activity in high income countries and issues of poverty together in low income countries with a view to reduce environmental burden while increasing economic benefits within lesser developed markets that experience the environmental effects related to the firm's activities.

**Table 2. 1: Framework of the NRBV**

<b>Strategic Capability</b>	<b>Environmental Driving Force</b>	<b>Key Resource</b>	<b>Competitive Advantage</b>
Pollution Prevention	Minimize emissions, effluents, & waste	Continuous Improvement	Lower costs
Product Stewardship	Minimize life-cycle cost of Products	Stakeholder integration	Preempt competitors
Sustainable Development Environmental	Minimize environmental burden of firm growth and development	Shared vision	Future position

Adapted from Hart (1995).

Hart (1995) noted that “*there were no examples, to my knowledge, of large manufacturing firms committed to a vision of sustainable development*” (p.1008) by mid-1990s.

In his view, sustainable development-based strategies related research must be more qualitative and case-comparative. Despite the product stewardship-based strategies that were preferable in mid-1990s, he recommended structured research strategy based on products as well as product development teams. Since most firms had widely adopted pollution prevention-based strategies, he suggested that hypothesis-testing related work could start with immediate effect. For over a decade, it is evident that most NRBV application has given much focus on prevention of pollution with little empirical research on strategies for product stewardship and sustainable development. It is well documented that among the common issues addressed is being green pays and if so, what circumstances in research organizations or the natural environment allow it (Berchicci and King, 2007; Hart and Ahuja, 1996). In essence, this research question concerns with whether improvement in environmental performance positively or negatively affects short-term financial performance. With the NRBV application, it is possible to establish the association between environmental actions with profit through a theoretical mechanism. It is notable that such question was raised before the NRBV emergence, during which most of the work explored the association of profit with pollution control or the reaction of stock market in order to disclose environmental liabilities (Berchicci and King, 2007).

Certainly, the NRBV approach facilitated a more systematic study on the association of environmental-financial performance through specifications of the relationship between resources plus capabilities with strategic outcomes. More specifically, the emphasis on contingent resources and capabilities by NRBV facilitated researchers to make specific associations between environmental-financial performance. In more than a decade since the introduction of NRBV, various resources and capabilities have been identified through research

to allow firms to gain profit from prevention of pollution, and researchers are engaged in identifying capability groups that affect abilities of firms to profit from efforts of pollution prevention. Berchicci and King (2007) demonstrated significant progress made to identify the broad capabilities together with resources that influence the firm's ability to pursue financial as well as environmental success concurrently. In their review on "pays to be green", Berchicci and King (2007) concluded that future research in the area may draw the greatest potential from identification of contingencies that influence the relationship between environmental–financial performances.

Pollution prevention studies are more advanced than studies on exploring factors that influence the ability of a firm to benefit from product stewardship and sustainable development. Sharma and Vredenburg (1998) support Hart's (1995) propositions in their article on the association between the strategies of product stewardship with competitive advantage. Hart (1995) noted that "firms that adopt product stewardship strategies will evidence inclusion of external stakeholders in the product development and planning process". In their view, Sharma and Vredenburg (1998), oil companies had more proactive strategies for environment, which incorporated product stewardship elements with greater integration of stakeholder capabilities. This is consistent with Fowler & Hope (2007) that stakeholder involvement was also an important ingredient in product stewardship efforts.

There is ongoing research work in the area of product stewardship, including operations management, marketing as well as strategy with promising findings. Most documented studies were done using case approach like (Fowler & Hope, 2007), while others used surveys like (Pujari, Wright, & Peattie, 2003). Literature analysis reveals that efforts of product stewardship

demand coordination in various domains. Indeed, recent findings show that cross-functional coordination together with top management support contributed significantly in the successful environmental performance of new product development (Pujari, Wright, & Peattie, 2003). In their study, Matos and Hall (2007) assessed product stewardship together with approach life cycle based on grounded-theory building as a form of landscape with interdependencies between decisions that result in great uncertainty on how simple change is likely to affect performance. The study concluded that development of product stewardship strategies should be based on clear knowledge of interdependencies as opposed to approaching life cycle issues in a specialized and disconnected product manner with high potential of unsuccessful product stewardship strategies.

Looking at sustainable development domain, there is little documented on its link with firm performance. Hart & Milstein (2003) partly attribute this failure to difficulties experienced in defining sustainable development from the business perspective, partly because of the extent to which sustainable development concept has advanced in terms of terminology. Therefore, many scholars are likely to wary while attempting to develop constructs that can test sustainable development strategies related elements of firms. This suggests failure of academic research to inform practice of management relating to sustainable development strategies.

## **CHAPTER THREE: METHODOLOGY AND WORK-PLAN**

### **3.1 Study Design**

Two methods are utilized in performing this study. The first is the quantitative method where the NRBV concept is investigated. Firms implementing strategies for the reduction of its impact on climate change are expected to perform better compared to their competitors whose strategies towards climate change are less proactive. The second is the qualitative method where the different features of participants like experiences and viewpoints or thoughts towards climate change are established and understood. Tashakkori & Teddlie (2008) came up with the definition of mixed studies as pragmatist standard products that have qualitative and quantitative methods combined during the different phases of research process. According to Bazely (2004), "Mixed methods are characteristically not more valid, and neither are they less valid compared to specific methods to research".

The goals of quantitative research are to gain the best neutrality and produce the same results when repeated exactly, as well as generalizability when it comes to the study results, specifically when it comes to prediction. Nonetheless, it is of prime importance that the researcher avoids injecting personal experiences and opinions, as well as biases to accomplish the objectivity during the implementation and conclusion of the research. Different instruments such as tests and surveys are employed by majority of quantitative studies in the data gathering, while probability theory is utilized in the testing of statistical hypotheses and their various research questions. Remarkably, these methods of research are basically recognized as deductive methods, considering the fact that the implications made on statistical hypotheses tests make the general implications on population traits available. The quantitative research method employed by this present study to ensure the best neutrality and produce the same results when repeated

exactly, as well as generalizability regarding study results on the effect of climate change on businesses.

According to Hiatt (1986), establishing and understanding the different characteristics of participants like experiences, viewpoints or thoughts are the aims of qualitative methods. The research method, therefore, makes an exploration of meaning and purpose, as well as reality. The method, in other words, gives a description of a positioned activity aiming to make an identification of the observer across the world. This is made up of numerous interpretive and material practices visualizing the world with the entire global transformation. The world is transformed by qualitative research into different representations like field notes and interviews to conversations, together with photographs, recordings, and memos to itself. Such gives the impression of qualitative methods being rooted in interpretive to realistic global viewpoint. Denzin & Lincoln (2005) observed that the focus of qualitative researchers is on things within their normal settings, with the aim of gaining understanding and interpreting phenomena when it comes to the relevance they derived from people. Qualitative exploratory case study is utilized by the study in exploring the effects of climate change in the business context with the aid of numerous companies' survey interviews to see to it that the concept is revealed and understood. The method, more precisely, make pertinent data for providing answers to research questions on climate change effects on businesses and the sustainability strategies being utilized by the companies available.

### **3.2 Data Analysis**

Collected Quantitative data has been exported into Statistical Package for Social Sciences (SPSS) version 21 followed by analysis. Descriptive statistics has been used to estimate

proportions, frequency, mean and standard deviation of the variables. A 95% confidence level and 5% significant level has been used for the test. On the other hand, qualitative data was analyzed thematically based on the main identified themes from the respondents' answers. The findings were reported in line with the research question, objectives as well as existing literature in narrative text, tables, charts and frequencies.

### **3.3.1 Part I, Climate Change and MNCs' Performance Assessment (Quantitative Approach)**

Exploring the thinking of MNCs on the link between climate change and their business strategies or exploring the connection between the sustainability of firms and the environment, or the natural resources that they make use of has been made by only a few studies. The focus of the current literature is on motivations of firm to go after climate change strategies. This study will attempt to participate in having that gap filled.

The production of SCA, as discussed prior to the fundamental competencies of the firm, is to be made by strategic capabilities adopting activities that are environmentally sustainable. The exhaustive internal and collaborative determination to produce environmentally friendly products covers the philosophies fundamental to the strategies of both pollution prevention and product stewardship. SCA drivers connected to pollution prevention and product stewardship strategies are entrenched in sustainable development strategies. In the event of a total or partial combination of pollution prevention strategic capabilities, product stewardship strategic capabilities, and sustainable development strategic capabilities for the creation of climate change strategies at the level of the firm and with the ability of gaining advantages in competition over others, firms which are more enterprising with regards to their strategies in implementing climate

change should perform better compared to firms that are less enterprising. The following hypothesis has been utilized in the validation of the concept derived from the NRBV concept:

***Hypothesis:*** *Firms recognized for their proactive approaches in pursuing climate change strategies will have their financial performance at higher levels when compared to firms with less proactive strategies.*

### **3.3.1.1 Sampling Technique**

In this part of the study, the selection of MNCs to be added to this part to proceed with the analysis was based on their best practices and being proactive in pursuing climate change strategies. The study needs an independent provider who has the capabilities and research-driven insights and tools to make this analysis. The researcher contacted a private organization called MSCI Inc. which have such capabilities and is well known with its researches and makes comprehensive ratings, as well as environmental, social and governance (ESG) analysis relative to business practices of thousands of companies available around the world. It produces indexes to assist investors and clients to integrate ESG factors into their processes of investment making decision. The MSCI Global indexes are designed to be a benchmark for investors who would like to gain exposure to companies whose primary source of revenues results in increasing the efficient use of scarce natural resources or mitigating the effects of environmental degradation. As mentioned above, MSCI was contacted to request the data for indices such as: MSCI Global Climate Index, MSCI Global Environment Index, MSCI Global Pollution Prevention Index, MSCI Global Clean Technology, and MSCI Global Sustainability Index which they are considered as the MSCI ESG indexes utilized for this study. Companies that are part of these indexes are offering or focusing on:

- High ESG performance;
- Reduction or elimination of pollution as toxic wastes, as well as emission during a product's entire lifecycle, beginning from manufacture and use to the time of disposal;
- Reduction in the use of materials during the manufacturing stage;
- In-process recycling facilitation;
- Using materials derived from reclaimed/recycled/post-consumer materials during the production process;
- Promotion for a product or a good to be reused;
- Reducing the effect of the production procedure by treating wastes before they are disposed;
- Product Stewardship;
- Remediation;
- Products that assist in making present technologies to be highly energy-efficient;
- Technologies that leads to producers or consumers making better and more efficient use of power or fuel; and
- Products or services that bring down the rate in energy demand or fuel consumption.

The following notice was asked by MSCI Inc. to be placed in the research paper:

*"The MSCI data contained herein is the property of MSCI Inc. (MSCI). MSCI, its affiliates and any other party involved in, or related to, making or compiling any MSCI data, make no warranties with respect to any such data. The MSCI data contained herein is used under license and may not be further used, distributed or disseminated without the express written consent of MSCI".*

### **3.3.1.2 Eligibility criteria**

Selecting the companies to be included in the study's sample to test the hypothesis, the company needs to be proactive and has good practices in pursuing strategies in climate change. The classification processes are difficult and does not come by easily. There is a need for the sample to consent to several layers of validations. The following rules in the selection of a company to be included in the main list of the proactive MNCs to perform the study are suggested by the researcher:

1. The company should be listed in at least two of the above-mentioned five MSCI ESG Global Indexes; and
2. The company should be listed in two years (in sequence) in each index (listed for two years in the index).

### **3.3.1.3 Methodology and Work-Plan**

Considering that the research goal would determine if MNCs with recognized proactive climate change strategies possess higher levels of financial performance when compared to similar companies that possess less proactive climate change strategies, the study adopted the following steps in determining whether the chosen financial parameters of the proactive companies were significantly greater than those of the less proactive companies.

1. Global Industry Classification Standard (GICS) has been utilized to classify each proactive MNC from the main sample;
2. Proactive MNCs on the basis of industry classification with other less proactive MNCs within same industry sector and within a country have been chosen for formation of the sub-sample (companies were selected from same industry sector and country). The assumption

in the study is that, those MNCs in this country list and didn't show in the MSCI Global Indexes are considered as a less proactive MNC;

3. By using a data service to collect the financial information, collect the necessary financial performance parameters information needed for each company in the sub-sample;
4. Consolidate the sub-samples from a country (or group of countries) in one sample to perform the test on it;
5. Use the proper statistical tool, test the mean value of the average of the selected financial parameter of the proactive MNCs against the less proactive MNCs in the country's sample (or the group of countries' sample), and verify the following:

$$H_0: \mu_{Pij} = \mu_{Lij}$$

$$H_1: \mu_{Pij} \neq \mu_{Lij}$$

*i.e.*

$$H_0: \mu_{Pij} - \mu_{Lij} = 0$$

$$H_1: \mu_{Pij} - \mu_{Lij} \neq 0$$

Where:

$\mu_{Pij}$ : Represents the mean of the average of the financial parameter  $i$  for the proactive MNCs of country  $j$  (or group of countries  $j$ );

$\mu_{Lij}$ : Represents the mean of the average of the financial parameter  $i$  for the less proactive MNCs of country  $j$  (or group of countries  $j$ );

In the event of rejection of the null hypothesis which is an indication of the means not being equal, then the following hypothesis should be utilized to test the right-tailed test:

$$H_0: \mu_{Pij} \leq \mu_{Lij}$$

$$H_1: \mu_{Pij} > \mu_{Lij}$$

*i.e.*

$$H_0: \mu_{Pij} - \mu_{Lij} \leq 0$$

$$H_1: \mu_{Pij} - \mu_{Lij} > 0$$

**Table 3. 1: Subsamples Used in the Study**

Seq.	Sample	Countries	No. of	No. of
		Represented in the sample	Proactive MNCs	Less-Proactive MNCs
1	US sample	United State	45	731
2	Japan sample	Japan	9	441
3	EU sample	Belgium, Denmark, France, Germany, Italy, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom	40	170
4	Asian sample	China, Hong Kong, India, South Korea, Taiwan and Turkey	11	427
5	Global sample	All the above	105	1769

### 3.3.1.4 Part I Samples

As shown in Table 3.1, five samples have been created:

1. First sample has the US proactive and less proactive MNCs;
2. Second sample has the Japanese proactive and less proactive MNCs;

3. Third sample has the proactive and less proactive MNCs from countries like: Belgium, Denmark, France, Germany, Italy, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom to represent the European sample;
4. Fourth sample has the proactive and less proactive MNCs from countries like: China, Hong Kong, India, South Korea, Taiwan and Turkey to represent Asian sample; and
5. Fifth sample is consisted of all previous four sample to represent the global sample.

### **3.3.2 Part II, Climate Change and MNC's Performance Assessment**

#### **(Qualitative Approach)**

This part of the study assessed companies from different countries on impact of climate change on business and the sustainability strategies they employ to cope with climate change risks using open-ended questionnaires. The Smart Survey services tools available online were used to design the questionnaire. The study participants are individuals of various cadres in the selected companies, ranging from the owners, senior or middle management and specialist levels. Therefore, all the participating companies were represented by one participant.

#### **3.3.2.1 Sampling Technique**

Convenient sampling technique has been used in this part to select the subjects based on their availability as recommended by Mugenda and Mugenda (2003). According to Dörnyei (2007), convenience sampling is one of the non-probabilities/nonrandom sampling techniques in which individuals are selected from the target population based on the study purpose and the fact that they meet some practical criteria like geographical proximity, their availability at given time, easy accessibility and their willingness to volunteer. The choice of the sampling method was influenced by nature of data to be collected, limited time and sample frame.

### **3.3.2.2 Eligibility criteria**

All companies that were assessed in this part of the study had to be selected the conveniently and consented to participate in the study.

### **3.3.2.3 Methodology and Work-Plan**

This part of the study used an open-ended questionnaire (**Appendix I**) designed to collect data from the selected MNCs through company representatives from different countries across the world. Collected information is about the perception towards climate change, knowledge on adaptation and mitigation, impact of climate change on business and investments, threats and opportunities associated with climate change, sustainability strategies and existing gaps on climate change strategies. Completed questionnaires were collected and returned to the researcher for analysis. Literature review has been done from selected published articles to supplement the case study.

Prior to data collection process, the researcher pretested the questionnaire to ensure that any ambiguities, and unnecessary issues are addressed prior to the main data collection exercise. In addition, the pretest was critical in eliciting the necessary and clear information as well as proper question sequencing, wording and ensuring that study methods and time required were feasible.

### **3.3.2.4 Part II Sample**

The questionnaire was distributed among a few numbers of MNCs as a pilot sample. A pilot sample is a small-scale preliminary study conducted to evaluate the questionnaire prior to the full distribution intended for this study. After reviewing the answers from the pilot sample and making the required changes based on the answers, updated questionnaire was distributed. A total of 108 answered questionnaire were collected from companies in countries like USA, UK, Brazil, and India.

## **CHAPTER FOUR: DATA ANALYSIS**

This part provides a detailed analysis and interpretation of results measured from a two-parts' samples on the implication of climate change and adopted sustainability strategies to manage climate change risks.

### **4.1 Part I: Quantitative Approach**

The sample adopted for this part was produced from the MSCI ESG Global Indexes that MSCI Inc. produced to point out the global publicly-traded firms well recognized for being proactive in pursuing climate change strategies. Moreover, companies listed in the MSCI Global Indexes, namely Climate, Environment, Pollution Prevention, Clean Technology, and Sustainability Indexes were considered as candidates for potential inclusion in the sample after implementing the selection criteria stipulated in Chapter three.

Financial data produced by Bloomberg Professional Services (Bloomberg Terminal) available at the university's PhD student lab for MNCs from countries like: United State, Japan, Belgium, Denmark, France, Germany, Italy, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom, China, Hong Kong, India, South Korea, Taiwan and Turkey were collected. Choosing these countries because they have MNCs listed in the MSCI Global Indexes and assumed in the study as proactive in pursuing climate change strategies. Other MNCs within that same industries within a country are assumed to be as less proactive MNCs. The financial data from these countries were processed and analyzed.

Given that the purpose of this research was to investigate whether firms recognized for their proactive approaches in pursuing climate change strategies will have their financial performance at higher levels when compared to firms with less proactive strategies, therefore, the researcher tested the financial performance of the sampled firms on the basis of higher

proactive on climate change against those with less emphasis using the Return on Assets (ROA=Net Income/Average Total Assets), and Asset turnover (AST = Total Revenue/Total Assets). This test will help attribute whether proactive firms with a higher emphasis on climate change have larger levels of financial performance than those firms with less emphasis on climate change.

Accordingly, ROA is amongst the recognized and standard measurement of accountability that determines the profitability of a firm when compared to its cumulative assets. Subsequently, Pugh, Jahera, and Oswald (2005) attribute that AST entails the effective ways firm exploit these accumulative assets. It is imperative to note that ROA and AST are measured in a span of 6 years between the years 2009 and 2014 amongst proactive firms and comparison made to the averages of the less-proactive firms within same industry and country.

A ROA composite was created, where the ROA values from 2009 to 2014 were accumulated and averaged. Correspondingly, a composite to the AST was also created and its values between the years 2009 and 2014 averaged. The independent t-tests were undertaken with data profiled per each country or group of countries. The t-values were assessed using a one-tailed p-value of .05 (because it was hypothesized that the more proactive MNCs would have better metrics). Prior to conducting the t-tests, variables were examined for normality. Per Kline (2011), a variable is not distributed normally if its skewness index is above three and its kurtosis index is above 20. Highly skewed variables were transformed using a natural log function or other type of transformation (Tabachnick & Fidell, 2013). The transformed variables were used in the t-test procedures although the descriptive statistics (i.e., mean and standard deviation).

#### 4.1.1 Results for the United States Companies

The findings in Tables 4.1, 4.2 and 4.3 show, there was no significant difference in mean ROA across proactive and less proactive MNCs for the United States companies. Meanwhile, within the US companies, mean AST (M= 0.252, SD= 0.097) for the proactive MNCs was significantly lower than the mean AST (M= 0.289, SD= 0.142) for the less proactive MNCs.

**Table 4. 1: Descriptive Statistics for the United States Companies**

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
<b>ROA</b>	722	-73.82	34.53	-1.48	14.88	-2.18	.091	6.13	0.182
<b>ROA_SQRT</b>	722	1.00	10.46	5.98	1.10	1.25	.091	3.74	0.182
<b>AST</b>	722	0.0015	10.93	1.05	0.9197	5.41	.091	47.4	0.182
<b>AST_LOG</b>	722	0.0007	1.08	0.2867	0.1397	1.05	.091	3.90	0.182

**Table 4. 2: Group Statistics for the United States Companies**

	TYPE	N	Mean	Std. Deviation	Std. Error Mean
<b>ROA</b>	<b>P. Active</b>	44	5.82	0.8241	0.1242
	<b>L. Active</b>	678	5.99	1.12	0.0428
<b>AST</b>	<b>P. Active</b>	44	0.2517	0.0969	0.0146
	<b>L. Active</b>	678	0.2889	0.1418	0.0054

**Table 4. 3: Independent Sample t-test Results for the United States Companies**

	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
<b>ROA Transformed</b>	-1.36	53.79	0.180	-0.1784	0.1314	-0.4419	0.0851
<b>AST Transformed</b>	-2.39	55.72	0.020	-0.0372	2.0156	-0.0684	-0.006

#### 4.1.2 Results for the Japanese Companies

The findings in Tables 4.4, 4.5 and 4.6 show that within the Japanese companies, mean ROA (M= 4.03, SD= 2.02) for the proactive MNCs was significantly higher than the mean ROA (M= 1.98, SD= 2.71) for the less proactive MNCs.

There was no significant difference in mean AST across proactive and less proactive MNCs for the Japanese companies.

**Table 4. 4: Descriptive Statistics for the Japanese Companies**

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
<b>ROA</b>	450	-10.23	13.00	2.03	2.71	-0.197	0.115	2.07	0.230
<b>AST</b>	450	0.2322	2.95	0.95	0.38	1.21	0.115	3.128	0.230

**Table 4. 5: Group Statistics for the Japanese Companies.**

	TYPE	N	Mean	Std. Deviation	Std. Error Mean
ROA	P. Active	9	4.026	2.0248	0.6749
	L. Active	441	1.98	2.7052	0.1288
AST	P. Active	9	1.06	0.7485	0.2495
	L. Active	441	0.95	0.3687	0.01756

**Table 4. 6: Independent Sample t-test Results for the Japanese Companies.**

	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
ROA	2.971	8.593	0.016	2.041	0.6871	0.4754	3.61
AST	0.455	8.079	0.661	0.1139	0.2501	-0.462	0.69

### 4.1.3 Results for the European Group of Companies

The findings in Tables 4.7, 4.8 and 4.9 show that within the European Group of companies, mean ROA (M= 2.70, SD= 4.10) for the proactive MNCs was significantly higher than the mean ROA (M= -0.16, SD= 12.28) for the less proactive MNCs.

There was no significant difference in mean AST across proactive and less proactive MNCs for the European Group of companies.

**Table 4. 7: Descriptive Statistics for the European Group of Companies**

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
<b>ROA</b>	210	-57.90	15.96	0.3839	11.24	-3.229	0.168	12.803	0.334
<b>AST</b>	210	-5.44	3.46	0.8997	0.9039	-2.753	0.168	21.211	0.334

**Table 4. 8: Group Statistics for the European Group of Companies.**

	TYPE	N	Mean	Std. Deviation	Std. Error Mean
<b>ROA</b>	<b>P. Active</b>	40	2.70	4.10	0.6485
	<b>L. Active</b>	170	-0.1603	12.28	0.9415
<b>AST</b>	<b>P. Active</b>	40	0.7645	1.62	0.2558
	<b>L. Active</b>	170	0.9315	0.6331	0.0486

**Table 4. 9: Independent Sample t-test Results for the European Group of Companies.**

	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
<b>ROA</b>	2.499	185.99	0.013	2.86	1.14	0.6014	5.11
<b>AST</b>	-0.641	41.85	0.525	-0.1670	0.2604	-0.6926	0.3585

**4.1.4 Results for the Asian Group of Companies**

The findings in Tables 4.10, 4.11 and 4.12 show that within the Asian Group of companies, there were no significant differences in mean ROA and mean AST across proactive and less proactive MNCs for the Asian Group of companies.

**Table 4. 10: Descriptive Statistics for the Asian Group of Companies**

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
<b>ROA</b>	438	-69.50	35.27	2.17	10.33	-2.371	0.117	12.33	0.233
<b>ROA_SQRT</b>	438	1.00	10.28	5.78	0.8397	0.569	0.117	7.793	0.233
<b>AST</b>	438	0.0179	4.37	0.9234	0.5764	2.015	0.117	7.27	0.233

**Table 4. 11: Group Statistics for the Asian Group of Companies**

	TYPE	N	Mean	Std. Deviation	Std. Error Mean
<b>ROA Transformed</b>	<b>P. Active</b>	11	5.53	1.09	0.3289
	<b>L. Active</b>	427	5.79	0.8330	0.0403
<b>AST</b>	<b>P. Active</b>	11	0.8281	0.4462	0.1345
	<b>L. Active</b>	427	0.9258	0.5796	0.0280

**Table 4. 12: Independent Sample t-test Results for the Asian Group of Companies.**

	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
<b>ROA Transformed</b>	-0.759	10.303	0.465	-0.2516	0.3314	-0.9871	0.4838
<b>AST</b>	-0.711	10.888	0.492	-0.0977	0.1374	-0.4006	0.2051

#### 4.1.5 Results for the Global Group of Companies

The findings in Tables 4.13, 4.14 and 4.15 show that within the Global Group of companies, mean ROA (M= 3.73, SD= 5.02) for the proactive MNCs was significantly higher than the mean ROA (M= 2.03, SD= 6.88) for the less proactive MNCs.

There was no significant difference in mean AST across proactive and less proactive MNCs for the Global Group of companies.

**Table 4. 13: Descriptive Statistics for the Global Group of Companies**

	N	Minimum	Maximum	Mean	Std. Deviation	Skewness		Kurtosis	
	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
<b>ROA</b>	1748	-25.33	27.32	2.13	6.80	-0.839	0.059	2.90	0.117
<b>AST</b>	1748	-5.44	10.93	0.9832	0.7423	3.98	0.059	54.79	0.117

**Table 4. 14: Group Statistics for the Global Group of Companies**

	TYPE	N	Mean	Std. Deviation	Std. Error Mean
<b>ROA</b>	<b>P. Active</b>	100	3.73	5.02	0.502
	<b>L. Active</b>	1648	2.03	6.88	0.1695
<b>AST</b>	<b>P. Active</b>	100	0.8308	1.08	0.1082
	<b>L. Active</b>	1648	0.9925	0.7160	0.0176

**Table 4. 15: Independent Sample t-test Results for the Global Group of Companies**

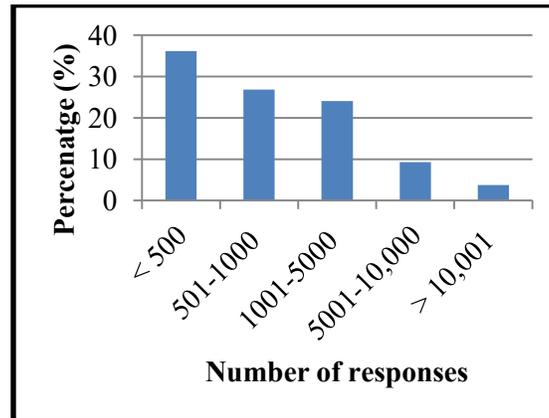
	t-test for Equality of Means						
	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
						Lower	Upper
<b>ROA</b>	3.202	122.78	0.002	1.70	0.530	0.6479	2.75
<b>AST</b>	-1.476	104.33	0.143	-0.1617	0.1096	-0.3791	0.0556

## 4.2 Part II: Qualitative Approach

This part provides details on analysis and interpretation of study results that assessed a total of 108 companies from countries like USA, UK, Brazil, and India on impact of climate change and the sustainability strategies they employ to cope with climate change risks. Since all the companies selected participated to completion, the study achieved 100% response rate.

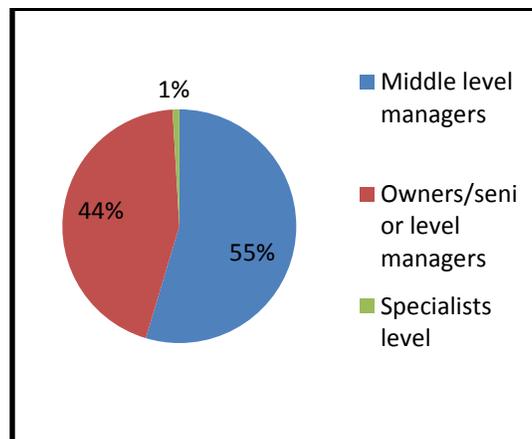
### 4.2.1 Results and Analysis

This study revealed that most firms 36.11% (N=39) had less than 500 employees, followed with 26.85% (N=29) with 501-1000 employees, 24.07% (N=26) with 1001-5000 employees, 9.26 % (N=10) with 5001-10,000, and the lowest 3.70% (N=4) with over 10,001 employees. Standard Error and Sample Variance were 6.408 and 205.3 respectively (**Figure 4.1**).



**Figure 4. 1: Number of Employees in Companies**

The results showed that most of the participants in this study were middle level managers at 54.63% (N=59), then owners/senior level managers at 44.44% (N=48), and specialists level at 0.93% (N=1). On other hand, Standard Error was 17.786 and Sample Variance was 949 (Figure 4.2).



**Figure 4. 2: Management Level**

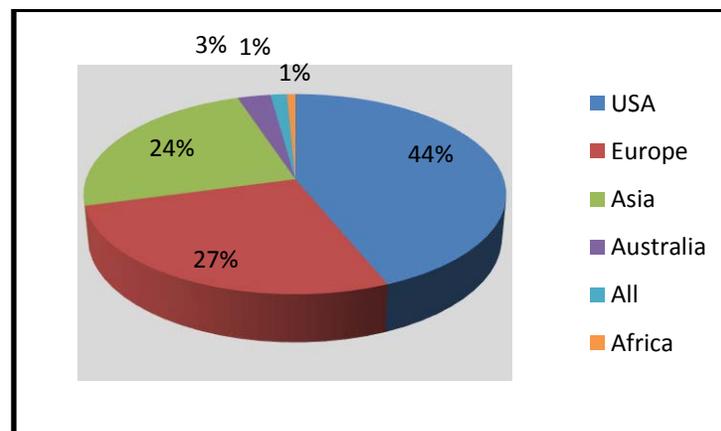
This study found that most companies 21% (N=23) were engaged in manufacturing, followed with electronics at 12.03% (N=13), construction and retail and consumer products at 11.11% (N=12) each, automotive at 6.5% (N=7), food and beverages at 5.5% (N=6), agriculture and airlines, aerospace and defense industries at 2.8% (N=3) each, and others (government, software, financial services, education, transport, Insurance, Information Technology (IT),

chemicals, local government, hotel, engineering, wholesale, telecommunication, legal services, School and computers) at 26.9% (N=29). There is a mean of  $12 \pm SD = 8.902$ , while the variance of 79.25 and the standard error was 2.967 (Table 4.15).

**Table 4. 16: Company Industry**

Company Industry	Frequency (N)	Percentage (%)
Manufacturing	23	21%
Electronics	13	12.03%
Construction	12	11.11%
Retail and consumer products	12	11.11
Automotive	7	6.5%
Food and beverages	6	5.5%
Airlines, Aerospace and Defense Industries	3	2.8%
Agriculture	3	2.8%
Others	29	26.9%
<b>Total</b>	<b>108</b>	<b>100</b>

Based on the country of operation, the results showed that most of the companies assessed operated globally in all the continents. However, majority of them operated in the USA with geographical distribution at 44% (N=60), then Europe at 27% (N=37), Asia at 24% (N=33), Australia at 3% (N=4), and Africa at 1% (N=1). Only 1% (N=2) of the responses accounted for countries that operated in worldwide with a standard error of 9.917 (Figure 4.3).



**Figure 4. 3: Distribution of companies by geographical operation**

#### 4.2.2 Awareness of Climate Change

Out of 94 subjects that responded to this question, there were slightly above half of the subjects who were aware about climate change. This can be confirmed by the following statements:

*Participant 9 “Climate change is when the weather and temperature of the planet fluctuate unpredictably”.*

*Participant 22 “The Earth's climate is steadily increasing (due to natural cyclical patterns over long periods of time), this is compounded to an unknown extent by man-made reasons”*

*Participant 51 “the weather is changing because of things we do to the environment”*

*Participant 84 “With the interference of man producing indiscriminately lethal gases to the environment, the climate on the planet has been drastically changed. Its climate is increasingly suffering often irreversible interference.”*

*Participant 97 “is a large-scale, long-term shift in the planet's weather patterns or average temperatures”.*

*Participant 100 “I think it's a serious change cause by human acts along the time, and that affect all lives in the world”.*

The remaining subjects did not have any idea on climate change or were not sure about the concept. This is confirmed by the following statements:

*Participant 5 “I proactively search for the concept of Climate change and I love to hear from politicians and environmentalists about climate change”.*

*Participant 25 “THERE IS NO SUCH THING--ALLEGED CLIMATE CHANGE IS A HOAX AND A LIE”*

*Participant 26 “... that's an open ended question. Regarding what?”*

*Participant 42 “We are serious need of change, but governments and corporations are too concerned with their bottom line to risk making changes”*

*Participant 94 “For me climate changes are changes in natural events that take place due to adverse media issued by men.”*

#### **4.2.3 Difference Between Climate Change Adaptation and Mitigation**

When asked the difference between climate change adaptation and mitigation, the findings showed that about three quarter of the subjects had no idea on the difference between the two climate change strategies. This is confirmed by the following responses:

*Participant 25 “THERE IS NO DIFFERENCE--THERE IS NO SUCH THING AS CLIMATE CHANGE”*

*Participant 37 “Climate change is a worldwide phenomenon believed by most scientists to be caused by the increasing concentration of greenhouse gases (GHG), especially CO<sub>2</sub>, in the Earth’s atmosphere.”*

*Participant 50 “That one is accepting what is going to happen and the other is trying to change with the climate”*

*Participant 84 “apparently curative solutions are not correct long term. Pretending not purge the worst effects”*

*Participant “I don't know the exactly difference, but I think the adaptation is the capacity to live with the changes in the climate, and the mitigation, maybe is the suffering with these changes”*

A quarter of the subjects had some knowledge on the difference between the two strategies as confirmed below:

*Participant 10 “mitigation of control of emissions”*

*Participant 41 “LIMITING CHANGE OR REVERSING CHANGE”*

*Participant 45 “HABIT TO ADOPT THE CLIMATE CHANGE”*

*Participant 94 “one you get used to the changes and the other is when you get out of the cold and go to the hot”.*

*Participant 95 “Adaptation would be changing with change with mitigation being proactive.”*

There were about a tenth of the subjects who were well versed with the differences in the two strategies as confirmed by the following responses:

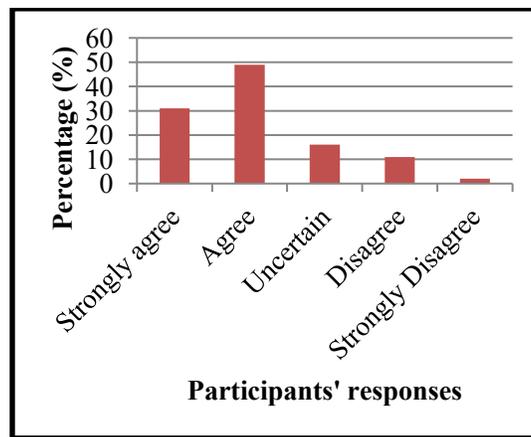
*Participant 6 “While adaptation aims to lessen the adverse impacts of climate change through a wide-range of system-specific actions, mitigation looks at limiting climate change by reducing the emissions of greenhouse gases”.*

*Participant 24 “adaptation means measures taken after the damage whereas mitigation means measures taken so that damage does not happen”.*

*Participant 86 “Adaptation aims to lessen the adverse impacts of climate change and mitigation looks at limiting climate change”.*

#### 4.2.4 Company Proactivity about Climate Change Adaptation

Regarding proactivity status, the results showed that majority of the subjects 45.37% (N=49) agreed that their companies were proactive with regard to climate change adaptation, followed by 28.70% (N=31) who were strongly in agreement, 14.81% (N=16) were uncertain, 10.19% (N=11) disagreed, while 1.85% (N=2) were strongly in disagreement. The Sample Variance was 341.7 and Std. Error was 8.267 (**Figure 4.4**).

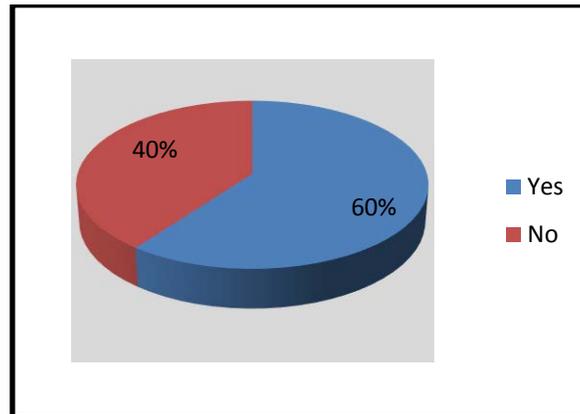


**Figure 4. 4: Company proactivity about climate change adaptation**

#### 4.2.5 Effects of Climate Change on Business Operations

When asked their opinion regarding the effects of climate change on business, the study found that most subjects 60.19% (N=65) disagreed to this idea, while 40.74% (N=44) supported the idea. The Standard Error is 11(**Figure 4.5**).

When asked how climate change affects business, this study found that there were slightly above half of the respondents that stated various ways by business is affected, including supply and demand of services and products, availability of energy and consumption, business operation, to name but a few. This is confirmed by the following responses:



**Figure 4. 5: Effects of climate change on business operations**

Participant 5 *“WE USE THE TECHNOLOGY AND EQUIPEMNTS THROUGH POWER SUPPLIED BY ENERGU COMPANY BUT WE ARE SLOWLY SWITCHING OUR NEED FOR POWER THROUGH SOLAR ENERGY”*.

Participant 6 *“it does not directly affect our business but indirectly affects us as our customers will be directly impacted which means they'll have less money to do business with us”*.

Participant 23 *“Extremely. Storms, tornadoes, torrential rain, very low or very high temperatures, forcing the company to adapt to handling all the logistics”*.

Slightly less than half of them agreed that climate change does affect business threats or opportunities in various ways as confirmed by the following responses:

Participant 9 *“Crops either coming in too late or too early.”*

Participant 21 *“ENERGY PRICES ARE HIGH, CONSUMPTION OF POWER IS MORE, DATA CENTRES NEED LOTS OF POWER”*

Participant 50 *“Could affect transport and the collection of raw materials”*

On the other hand, slightly less than half of the respondents stated that it does not affect business as stated below:

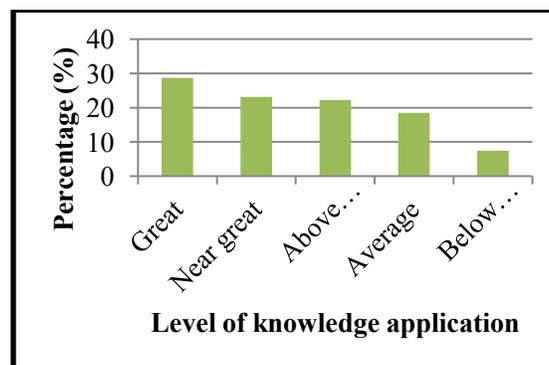
Participant 25 “*THERE ARE NO EFFECTS BECAUSE THERE IS NO SUCH THING AS CLIMATE CHANGE.*”

Participant 39 “*it does not affect my organization in any way.*”

Participant 66 “*It does not affect my business; my business runs on Internet.*”

#### 4.2.6 Application of Climate Change Knowledge

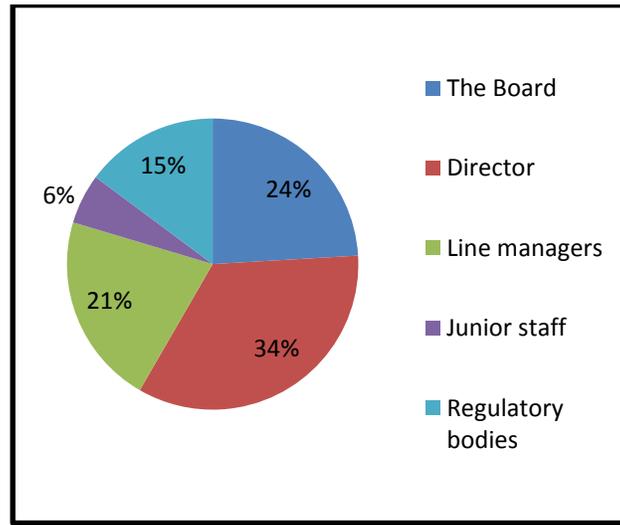
Regarding the extent to which climate change knowledge is applied in business activities, the study found that most respondents 28.70% (N=31) stated that it was applied above average, then near great at 23.1% (N=25), average at 22.22% (N=24), great at 18.52% (N=20), and below average at 7.41% (N=8). The Standard Error of 3.829 and Sample Variance of 73.3 (**Figure 4.6**).



**Figure 4. 6: Application of climate change knowledge**

#### 4.2.7 In-Charge of Climate Change Awareness and its Effects.

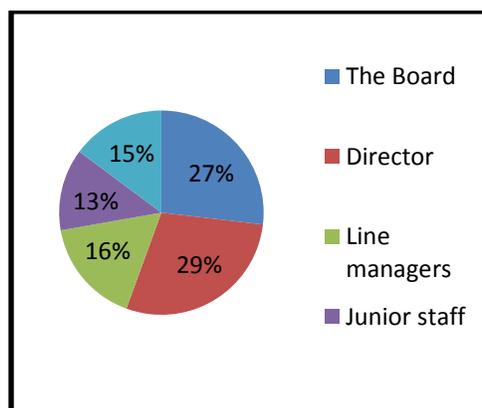
This study showed that climate change awareness and its effects on business activities in most organizations 34% (N=37) was regulated by the director, then the Board at 24% (N=26), line managers at 21% (N=23), regulatory bodies at 15% (N=16), and junior staff at 6% (N=6). The Standard Error is 5.163 (**Figure 4.7**).



**Figure 4. 7: In-charge of climate change awareness and its effects.**

#### 4.2.8 Target Agent for Knowledge of Climate Change Effects

When asked who should know the climate change effects on business activities, most respondents 29% (N= 31) indicated that it was the director, followed by the board at 27% (N= 29), line managers at 16% (N= 18), regulatory bodies at 15% (N= 16), and junior staff at 13% (N=14). The Standard Error is 3.501 (**Figure 4.8**).



**Figure 4. 8: Target agent for knowledge of climate change effects**

#### 4.2.9 Gap in Climate Change Knowledge

When asked whether there was knowledge gap in climate change, majority of the respondents 81% (N=88) disagreed to it while only a few of them 19% (N=20) acknowledged the gap. The Standard Error is 34 (Figure 4.9).

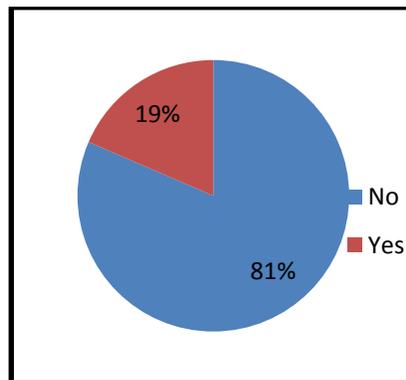


Figure 4. 9: Gap in climate change knowledge

#### 4.2.10 Barriers to Climate Change Communication

Regarding the barriers to communication, there were slightly more than half of the respondents who acknowledged the presence climate change communication barriers as confirmed by the following responses:

*Participant 1 “everyone doesn't understand the concept”.*

*Participant 24 “It's not a serious topic yet in most of the business.”*

*Participant 39 “no policies to make things better, bureaucracy”.*

On the other hand, slightly more than one third of the participants disagreed that there was communication barrier to climate change. This is confirmed by the following responses:

*Participant 25 “THERE ARE NO BARRIERS--THERE IS NO SUCH THING AS CLIMATE CHANGE”.*

*Participant 37 “No barriers as of now.”*

*Participant 52 “nothing but must be careful”.*

When asked to identify specific barriers to communication, about three quarters of the respondents acknowledged the presence of issues such as lack of awareness, lack of knowledge sharing, and direct business impact, among others. This is confirmed below as follows:

*Participant 1 “Not everyone is aware of the impact they are making on climate and how they can improve it.”*

*Participant 12 “Junior level staff are not that much knowledgeable about climate effect.”*

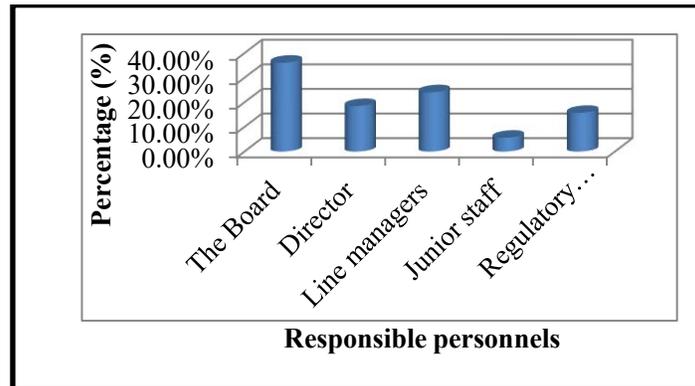
About one quarter of the participants disagreed that there was communication barrier to climate change. This is confirmed by the following responses:

*Participant 2 “THE FACT THAT THERE IS NO SUCH THING AS CLIMATE CHANGE”.*

*Participant 12 “Junior staff isn't apprised the way they should”.*

#### **4.2.11 In-Charge for Risks and Opportunities**

When asked about those responsible for climate change risk identification, it was found that most respondents 36.1% (N=39) stated that it was the board, then line managers at 24.1% (N=26), director at 18.5% (N=20), regulatory bodies at 15.7% (N=17) and junior staff at 5.6% (N=6). The Standard Error is 5.428 and Sample Variance of 147.3 (**Figure 4.10**).



**Figure 4. 10: In-charge for risks and opportunities**

#### 4.2.12 Identification Methods for Risks and Opportunities

When asked about the methods used to identify risks and opportunities associated with climate change, the study found that slightly more than one quarter of the subjects were versed in this area as confirmed by the following responses:

Participant 11 *“Any problems are reported in written report”*.

Participant 14 *“Monitor the globalization and also climate changes and pollution”*

Participant 42 *“Daily assessment of demand”*

On the other hand, slightly less than a half of the participants did not have any idea in the area. This is confirmed by the following responses:

Participant 25 *“THERE ARE NO RISKS AND OPPORTUNITIES ASSOCIATED WITH CLMATE CHANGE SINCE THERE IS NO SUCH THING”*.

Participant 68 *“none so far”*

Participant 100 *“I don't know exactly.”*

#### 4.2.13 Response Measures for Addressing Climate Change

This study found that there were slightly less than half of the participants were aware of the response measures methods employed in addressing climate change issues as confirmed by the following responses:

Participant 9 *“We've cut down on our carbon emissions and grow crops more responsibly.”*

Participant 21 *“WE HAVE APPLIED FOR SOLAR ROOF TOP POWER GENERATION FOR ALL OUR OFFICES, WIND POWER IS BEEN INTRODUCED IN HQ”*

Participant 84 *“Research and profound analysis of the effects both within the company and externally. Taking prevention, correction and, above all, to adapt as: air conditioning production line and working environments; adaptation of the physical structure of the company to withstand climate variations; etc...”*

On the other hand, about one quarter of the subjects did not have any idea in this area.

This is confirmed by the following responses:

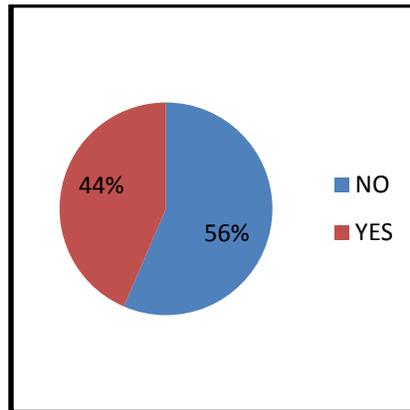
Participant 50 *“We don't have any at the moment”*

Participant 33 *“uncertain of that”*

Participant 106 *“I think that my company doesn't care about it”.*

#### 4.2.14 Company's Climate Change Adaptation Plan

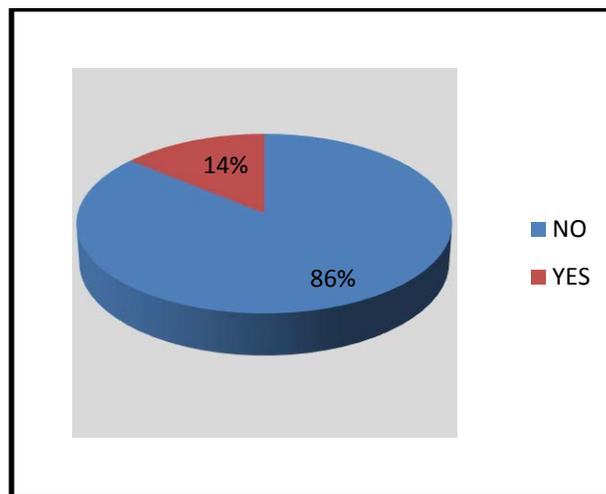
The results showed that most companies 56% (N=61) did not have the climate change adaptation plan versus 44% (N= 47) that have the plan. The Standard Error is 7 (**Figure 4.11**).



**Figure 4. 11: Company's climate change adaptation plan**

#### **4.2.15 External Pressure in Climate Change Adaptation Implementation**

When asked whether the company face external pressure to implement climate change adaptation, 56% (N=93) of the subjects confirmed their company did versus 44% (N=15) who did not. The Standard Error is 36 (**Figure 4.12**). Among the sources of pressure include peoples, customer service barriers, quality service, and regional culture.



**Figure 4. 12: External pressures of implementing climate change adaptation**

#### 4.2.16 Sustainability Strategy for Climate Change

The results showed that most companies 72.22% (N= 78) did not have the sustainability strategy for climate change versus 27.78% (N=30) who confirmed to have. The Standard Error is 24 (**Figure 4.13**). Moreover, it was found that half of the respondents were aware of the sustainability strategies as confirmed by the following responses:

Participant 2 “*WE WOULD BE SWITCHING TO LED LIGHTS, SOLAR POWER, ENERGY EFFICIENT DEVICES AND EQUIPMENTS IN DATA CENTRES ARE BEEN INTRODUCED*”.

Participant 14 “*We are constantly monitoring the climate change not only the planet but also the regions where we have branches. We perspectives and anticipate changes.*”

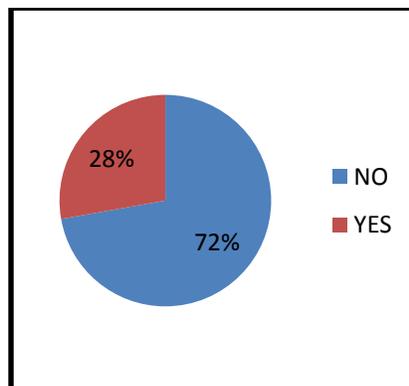
Participant 15 “*Living within environmental limits, protecting our natural resources.*”

On the other hand, one third of the subjects appeared not to have any idea on the sustainability strategies as confirmed by the following responses:

Participant 5 “*n/a*”.

Participant 9 “*yes, we are seriously looking in by engaging more people*”.

Participant 12 “*plants*”.



**Figure 4. 13: Sustainability strategy for climate change**

#### 4.2.17 Effects of Adaptation on Clients and Employees

When asked about the effects of adaptation on clients and employees, the study showed that slightly more than half of the respondents stated the negative or positive effects. This is confirmed below by the following responses:

Participant 12 *“adaption will make more useful benefit for clients and employees”*.

Participant 19 *“LACK OF EMPLOYEES DUE TO ILLNESS, POWER DISRUPTION”*.

Participant 72 *“it shouldn't affect clients but employees should modify their method of work”*.

However, slightly more than one third of the respondents disagreed with the idea as stated below:

Participant 11 *“It has no effect”*.

Participant 25 *“THERE IS NO ADAPTATION EFFECT SINCE THERE IS NO SUCH THING AS CLIMATE CHANGE”*.

Participant 81 *“doesn't affect really”*.

#### 4.2.18 Knowledge Sharing on Mitigation and Adaptation

When asked whether their company shares knowledge on mitigation and adaptation with partners, the study found that there were slightly more than half of the companies that did not allow knowledge sharing as confirmed by the following participants:

Participant 25 *“NO--SINCE THERE IS NO KNOWLEDGE OF IT SINCE IT DOES NOT EXIST”*.

Participant 66 *“No, it is confidential.”*

Participant 95 *“We don't.”*

By contrast, there were slightly more than one third of the companies that shared their knowledge with partners as stated below:

Participant 9 *“Yes but how the implement them is elementary at the very least.”*

Participant 21 *“YES WE ENCOURAGE THEM TO USE OF SOLAR LIGHTS, POWER GENERATION THROUGH SOLAR ROOF TOP PANELS”.*

Participant 84 *“It is very significant because we have constant improvements on what reactions we must make on the most varied circumstances”.*

#### **4.2.19 Engagement of Suppliers in Mitigation and Adaptation**

About half of the respondents stated that their companies engaged with suppliers on mitigation and adaptation of climate change related risks. This is confirmed by the following quotes:

Participant 9 *“We educate them properly.”*

Participant 14 *“Through bulletins and awareness campaigns.”*

Participant 69 *“buying from partners whose products come from sustainable sources”.*

On the other hand, there were slightly more than one third of the companies that did not engage their suppliers as confirmed by the following respondents:

Participant 6 *“we haven't engaged yet”.*

Participant 29 *“No engagement.”*

Participant 56 *“Not necessary to involve suppliers”.*

## CHAPTER 5: CONCLUSION AND FUTURE STUDIES

### 5.1 Conclusion

In the first part of the study, the NRBV concept was investigated using MSCI Global Indexes: Climate Index, Environment Index, Pollution Prevention Index, Global Clean Technology, and Sustainability Index. These indexes rank companies from all parts of the world to assist investors and clients to integrate ESG factors into their processes of investment decisions. Companies listed in two indexes for two years in a row were assumed to be proactive in pursuing climate change strategies. Other companies listed in the same industries within the same country were assumed to be less proactive in pursuing climate change strategies.

ROA and AST financial performance parameters, for both proactive and less proactive companies, have been collected for the years 2009-2014. These companies were grouped into five samples to perform the analysis. One sample to represent the United States proactive and less proactive companies, the second for the Japanese companies, the third for companies in selected European countries (Belgium, Denmark, France, Germany, Italy, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom), fourth sample for the Asian countries (China, Hong Kong, India, South Korea, Taiwan and Turkey), and the fifth sample is the Global group that consists all companies listed in the first four samples. Classifying the data into these samples allowed the possibility to analyze the differences between these groups toward climate change strategies applied by companies in different parts of the world.

The summary of findings in Table 5.1 for the first part of the study, reveals that in the United States sample, the proactive MNC's financial parameter (mean AST) was significantly lower than the less proactive MNC's. While, in the Japanese, Europe, and the Global group samples of the proactive MNC's financial parameter (mean ROA) was significantly higher than

less proactive MNCs. Remaining Asian group sample show, no significant differences in mean ROA or the mean AST across proactive and less proactive MNC'S.

**Table 5. 1: Summary of Findings**

Seq.	Sample	Countries		
		Represented in the sample	Proactive MNCs	Less-Proactive MNCs
1	US sample	United State	---	AST
2	Japan sample	Japan	ROA	---
3	EU sample	Belgium, Denmark, France, Germany, Italy, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom	ROA	---
4	Asian sample	China, Hong Kong, India, South Korea, Taiwan and Turkey	No Significant Differences	
5	Global sample	All the above	ROA	---

In this study, by using ROA as a financial performance parameter, we can accept the hypothesis, "*Firms recognized for their proactive approaches in pursuing climate change strategies will have their financial performance at higher levels when compared to firms with less proactive strategies*". Especially for Japan and European companies.

Climate change strategies followed by the United states and Asian companies were not efficient. The government-based entities in these countries made poor decisions and failed to implement strategies to foster the private sectors to adapt to climate changes. The private sectors have a large vacuum to do their business with less concerns about climate change adaptations because it's cheaper (short term). Japan and European countries were more concerned about climate change.

Furthermore, this part of the study contributes to literature by testing the hypothesis of comparing the performance of the proactive firms that are well recognized for their proactive approaches in pursuing climate change strategies compared to firms with less proactive strategies using mean ROA and mean AST as measures of financial performance.

According to the IPCC (2011), the proof that climate conditions are changing in modern times are unmistakable, and in its report released in 2011, the climate changes are costly to the business entities and government organizations in the recent past. Nevertheless, the report established that Canada spent an estimate of \$5 billion alone in 2010 after the climate changes hit the country. Moreover, findings from the report indicate this is just the beginning and that climate conditions are going to cause more problems in the future. Therefore, modern scholars need to research and report whether adapting to climate change elicits changes for business companies and the government-based entities. Currently, in anticipating and responding to the risks associated with business environment is considered to be a usual activity by numerous business firms, corporations, and investors.

It is established that adaptation decisions are dealt upon by individuals or firms. In this regard, the private sector makes decisions that are benevolent for their stakeholders, for example, the case of insulating their respective buildings. Whereas the insulation shields the occupants of the premises from adverse weather conditions (it should be noted that they bear the costs of for the initiated new insulation). However, when the benefits override the costs, the occupants are forced to invest in a more superior insulation. When this option fails, the occupants do not seek adaptation measures. There is no need for government intervention in the form of building regulation or rehabilitation programs.

Governments have to help in improving their citizens' knowledge of climate change. Information about climate change and technical adaptation measures are typical public goods: the cost of generating the information has to be incurred once, whereas the information can be used at no additional costs. Without government intervention, little information would be generated. Therefore, financing basic research in this area is one of the fundamental tasks for a central government.

The second part of the study assessed a total of 108 companies from countries like USA, UK, Brazil, and India on impact of climate change on business operations and the sustainability strategies they employ to cope with climate change risks. The findings showed that most of the study participants were middle level managers at 54.63%, then owners/senior level managers at 44.44%, while the specialists level were 0.93%. These findings confirm the fact that key decision makers such as the executives, managers and other lower management agents have a critical role to play in promoting pro-environmental behavior in an organization (Linnenluecke, Griffiths, and Winn, 2013). Previous reports highlighted the importance of internal champions to identify and communicate climate risks and opportunities as well as support adaptation decision-making (Caring for Climate survey UN Global Compact, 2011). However, there is little evidence on the role of these decision makers in response to climate change and their influence on company action (Linnenluecke, Griffiths, and Winn, 2013).

In terms company industry, this part of the study found that most companies 21% were engaged in manufacturing compared to agriculture and airlines, aerospace and defense industries at 2.8% each. Other sector companies included electronics at 12.03%, construction and retail and consumer products at 11.11% each, automotive at 6.5%, food and beverages at 5.5%, and others

(government, software, financial services, education, transport, Insurance, IT, chemicals, local government, hotel, engineering, wholesale, telecommunication, legal services, School and computers) at 26.9%. Banking sector was the major multinational sector at 35 %, then Oil & gas producers at 30%, beverage, chemicals and IT sector at 20%, finally life insurance at 10% and mining at 5%.

Based on the country of operation, the results showed that most companies operated globally in all the continents. However, most of these companies 44%, operated in the USA, then Europe at 27%, Asia at 24%, Australia at 3%, and Africa at 1%. Only 1% of the responses accounted for companies that operated worldwide.

It was found that there were slightly above half of the subjects who were awareness of on climate change. The rest remaining subjects did not have any idea on climate change or were not sure about the concept. This finding supported earlier report that a large proportion of investors, policy makers and other stakeholders in the contemporary world appear to be uncertain of what the exact climate changes could be that could result in serious loses as well as damages to the operations of businesses, economic grow, or developments within a region (Epstein & Rejc, 2014). It is well established that the employment and skills related knowledge and awareness implications of climate change together with related policies are limited. This explains partly as to why decisions on climate policies are rarely assessed from the standpoint of employment. Therefore, there is need for research aimed at identifying the scale as well as nature with regard to employment transformation with resultant shift towards more sustainable production and consumption patterns.

Similarly, it was found that about three quarter of the subjects had no idea on the difference between the two climate change strategies, a quarter of them had some knowledge on the difference while only about a tenth of them were well versed with the differences in the two strategies. Previous studies have highlighted the need to clarity on the meaning adaptation in the context of MNCs with a view to avoid confusion across the businesses sector. Most importantly, the distinctions with regard to adaptation and mitigation are much necessary in corporate context (United Nations Global Compact and United Nations Environment Programme (UNEP), 2012). As reported by Natural Resources Canada, there were 40% of businesses that claimed to be engaged in adaptation measures when actually 73% of them meant mitigation actions versus 18% that engaged in adaptation actions. Moreover, the synergies between the two strategies were largely overlooked (NRTEE, 2012).

When asked about how proactive their companies were, the study found that majority of the subjects 45.37% agreed that their companies were proactive with regard to climate change adaptation compared to 1.85% that strongly disagreed. Other findings included 28.70% who were strongly in agreed, 14.81% were uncertain and 10.19% disagreed. NRTEE (2012) found that, proactive business stances face perceived uncertainty in terms of the magnitude and monitoring impacts as well as lack of policy plus regulatory incentives.

When asked about the effects of climate change on business, 60.19% argued that climate change does not affect business while 40.74% supported the idea. These findings highlight the gap in climate change awareness among MNCs. According to the findings, climate change could affect business operations in various ways, including supply and demand of services and products, availability of energy and consumption, business operation. As a matter fact, the effect

of climate change on business is well documented. Similarly, there were slightly above half of the respondents that stated various ways by business is affected, including lack of employees due to illness, power disruption, working approach of employees, just but a few. Indeed, climate change significantly impacts human and natural systems by exposing individuals and businesses, as well as to infrastructure, assets plus economies to greater risks (IPCC, 2014a). More specifically, Sussman and Freed (2008) categorize climate change related risks into core operational risks, value chain-related risks and broader change economic and infrastructural related risks. Moreover, climate change policies regarding mitigation and adaptation are more than likely to affect business operations.

Notably, Hoffman and Woody (2008) highlighted the need for businesses to approach climate change as a market-related issue given that it affects prices together with availability of energy, among others, with eventual ripple effect in the entire value chain. Kolk and Pinkse (2007) argued that businesses operations are under constraints of more vigorous, risky and climate change-prone environment in which institutional and resource-based as well as supply chain plus stakeholder views play significant role in characterizing and understanding strategic responses to sustainability issues.

This study found that 28.70% of the respondents stated that climate change knowledge was applied above average in business activities, then near great at 24.07%, average at 22.22%, great at 18.52%, and below average at 7.41%. Similarly, the study found that 81% the of the respondents disagreed that their companies experienced knowledge gap in climate change, while only a few of them 19% acknowledged the gap. There is a possibility that some reported

activities partly group strategy and partly local context, but not covered within the entire company report.

When asked about the target population for knowledge on effects of climate change on business activities, 29% of the most respondents indicated that it was the director, followed by the board at 27%, line managers at 16%, regulatory bodies at 15%, and junior staff at 13%. Knowledge on climate change should target all stakeholders. For instance, Sharma and Vredenburg (1998) noted that oil companies employ more proactive environmental strategies with integrated product stewardship elements and greater stakeholder capabilities. These could range from company owners, employees, overall management, researchers, suppliers, policy makers, practitioners, among others. For instance, it well recognized that incorporating climate change in suppliers' selection and engagement in the implementation of carbon management strategies aimed to reduce GHG emissions within the supply chains.

This study found that there were slightly more than half of the respondents who acknowledged the presence climate change communication barriers as. By contrast, slightly more than one third of the participants disagreed that there. Moreover, slightly more than one quarter of the subjects were aware of methods for identifying risks and opportunities of climate change such as written reports, monitoring climate changes and pollution, and assessment of demands and supplies. Slightly less than a half of the participants did not have any idea in the area. Reporting is one of the methods widely used by companies to identify climate change related risks. However, studies have shown that this method reveal slightly low adaptation disclosure rates (Linnenluecke, Birt, and Griffiths, 2015). This is to say that most activity risks are not captured in the overall disclosure since adaptation largely occurs in local contexts.

Slightly less than half of the participants were aware of the response measures methods employed in addressing climate change issues, of which include reducing carbon emissions, growing crops more responsibly, use of solar and wind systems for power, air conditioning in working environments, among others. On the other hand, about one quarter of the subjects did not have any idea in this area. Recent research classified adaptation processes into no adaptation actions to no regret or rather 'soft' adaptation measures, and the 'hard' adaptation measures implementation (Agrawala et al., 2011). That is, adaptation responses range from indifferent to 'wait and see' and active.

The results showed that most companies 56% did not have the climate change adaptation plan versus 44% that have the plan. These findings are within the range that was reported by Kolk and Pinkse (2005) that majority (67%) of corporations operate between little and no specific measures of climate in place to early stages during which they considered implementing a more comprehensive as well as concrete climate strategy. On the other hand, only 5% of them were exploring while entering new markets/opportunities, partnerships included. This suggests that most MNCs operate on the basis of cautious or emergent adaptive responses with strong internal focus.

Closely related to the foregoing, this study found that most companies 72.22% did not have the sustainability strategy for climate change versus 27.78% who confirmed to have. This finding is inconsistent with previous report by Hart (1995) that, there were no examples (to his knowledge by mid-1990s) of large manufacturing firms committed to a vision of sustainable development. Among the sustainability strategies stated by half of the respondents who were aware of the sustainability strategies use of led lights, solar power, energy efficient devices,

regular monitoring of climate change, living within environmental limits, protection of natural resources, among others. However, one third of the subjects appeared not to have any idea on the sustainability strategies.

When asked whether the company face external pressure to implement climate change adaptation, 56% of the subjects confirmed their company did versus 44% who did not. Among the sources of pressure include peoples, customer service barriers, quality service, and regional culture. Previous studies identified external quality related factors such regulatory and legal factors that influence the engagement of private sector through encouragement or demand of businesses adaptation action. Consistent to this is a study by Arnell and Delaney (2006) and Wilby and Vaughan (2011) that revealed the significant role played by the regulatory environment to encourage adaptation action. Similarly, stakeholders like the insurers and banks to investors, regulators and civil society organizations to governments and customers are likely to pressurize companies towards addressing risks related to climate change (Crawford and Seidel, 2013; NRTEE, 2012). Collectively, these factors serve as predictors for climate change adaptation in private sector and thereby influence businesses investment decisions.

When asked whether their company shares knowledge on mitigation and adaptation with partners, the study found that slightly more than one third of the companies shared their knowledge with partners compared to slightly more than half of the companies that did not allow knowledge sharing. This confirms previous report by Linnenluecke, Birt, and Griffiths (2015) that disclosure of voluntary adaptation is not yet high on the corporate agenda, and that private sector had just started on disclosure of specific adaptation schemes. Generally, sharing of knowledge, lessons learned as well as good practices both from past or current adaptation

activities among stakeholders is essential for future adaptation planning as well as implementation of practices.

About half of the respondents stated that their companies engaged with suppliers on mitigation and adaptation of climate change related risks through various ways such as educating the suppliers through bulletins and awareness campaigns. However, it should be noted that risks and uncertainty of climate impacts can inhibit effective engagement in private sector. In general, engagement of stakeholders in planning and implementation of adaptation promote a democratic as well as transparent approach for choosing implementation actions and ensuring buy-in or maximum implementation support.

## **5.2 Future Studies**

In light of the current findings, the researcher recommends that future studies assess the need for more of empirical testing of the NRBV concept; government entities decisions to enforce the private sectors to adapt to climate changes; and the role of decision makers in response to climate change and their influence on company's action in order to facilitate adaptation decision-making. Given that about three quarter of the subjects had no idea on the difference between climate change adaptation and mitigation, this study recommends the need for future research to clarify on the meaning adaptation in the context of MNCs so as to avoid confusion across the businesses sector. Although climate change significantly affects business and human life in general, most companies were not implementing their response plan. This calls for future research to explore on factors contributing to this practice in order to facilitate effective climate change management.

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**APPENDIX I: ASSESSMENT OF IMPACT OF CLIMATE CHANGE ON BUSINESS  
AND THE SUSTAINABILITY STRATEGIES.**

My name is..... A doctorate student from .....

I am doing a research on impact of climate change on multinational corporations (MNCs) and the sustainability strategies they employ to cope with climate change risks. I therefore request you to participate in the interview related to the topic to ensure a successful research process. If you agree, you will be asked questions about yourself and on perception towards climate change, knowledge on adaptation and mitigation, impact of climate change on business and investments, threats and opportunities associated with climate change, sustainability strategies and existing gaps on climate change strategies. This will last for about 20 minutes to complete the interview. The interviewer will explain all the details regarding the study and any related question will be clarified. The information you give will be kept confidential. Your participation is important since it will help MNCs to make evidence-based policy formulation and strategic planning on implementing effective climate change sustainability strategies.

**Company Code:** .....

**Date:** .....

**Section A: Demographic characteristics** (Tick where appropriate)

1. Sex

i) Male ii) Female

2. Age .....

16-21 ii) 22-28 ii) 29-35 iv) 36-44 v) 45 and above

**Section B: Awareness of climate change**

1. How do you understand the concept of climate change?
2. What do you know about the difference between climate change adaptation and mitigation?
3. In your opinion, would you say your company proactive about climate change adaptation?  
i) Strongly agree ii) Agree iii) Uncertain iv) Disagree v) Strongly disagree.

**Section C: Knowledge and communication of climate change**

4. In your opinion, does climate change affect your business operations?  
i) Yes ii) No
5. If yes, in what ways?
6. In what ways does climate change affect your business threats or opportunities?
7. On a scale of 1 -5, how is the knowledge of climate change applied in the business activities?  
i) Great ii) Near great iii) Above average iv) Average v) Below average
8. Who is responsible for climate change awareness and its effects on activities of your company?  
i) The Board ii) Director iii) Line managers iv) Junior staff v) Regulatory bodies
9. In your opinion, who should know the climate change effects on business activities?  
i) The Board ii) Director iii) Line managers iv) Junior staff v) Regulatory bodies
10. Is there any gap in climate change knowledge in the company?  
i) Yes ii) No
11. If Yes, what is it?
12. What are the barriers to climate change communication?

**Section D: Risks and opportunities**

13. Who is responsible for climate change risk identification in your company?

i) The Board ii) Director iii) Line managers iv) Junior staff v) Regulatory bodies

13. What methods are used to identify risks and opportunities associated with climate change in your company?

14. What are the response measures used by your company to address climate change?

15. Does the company have climate change adaptation plan?

i) Yes ii) No

16. Does the company face any external pressure to implement climate change adaptation?

i) Yes ii) No

17. If Yes, by who, what and when?

**Section E: Sustainability strategy**

18. Does your company have a sustainability strategy for climate change?

i) Yes ii) No

19. If Yes, please explain more.

20. In your opinion, how does adaptation affect your clients and employees?

21. Does your company share knowledge with your partners on mitigation and adaptation of climate change related risks?

22. How does your company engage its suppliers in mitigation and adaptation of climate change related risks?