



Greenhouse gas mitigation in emerging economies: market-based versus command-and-control strategies

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Abstract

This study was designed to establish which mitigation approach to climate change business in an emerging market would prefer. Since greenhouse gas emissions are a collective concern, it is expected emerging economies play their part in tackling the issue of global warming regardless in spite of concerns on economic growth.

The research was a quantitative study designed to determine business' perception of various mitigation measures. The study was conducted through an online platform and data was gathered from 33 JSE listed companies. Respondents had to be individuals responsible for environmental policy or similar.

The study showed that the surveyed organisations were in favour of the emission trading approach as opposed to the carbon tax and the command-and-control strategy. In addition, the research revealed that companies are increasingly reporting on their carbon footprint and have detailed policies with regard to greenhouse gas reduction.

Keywords

Greenhouse gas emissions, cap-and-trade, carbon tax, command-and-control

Declaration

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

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CHAPTER 1: INTRODUCTION TO THE RESEARCH PROBLEM

1.1 Research title

Greenhouse gas mitigation in emerging economies: market-based versus command-and-control strategies

1.2 Research problem

Climate change is a topical issue since it affects our very livelihood and is a threat to future generations. Recent years have seen global air and ocean temperatures rising, oceans acidifying and ice caps melting (Storm, 2009). In addition, the sea level is rising and natural disasters are occurring more frequently and more intensely (Storm 2009, Tol 2009). This is also emphasized by Fujino, *et al.* (2008) with the authors stating that the consequences of increases in temperature carry profound risks such as increased drought and extreme rainfall events, with severe consequences for society.

Not only does climate change impact negatively on the earth's ecosystems, research has also shown that extreme weather events are associated with adverse human health, such as heat-related mortality and morbidity during heat waves; injuries from extreme weather events; injuries and death from flooding and the re-emergence of communicable diseases such as hantavirus associated haemorrhagic fever, West Nile fever, or Lyme disease (Semenza, Ploubidis, & George, 2011).

It is well documented that human behaviour has impacted negatively on the environment (Tol 2009, Semenza *et al.*, 2011). Furthermore, Minqi (2009) argues that the activities of material exchange between human beings and the earth's ecological system have overwhelmed the ecological system's natural operative capacity.

Humankind is now confronted with a complex global environmental crisis that threatens to undermine the basis of civilization and the survival of the human species (Minqi, 2009). As such, inertia to curb today's greenhouse gas emissions will eventually result in catastrophic consequences for mankind (Tol, 2009).

It is therefore imperative that bold steps be undertaken to alleviate the effect of climate change. This requires a concerted effort from all stakeholders including governments, businesses and the population at large.

Two main strategies have been identified in response to dealing with greenhouse gas emissions. These are adaptation and mitigation (Semenza *et al.*, 2011). While adaptation entails adjustments of environmental or social settings in response to climatic events, mitigation is about reducing greenhouse gas emissions in order to minimize the extent of global warming (Semenza *et al.*, 2011). Mitigation strategies can take the form of market-based approaches or be implemented through command-and-control methods, each with its pros and cons (Metcalf 2009, Semenza *et al.* 2011). While the U.S government has historically favoured command-and-control approaches through legislation, the European Union has heavily relied on a market-based approach through its Emission Trading scheme adapted from the Kyoto Protocol (Metcalf 2009, Stewart 2010).

The South African government understands the importance of mitigating the effect of greenhouse gas emissions. The country is a signatory to the Kyoto Protocol and has committed to a reduction target, which has resulted in the publication of a white paper in November 2011. However, in the absence of a clear regulatory framework or policies to deal with climate change and taking into account the fact that South Africa is an emerging economy, it is a challenge to compel business to espouse government's vision of a low carbon future. The issue can be summed up through the following question: which mitigating approach between market-based actions or command-and-control model would best serve businesses operating in a developing economy?

1.3 Research objectives

The overarching objective of the study is to determine from a business perspective which mechanism between market-based and command-and-control approaches is most appropriate in the mitigation of greenhouse gas in the context of an emerging economy.

1.4 Motivation for the research

In light of the negative consequences of global warming, the drive to a low-carbon, energy-efficient economy is imperative. While historically the developed countries have been responsible for most of the greenhouse gases emissions, recent years have seen emerging markets now account for about half of the world's total carbon dioxide emissions (Minqi, 2009). Minqi (2009) recognises that without substantial emissions reductions by big semi-peripheral states such as Brazil, China, India, Mexico and South Africa, there is virtually no hope for global climate stabilization to be achieved.

South Africa being a signatory to the Kyoto Protocol implies that government's commitment to greenhouse gas reduction has to be reflected through tangible action by the population at large and business in particular.

Recent years have seen various mitigation measures being implemented in the U.S. and in Europe in response to the challenge of greenhouse gas emissions. Far from stating that these measures have been effective in addressing global warming, the issue is to ascertain which mitigation approach from a business perspective is best suited to an emerging market.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The following chapter reviews the current literature on society's response to climate change in general, and business response to climate change in particular. Extensive research has already been conducted on the current impact of climate change on earth's ecosystem as well as the likely impact on future generations if the status quo remains (Fujino, *et al.*, 2008; Storm, 2009; Tol, 2009). Rather than focusing on the scientific evidence of climate change and its negative impact on our livelihood or the economics of climate change, this section aims at addressing the various actions which governments and businesses have undertaken in an attempt to curb greenhouse gas emissions.

As Knox-Hayes (2010) stated, climate change presents one of the most acute collective problems confronting governments and societies today. As such, countries around the world understood that a collective approach had to be adopted in order to address carbon emissions effectively. This materialised in the Kyoto Protocol which sought to set binding obligations on the industrialised countries to reduce their emissions of greenhouse gases (United Nations Framework Convention on Climate Change, 2012). The Kyoto Protocol is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC) which is an international environmental treaty aiming to achieve stabilisation of greenhouse gas concentrations in the atmosphere at acceptable levels (United Nations Framework Convention on Climate Change, 2012).

In spite of the challenges that followed the establishment of the Kyoto Protocol, it is widely acknowledged that it has created a basis for governments and policy makers in their quest to reduce greenhouse gas emissions (Goers, Wagner, & Wegmayr, 2010).

Crane & Landis (2010) have identified two broad ways for society to respond to climate change. These are through mitigation responses or actions that would reduce climate change and through adaptation responses, or actions dealing with the consequences of climate change.

Both mitigation and adaptation approaches are discussed in this chapter with specific emphasis on mitigation strategies which constitute the basis of the research at hand. The literature review will also delve into the advantages and shortcomings of these mitigation approaches. Furthermore, the literature critically reviews climate change response in emerging economies, especially business response to climate change in South Africa.

2.2 Adaptation as a response to climate change

Semenza *et al.* (2011) argue that adaptation requires adjustments of environmental or social settings in response to past, current or anticipated climatic events and their impacts in order to moderate their consequences. As such, adaptation practices aim to lessen the impacts of increased atmospheric greenhouse gas concentrations (Ayers & Forsyth, 2009).

Until recently, adaptation was a controversial topic in climate change policy debates, with many arguing that too much attention to adaptation could detract from mitigation efforts for the global good. However, the need for greater and more rapid impacts of climate change has compelled governments and policy makers to consider adaptation as a crucial supplement to mitigation efforts (Ayers & Forsyth, 2009).

Semenza *et al.* (2011) make a distinction between autonomous or spontaneous adaptation and anticipatory or proactive adaptation. While spontaneous adaptation is defined as a response to climate driven changes in natural systems and is usually the result of reactive responses to current climate impacts, anticipatory adaptation is initiated prior to climate change impacts are observed. It is based on scientific information about projected impacts and is usually executed by government agencies (Semenza *et al.*, 2011).

A report published by The Center for Climate and Energy Solutions (C2ES) has highlighted some of the adaptation measures that business has undertaken in response to climate change. These measures include seed research design to develop crops that are resistant to extreme weather events or partnering with various stakeholder groups to develop sustainable agriculture programs that focus on ways to improve farming efficiency and minimize water use (The Center for Climate and Energy Solutions, 2008).

However, the report argues that adaptation measures by business to address the potential risks posed by the physical effects of climate change have in general lagged behind consideration of the financial risks associated with mitigation. In support to these findings, a very recent report by The Carbon Disclosure Project looking into climate change adaptation in the United Kingdom found that only 17% of the surveyed companies had a clear adaptation strategy integrated into their business strategy (The Carbon Disclosure Project, 2012).

While the literature shows that adaptation strategies have become increasingly relevant in the context of climate change response, an in-depth discussion of these strategies fall beyond the scope of this research. Nonetheless, it is very important to acknowledge that businesses understand that in the long run, mitigation strategies have to be coupled with adaptation measures in order to deal with the threat of climate change more effectively.

2.3 Mitigation as a response to climate change

Mitigation strategies are aimed at reducing greenhouse gas emissions in the atmosphere or at increasing the amount of greenhouse gas sinks intended to minimize the extent of global warming (Semenza *et al.*, 2011). These include actions or policies designed to promote energy conservation; switching to cleaner energy sources; or carbon sequestration through tropical reforestation (Semenza *et al.*, 2011).

In general, mitigation strategies can be classified as either market-based or based on a command-and-control approach (Metcalf, 2009). While the proponents of a market-based approach to mitigate carbon emissions argue that it provides an incentive for emitters to abate their emissions, antagonists have put forward the fact that a price on carbon emission will not necessarily compel businesses to change their behaviour. Instead, these antagonists believe that a more direct and coercive approach using command-and-control strategies is needed. The research at hand aims at providing further knowledge on which mechanism business considers to be best in curbing greenhouse gas emissions.

2.3.1 Market-based mitigation strategies

As stated by Shrum (2007), two market-based mechanisms that intend to internalise the costs of emitting greenhouse gas are the cap-and-trade system and carbon tax. Although there is much debate about the appropriateness of each of these strategies, the general agreement is that these mitigation approaches have shown to be effective at reducing pollution at a much lower cost than other methods (Shrum 2007, Storm 2009). Furthermore, Metcalf (2009) argues that market-based environmental mechanisms that put a price on greenhouse gas emissions provide the right incentive for business to reduce its carbon emission.

A market based approach ensures that all polluters, regardless of industrial sector, face the same marginal cost of abatement and provide the right incentive to shift the larger pollution reductions from firms or sectors with high marginal abatement costs to those with low marginal abatement costs (Metcalf, 2009).

2.3.1.1 The cap-and-trade system

Carbon trading as a policy response to climate change has been endorsed by international bodies such as the International Energy Agency, the International Monetary Fund, the World Bank, and the European Union through its Emission Trading System (Storm, 2009; Mastel, Kho, & Janzen, 2009). The system was developed in the 1980s to address the issue of acid rain and morphed into the current cap-and-trade scheme after being introduced into discussions of climate change during the Kyoto Protocol negotiations in the mid 1990s (Betsill & Hoffman, 2011).

In essence, the cap-and-trade system places a total cap on emissions of greenhouse gases. It is set up by a regulatory body which is responsible for the issuance of allowances to emitters that permit them to emit a certain quantity of pollution (Mastel, Kho, & Janzen, 2009; Shi-Ling & Elliot, 2009; Young, 2009). These allowances are tradable under the declining cap through auction, allocation, or a combination. Compliance is thus determined solely by whether the emitter has enough allowances to cover its emissions (Shi-Ling & Elliot, 2009).

As stated by Young (2009), the cap-and-trade system creates a market for emission rights where entities that need more permits to pollute have the opportunity to purchase additional units from those who pollute less. Shi-Ling & Elliot (2009) argue that economic theory predicts that the allowances will flow to their highest and best use to those emitters for whom emissions reduction would be the most costly.

They further state that the flow has the effect of concentrating emissions reductions among those for whom it would be cheapest, thereby minimizing overall industry compliance costs.

Advocates of the cap-and-trade system argue that not only does it facilitate a steady decline of carbon emissions; it also provides a financial incentive for businesses that are able to reduce their emissions beyond the baseline (Mastel, Kho, & Janzen, 2009). Indeed by lowering their emissions, businesses can profit financially since they have the opportunity to trade their excess capacity and get additional revenue.

Furthermore, Metcalf (2009) supported by Shi-Ling & Elliot (2009) argues that cap-and-trade programs have the potential to spur innovation. They state that imposing a cost on emissions should in theory induce emitters to undertake self-interested efforts to reduce their emissions at lower cost with new technology.

However, opponents to the system claim that a cap on emissions would inevitably lead to increases in the costs of energy since it represents an indirect pricing instrument which will eventually lead to increasing costs throughout the economy (Metcalf, 2009). Indeed Brady (2011) argues that the main purpose of cap and trade is to increase the price of carbon-based energy which should ultimately reduce carbon emissions. As such, cap-and-trade as a strategy threatens to impose substantial costs on individuals and businesses. Furthermore, Farber (2012) indicates that the system has the potential to penalise emitters who invested in earlier emissions reductions, while rewarding those who did not invest in such technology. It also thought that emission trading as a mitigation approach favours current emitters over new energy sources, which are often more efficient, emit less, and consequently may receive fewer allowances because their historic emissions are lower (Farber, 2012).

Despite these arguments, Storm (2009) claims that carbon trading as a policy is politically more acceptable to business and consumers. Furthermore, cap-and-trade systems have appealed to policymakers because they appear to offer greater certainty about the quantity of emissions but more importantly, they do not explicitly place a price on carbon emissions (Metcalf, 2009).

Interestingly, Stewart (2010) has found that some of the most aggressive and efficient carbon trading systems have been the ones introduced by private industries. The author argued that these voluntary emission trading initiatives were undertaken to create a good green public image in some cases and in others to foster efficiency and prepare for a future in which greenhouse gases would be regulated (Stewart, 2010).

2.3.1.2 The carbon tax system

Young (2009) defines carbon tax as “a tax on fuels that emit high levels of carbon dioxide” (p. 1379). Carbon tax is a fiscal policy that allows governments to determine a price for carbon emissions and tax entities according to their carbon dioxide emission. Indeed, a carbon tax sets the price of a unit of carbon dioxide emission and allows the quantity of carbon dioxide emissions to fluctuate instead of the price (PricewaterhouseCoopers, 2009).

Similarly to cap-and-trade programs, a carbon tax imposes a marginal cost on emissions and it is anticipated that the emitters that can most cheaply reduce emissions will do so (Shi-Ling & Elliot, 2009). However, unlike a cap-and-trade program which is essentially a quantity instrument, the carbon tax is a price instrument. It offers a degree of certainty for emitters that the price of emissions will stay at a particular level, while cap-and-trade programs attempt to set a particular maximum level of emissions (Shi-Ling & Elliot, 2009). Furthermore, carbon tax as a mitigation strategy is far easier and relatively quicker to implement and more importantly, it addresses emissions of carbon from every sector (Yale Environment 360, 2009).

As stated by Storm (2009), the Kyoto Protocol and the European Union's Emission Trading System have produced no obvious reductions in emissions. On the contrary, an increase in carbon dioxide concentrations in the past decade has been noticed and global climate conditions have become worse (Storm, 2009). Consequently, some quarters have lobbied for more stringent measures to be adopted to deal with greenhouse gas emissions. As such, a carbon tax is deemed more appropriate than the cap-and-trade system because of its perceived punitive nature. However, the main counter argument for the implementation of carbon tax is that businesses who can afford the tax will not change their behaviour but will simply pass the cost to consumers.

2.3.2 Command-and-control strategy

Shi-Ling & Elliot (2009) stated that greenhouse gas regulation could take a traditional form of environmental regulation generally referred to as command-and-control regulation. Command-and-control typically refers to the use of administrative standard as a baseline for controlling carbon emission (Shi-Ling & Elliot, 2009).

Command-and-control approaches have also been identified as non-market based solutions to greenhouse gas emissions (Shrum, 2007). They dictate the method of reaching a given goal, in this case a reduction in greenhouse gas emissions. These solutions impose mandates requiring certain practices, standards or products.

Shrum (2007) argues that while these policy tools intend to correct the problems associated with market failures, they bypass reliance on the market by choosing the solutions to the problem. Examples of command-and-control strategies include requirements to use best available technology or other specific technology mandates (Storm, 2009). They may also require a certain percentage of renewable energy production (Shrum, 2007).

These include mandates for renewable portfolio standards, vehicle standards, appliance standards, and building standards (Shrum, 2007).

Historically, the United States has used command-and-control regulatory approaches to control emissions (Avi-Yonah & Uhlmann 2009; Metcalf 2009). Currently, the most significant existing regulations for reduction of carbon emissions are the Corporate Average Fuel Efficiency standards which impose minimum mileage standards for motor vehicles sold in the United States (Metcalf, 2009). Other command-and-control approaches in the US sought to control greenhouse gas emissions by regulating emissions from fossil plants, oil refineries and by developing sources of clean energy (Meltzer & Sierra, 2011). In the U.K., the Climate Change Act which was enacted in 2008 became the first piece of domestic legislation worldwide to create mandatory targets for lowering emissions of greenhouse gases (Altman, 2009).

Although it may be necessary to compel businesses to reduce their carbon footprint through command-and-control strategies, economists generally agree that these strategies are more expensive and less efficient than market-based strategies (Shrum, 2007). In fact, findings from a study by climate change economists found that non-market policies could raise emissions reduction costs substantially (Shrum, 2007). Furthermore, the author quoting Fischer & Toman (1998) stated that regulatory mandates could raise demand for a certain product, which would allow the producer to sell the product at higher prices, resulting in a subsidy for the producer and higher costs for the consumer.

Goers, Wagner, & Wegmayr (2010) recognise that command and control instruments such as fixed standards over inputs, outputs, or technologies, are inadequate to obtain the desired reduction of emissions in cost-minimizing ways.

2.4 The mitigation challenge and the developing world

As stated by Mastel, Kho & Janzen (2009), there is scientific consensus that the release of greenhouse gases by human activity is the leading cause of global warming. Crane and Landis (2010) citing findings from the Intergovernmental

Panel for Climate Change (IPCC) indicate that the burning of fossil fuels such as coal, oil, and natural gas for power, transportation, and heating accounts for up to 91% of human-caused carbon dioxide emissions. Consequently, the causes of greenhouse gas emissions from fossil fuels and land use are intrinsically linked to economic development (Lewis, 2008). It is therefore not surprising that the developed world has traditionally been recognised as the main contributor in the release of carbon dioxide and other greenhouse gases into the atmosphere since the Industrial Revolution (Mastel *et al.*, 2009).

However, recent years have seen the contribution of emerging economies in greenhouse gas emissions increase. According to Princiotta (2009), emerging economies accounted for about 73% of the global growth in greenhouse gas emissions in 2004. Problems such as pollution and destruction of tropical rainforests in these markets have become major concerns as the rate of industrialization increases and the migration of population to the cities becomes more prominent (Balat, 2010). Historical evidence suggests that, as a country develops economically, it uses greater quantities of electrical power and experiences a significant growth in the number and use of motor vehicles and other transportation sources (Princiotta, 2009).

Emerging economies such as China and India, with a cumulative population of over 2.4 billion, are projected to continue their rapid economic expansion with commensurate pressure on the power generation and transportation sectors with the associated consequences on greenhouse gas emissions (Princiotta, 2009).

According to Dongsheng (2009), the International Energy Agency estimated that primary energy demand in China grew by 55% while Gross Domestic Product (GDP) increased by 57% between 2000 and 2005. Such increase in energy demand was driven by surging electricity demand and by the manufacture of metals, building materials and chemicals for infrastructure, consumer goods and export markets. As a consequence, emission of carbon dioxide grew on average by 10.6% during the same period (Dongsheng, 2009). Mastel *et al.* (2009) recognise that China has now surpassed the U.S. and is the world's leading emitter of greenhouse gases with other developing countries not far behind.

Although it is acknowledged that Africa has contributed least to greenhouse gas emissions, South Africa in contrast is a relatively significant contributor to global climate change. The country is the continent's worst offender in terms of greenhouse gas emission per capita from energy combustion (South Africa and Copenhagen: Editorial, 2009). In addition, South Africa is the world's 16th most electricity-intensive economy as a result of 70% of its primary energy and more than 90% of its electricity coming from coal (South Africa and Copenhagen: Editorial, 2009).

Further statistics indicate that in 2007, South Africa emitted 7,266 kg of carbon dioxide per capita which is more than three times that of most African countries. By comparison, the European Union emitted 7,917 kg of carbon dioxide in the same year, China 4,567 kg, Brazil 1,812 kg and India 1,179 kg (South Africa and Copenhagen: Editorial, 2009).

From the literature above, it is clear that for developing economies, the mitigation challenge is more about finding the right balance between the necessity to curb carbon emissions and economic growth.

In fact, an ideal solution would be the use of mitigation strategies that would spur growth and innovation. It has been shown in this chapter that both carbon trading as well as carbon tax could encourage businesses to innovate, although carbon tax is perceived to be punitive in nature.

2.5 Mitigation strategies in emerging markets

It is not surprising that efforts to curb greenhouse gas emissions have included emerging economies since they are increasingly playing an important role in the world stage. However, in light of the correlation between greenhouse gas emission and economic development, some countries in emerging markets have argued that any restrictions on their future carbon dioxide emissions would impact negatively on the growth of their standard of living and overall development (Mastel *et al.*, 2009).

China and India in particular have been reluctant to aggressively tackle the issue since they feel that it will negatively impact on their economic growth. This was illustrated by the then Chairman of China's National Development and Reform Commission who stated when unveiling China's 2007 national plan for climate change, that China would not commit to any quantified emissions reduction targets because the international community had to respect the country's right to develop (Mastel *et al.*, 2009). China went as far as stating that developed countries should take the lead in reducing their emissions of greenhouse gases, while ensuring development rights and spaces for developing countries (Mastel *et al.*, 2009).

However, China's rigid stance has softened since the Copenhagen Accord in 2009. Under the Copenhagen Accord, developing countries have agreed to list the actions they are taking to reduce their greenhouse gas emissions. China has adopted a carbon emission intensity target of 40 to 45% by 2020 compared to 2005 levels and a renewable energy target of 15% by 2020.

The country also pledged to increase funding for renewable energy, mass transit, and electric vehicles. India pledged to develop renewable energy, improve energy efficiency, and invest in its forestry and agriculture sectors. As for Brazil, the country pledged to reduce its emissions through reducing deforestation and increasing the use of bio-fuels and renewable energy (Meltzer & Sierra, 2011).

Recent reports have also indicated that China would soon introduce a carbon tax to stimulate greenhouse gas reduction. Furthermore, pilot projects for carbon trading have also been discussed in support for China's mitigation efforts (Reuters, 2012).

South Africa's response to the issues associated with climate change is in accordance with the framework established by the Framework Convention on Climate Change (FCCC) and the Kyoto Protocol. As a Non-Annex I Party, South Africa did not have to commit to a quantified emission limitation but the country undertook to take action in this regard, including formulating and implementing mechanisms to address greenhouse gas emissions (The Department of Environmental Affairs, 2011).

It is with this in mind that the government gazetted a White Paper on the country's climate change response in November 2011. The document spells out South Africa's approach to mitigation which seeks to balance the country's contribution as a responsible global citizen with the economic and social opportunities presented by the transition to a lower-carbon economy (The Department of Environmental Affairs, 2011).

Some important key elements of the country's approach to mitigation, as spelled out in the National Climate Change Response White Paper include the following:

- Defining desired emission reduction outcomes for each significant sector and sub-sector of the economy based on an in-depth assessment of the mitigation potential, best available mitigation options, science, evidence and a full assessment of the costs and benefits;
- Adopting a carbon budget approach to provide for flexibility and least-cost mechanisms for companies in relevant sectors and/or sub-sectors and, where appropriate, translating carbon budgets into company level desired emission reduction outcomes.
- Requiring companies and economic sectors or sub-sectors for which desired emission reduction outcomes have been established to prepare and submit mitigation plans that set out how they intend to achieve the desired emission reduction outcomes.
- Developing and implementing a wide range and mix of different types of mitigation approaches, policies, measures and actions that optimise the mitigation outcomes as well as job creation and other sustainable developmental benefits.
- The deployment of a range of economic instruments to support the system of desired emissions reduction outcomes, including the appropriate pricing of carbon and economic incentives, as well as the possible use of emissions offset or emission reduction trading mechanisms for those relevant sectors, sub-sectors, companies or entities where a carbon budget approach has been selected.
- A national system of data collection to provide detailed, complete, accurate and up-to-date emissions data in the form of a Greenhouse Gas Inventory and a Monitoring and Evaluation System to support the analysis of the impact of mitigation measures. (The Department of Environmental Affairs, 2011)

It is evident from these key elements that businesses are expected to play a vital role in the formulation of the country's mitigation strategy. The overarching objective of any business is to generate sustainable profits. It is therefore understandable that any new policy or legislation that could affect the way companies run their operations would draw particular attention from the business community since those policies have the potential to affect their bottomline. In addition, since businesses represent a source of revenue to the government through taxes, government as well policy makers have to be careful not to introduce policies that could force some businesses to cease operations.

It is therefore crucial that business and the government work closely to achieve the country's aspiration to a low carbon economy. In fact, business and government have little option but to work together to address the challenge of climate change. It is expected that the research at hand will provide insights into what business expect the role of government to be in addressing greenhouse gas emissions.

2.6 Business response to climate change

A study conducted by Ernst & Young in 2010 explored how organisations were responding to the complexities associated with climate change risks and opportunities within their businesses. The research was based on a global survey of 300 executives representing companies with revenues exceeding US\$1b annually from 16 countries and 18 industry sectors (Ernst & Young, 2010). Interestingly, China, India and South Africa were the only three emerging economies included in the study.

Key findings are summarised below.

- **Business drivers dominated by top-line and bottom-line impacts, creating a race to innovate**

The majority of respondents considered energy costs to become, if not already, a very important driver in the short term. Respondents recognised that a focus on energy-efficiency initiatives would provide a strong driver to innovation. Another strong driver which was identified was the desire to meet changes in customer demand. Changing customer expectations were perceived as very important in businesses' need to be involved in climate change initiatives. Furthermore, new revenue opportunities such as more efficient products or building a portfolio of carbon assets were identified as another key driver. This suggests that businesses should view climate change activities as an investment rather than an expense.

- **Despite regulatory uncertainty, climate change investment is on the rise**

Investing in energy efficiency topped the list of climate change initiatives senior executives planned to undertake in the near future. Other top priorities for investment included developing new products and services and improving transparency in corporate reporting. Furthermore, a growing interest in revenue-generating climate change initiatives was reported with a substantial majority of surveyed executives planning to increase their spend between 2010 and 2012 on such initiatives.

- **Transparent reporting gains momentum**

The Ernst & Young survey indicated that up to 64% of respondents provided transparent reporting of their greenhouse gas emissions data in an annual corporate social responsibility report or a sustainability report. This was a reflection that executives and boards had become increasingly aware of the growing demand for more transparent reporting of climate change business strategies, initiatives and performance. It was expected that increased stakeholder expectations and regulatory requirements were likely to drive an increase in the number of companies reporting on their carbon emissions and their response to climate change (Ernst & Young, 2010).

A similar study to the Ernst & Young project discussed above is the Carbon Disclosure Project. The Carbon Disclosure Project (CDP) is an independent, non-profit organisation seeking to drive greenhouse gas emissions reduction as well as sustainable water use by business and cities. As stated by the organisation, the Carbon Disclosure Project works with investors globally to advance the investment opportunities and reduce the risks posed by climate change by asking a substantial number of the world's largest companies to report on their climate strategies, greenhouse gas emissions and energy use (The Carbon Disclosure Project, 2011).

The fifth Carbon Disclosure Project conducted in 2011 included 100 of the largest JSE listed companies. Interestingly, the study results correlated with those of the Ernst & Young project. Key findings from the report are summarised below.

- **Improved level of disclosure on most issues since 2009**

Disclosure levels have improved across all key issues, namely risks and opportunities, greenhouse gas emissions, greenhouse gas reduction targets and activities, and climate governance practices. In fact, close to 100% of responding companies disclosed their greenhouse gas emissions in 2011.

- **Growing awareness among South African companies of the risks and opportunities of climate change**

Companies recognised that climate change would entail significant regulatory, physical and other risks and opportunities for their operations. However, the findings revealed that few companies showed evidence of being rigorous in quantifying the potential financial implications of climate change.

- **Increase in number of companies with greenhouse gas emissions reduction targets**

40% of the surveyed companies reported having emissions reduction targets. This was significantly higher than the proportion of companies having emission targets in 2010 and 2009.

- **Increase in disclosure on emissions reduction initiatives, with the greatest focus being on energy efficiency initiatives**

Most energy efficiency initiatives related to processes and building services. Behavioural change was the second most common approach to reducing emissions. Findings also revealed a significant increase in the reported levels of investment in emission reductions activities.

- **Increased evidence of partnerships and climate change governance practices**

Climate change issues had become increasingly integrated in companies' governance activities. This was illustrated by the fact that up to 90% the companies surveyed reported having a board committee or executive body with responsibility for climate change. Furthermore, more than three-quarter of responding companies reported that climate change risks and opportunities were integrated into their overall business strategy (The Carbon Disclosure Project, 2011).

It is evident from the insights highlighted in both the Ernst & Young study and the Carbon Disclosure Project, that business forms an integral part of the solution to greenhouse gas mitigation. It is also important to note that in spite of the absence of regulatory mechanisms in countries such as South Africa, businesses understood that they had to be forward looking. Hence, actions to climate change had to be initiated in order to remain competitive and sustainable in a very complex environment. However, it is not clear whether both the Ernst & Young study and the Carbon Disclosure Project explored businesses' perceptions of and readiness to mitigation measures such as carbon tax, emission trading or command-and-control approaches. Hence, the aim of our research is to build on the wealth of information obtained from the available literature in our attempt to answer the question.

2.7 Conclusion

The literature review explored the various approaches that are being used to tackle the issue of climate change. These approaches include adaptation, cap-and-trade, carbon tax as well as command-and-control measures.

Although these strategies have their own merit in combating carbon emissions, the literature shows that there is a strong preference for market-driven initiatives since market-driven approaches are perceived to be more cost effective and politically attractive in comparison to command-and-control approaches.

CHAPTER 3: RESEARCH QUESTIONS

In order to achieve the main objective of the research, the following questions were put forward:

Research Question One: Which mitigation approach or combination thereof would business consider best in the South African context?

Considering the context within which South African companies operate, it is important to gauge which mitigation approach will suit them best. South Africa being an emerging market and in light of the fact there is a correlation between economic development and greenhouse gas emission, any mitigation strategy should not impede growth but instead encourage companies to reduce their carbon emission.

Research Question Two: From a business perspective, what should government's role be in mitigating greenhouse gas emissions?

Although it is expected that government should draft and implement policies that address carbon dioxide emission, the government has a choice between market-based strategies or command-and-control approaches. It is important to gauge businesses' expectations of what the role of government should be in addressing climate change mitigation.

Research Question Three: In the absence of a legal framework in mitigating greenhouse gas emissions, what are businesses currently doing to contribute to greenhouse gas reduction?

Businesses do not always have to be led by government in order to reduce their carbon footprint. In fact, businesses may take advantage of market opportunities resulting from society's need to move to a low carbon economy. It is therefore important to determine whether business is proactive or passive with regard to greenhouse gas emission.

Research Question Four: Which of economic imperatives and social responsibility concerns are the principal drivers behind business' drive to reduce their carbon emissions?

There is a fine balance between business' need to reduce their carbon footprint and the motivation to do so. Is the motivation purely for economic reasons or for a genuine concern about the environment?

CHAPTER 4: RESEARCH METHODOLOGY

4.1 Introduction

This chapter discusses the research methodology which was used to address the research questions stated in the previous chapter. The chapter specifically covers the research design, the population of interest, the unit of analysis, the sampling method and size, the questionnaire, data collection and analysis as well as the limitations of the methodology.

4.2 Research design

In light of the research objective and research questions, the most appropriate methodology was a quantitative survey using descriptive research. As Saunders & Lewis (2012) stated, descriptive research intends to describe accurately people, events or situations. Furthermore, Saunders & Lewis (2012) argue that a survey is a research strategy which involves the structured collection of data from a relatively large population.

This research project sought to describe businesses in terms of their behaviour, perceptions and expectations with regard to climate change mitigation strategies. In order to achieve the objectives of the study, it was important that primary research be conducted. The need for primary research stemmed from the fact that current data was non-existent and had to be sourced from respondents. This is corroborated by Kotler & Keller (2009) with the authors stating that primary data are indeed freshly gathered for a specific purpose or specific research project. They further indicate that primary data has to be collected when the needed data do not exist, are dated, inaccurate, incomplete or unreliable.

For the purpose of this project, an online survey was deemed to be the most appropriate methodology since it allowed data to be collected remotely without the need for physical interaction between respondents and the interviewer. This is discussed further in the data collection section.

4.3 Population of interest

Welman, Kruger, & Mitchell (2005) define the population as the study object which consists of individuals, groups, organisations, human products and events, or the conditions to which they are exposed. The population for this research consisted of organisations, specifically Johannesburg Stock Exchange (JSE) listed companies. They were considered for the following reasons:

- Their database is readily available from the JSE website
- They are public companies and as such, their shareholder profile is relatively wider than private companies
- Some of them are multi nationals which operate in various countries and as such are more likely to have a wider carbon footprint than local companies
- Being public organisations, their operations and financials are more open to public scrutiny

In order to compile a comprehensive database, a point of departure was to peruse the JSE website. Preparatory work had shown that the database was accessible from the following link: <http://www.jse.co.za/How-To-List/Main-Board/Main-Board-Listed-companies.aspx>. The database was then downloaded in an Excel format, checked against possible duplications to ensure that the sample was drawn from a clean list. A final list of 354 companies was gathered as a platform from which to draw the sample.

4.4 Sampling method and size

A sample is a subgroup of the entire population of interest. It is not necessarily a subset of individuals or employees but can also be a subset of organisations or places (Saunders & Lewis, 2012).

Ideally, research studies should be used to make inferences on the population based on the results from the sample. However, this is only possible when the sample is drawn by means of a probability sampling technique. As indicated by Albright, Winston, & Zappe (2009), a probability sample is a sample in which the sampling units are chosen from the population by means of a random mechanism. They further state that this is in contrast to a judgmental sample in which the sampling units are chosen according to the researcher's judgement.

Probability sampling techniques as highlighted by Saunders & Lewis (2012) include the following:

- Simple random sampling. This is a technique which uses a series of random numbers such as those generated in Microsoft Excel to select a sample of members from a population;
- Stratified random sampling. In this sampling technique, the sampling frame is divided into sub groups or strata. Sampling units are then randomly selected from each stratum;
- Systematic random sampling. In this sampling technique, members of the sample are selected at regular intervals from a database. To ensure that the sample is entirely random, the first sample member is selected using a random number before subsequent members of the sample are selected systematically.

For the purpose of this research, systematic random sampling was used to select the sampling units. In order to avoid order bias, a random number using Microsoft Excel was generated for each member in the sampling frame. Members were then sorted using the random values generated and the sample was subsequently selected using the systematic random sampling method.

For a systematic sample, members of the population are selected from the sampling frame at regular intervals (Saunders & Lewis, 2012). The interval is dependent on the size of the population and the size of the sample that the researcher intends to achieve. As specified in the previous section in this chapter, the database consisted of 354 organisations and 35 companies were initially selected for the sample. Consequently every 10th company was selected for the research at hand. A more robust sample would have been ideal in the context of this research. However, a more pragmatic approach had to be considered due to the expected low response rate. Furthermore, time constraints dictated that the sample be limited in size.

4.5 Unit of analysis

The unit of analysis in this research was the business entity from which the data was collected. Targeted respondents were environmental or sustainability managers or the individuals responsible for setting environmental policy within the organisation. In order to identify these individuals, annual reports as well as company websites were perused extensively. In cases where it was not possible to identify such individuals, traditional decision makers such as Managing Directors (MD), Chief Financial Officers (CFO) and Chief Executive Officers (CEO) were approached. They are directly involved in running the business and have a significant influence on strategy formulation and implementation.

4.6 Data collection and questionnaire design

4.6.1 Data collection method

A web-based survey using a structured questionnaire was used to collect the data. Web-based or online surveys have become popular with the surge of the internet penetration amongst users, especially business users.

Olsen (2009) has highlighted some advantages and disadvantages of online surveys. One major advantage associated with web-based surveys is the reduced costs in relation to the traditional Pen and Paper interviews (PAPI). This is because online surveys eliminate expenses associated with printing and postage. Furthermore, the time and costs associated with the need to manually enter data in an electronic format is eliminated.

Another advantage stated by Olsen (2009) is the speed of response in comparison to conventional mail interviews. Further advantages include the improvement of data quality, the ability to use filters or routing questions more easily and the avoidance of manual data entry mistakes.

On the other hand, the most severe disadvantage associated with web-based surveys is related to the sample procedure. Olsen (2009) indicated that access to a computer and the internet may not be available to every single individual in a population; hence problems concerning sample coverage and representativeness are to be expected.

For the purpose of this research, an online survey was deemed to be the most appropriate method to collect the data. Most, if not all JSE listed organisations have an online presence in the form of a website where companies' annual reports are displayed. In addition, the website usually contains details of the executive and management teams which were essential in identifying the appropriate respondents for the interview.

Furthermore, the selected organisations were geographically dispersed. As such, a web-based study was the most appropriate method to reach them given the resources and time available.

In order to increase the response rate, an introductory email was sent to all selected respondents explaining the objectives of the study. The email also contained details of the researcher and respondents were offered a summary of the results as an incentive for their participation. Furthermore, frequent weekly email reminders were sent to respondents in order to increase the response rate. This resulted in 33 interviews being completed overall.

4.6.2 The questionnaire

A self-administered questionnaire was designed for the study. The questionnaire was structured around the research questions using a consistency matrix to ensure that the survey questions would provide responses to the research questions. In order to achieve the main objective of the research, the following research questions had to be answered:

- Which mitigation approach or combination thereof would business consider best in the South African context?
- From a business perspective, what should government's role be in mitigating greenhouse gas emissions?
- In the absence of a legal framework in mitigating greenhouse gas emissions, what are businesses currently doing to contribute to greenhouse gas reduction?
- Which of economic imperatives and social responsibility concerns are the principal drivers behind business' drive to reduce their carbon emissions?

The questionnaire consisted of 11 questions divided as follows:

- Eight closed-ended questions;
- Two 7-point Likert scale attribute questions and;
- One open-ended question probing businesses' own view of the role of government in reducing greenhouse gas emissions

Pilot interviews were conducted prior to and after uploading the questionnaire onto SurveyMonkey, the online platform used to collect the data. Piloting was essential since it allowed the questionnaire to be refined in terms of routing and length of the interview. Interview length was estimated to be about 25 minutes and this was confirmed during piloting.

It is important to note that no confidential or sensitive information was collected from respondents. This was necessary in order to guarantee respondents' confidentiality and to increase response rate. Therefore, the questionnaire did not collect companies' name or their turnover in order to ensure that responses could not be linked to individual companies. Sample description was limited to sector of activity, number of employees and number of sites that the organisations have in South Africa.

4.7 Data analysis

Data analysis was limited to descriptive statistics. This was due to the fact that the sample size for the research was limited to 33 completed interviews which made it impossible to compare sub categories using inferential statistics.

Microsoft Excel was mainly used to analyse the data. Although the Statistical Package for Social Sciences was available, it was not deemed necessary to use the software since Microsoft Excel was sufficient to perform the basic descriptive statistics needed for the research.

The table below provides an overview of the analysis that was conducted on the data.

Research Questions	Data Collection Tool	Analysis
Which mitigation approach or combination thereof would business consider best in the South African context?	Attribute rating on 7 point-Likert-scale	Descriptive statistics using frequencies and means scores
From a business perspective, what should government's role be in mitigating greenhouse gas emissions?	Multiple response question Importance rating	Descriptive statistics using frequencies Test of proportions
In the absence of a legal framework in mitigating greenhouse gas emissions, what are businesses currently doing to contribute to greenhouse gas reduction?	Multiple response question	Descriptive statistics using frequencies Test of proportions
Which of economic imperatives and social responsibility concerns are the principal drivers behind business' drive to reduce their carbon emissions?	Attribute rating on 7 point-Likert-scale	Descriptive statistics using frequencies and means scores

Table 1: Overview of data analysis based on the consistency matrix

4.8 Research Limitations

The following limitations have been identified for the study:

- The sample was limited to JSE listed companies and as a result, the findings of the study were interpreted accordingly. At no stage should the findings should be extrapolated to the entire business fraternity in South Africa;
- The sample size was relatively small and did not allow for inferential statistics to be conducted. As a result, analyses of the results were limited to descriptive statistics such as frequencies and mean scores. This restricts the findings to the sample and should not be extrapolated to all JSE listed companies.
- In essence, the research is exploratory and enables concepts to be refined and researched further

4.9 Conclusion

This chapter discussed the methodology used for this research. Included in this chapter were the research design, the population of interest, the unit of analysis, and the sampling method and size. The measurement instrument was also discussed as well as details of the data collection and analysis of the results.

The next chapter discusses the findings of the study.

CHAPTER 5: RESULTS

5.1 Introduction

This section covers the results of the study. While these results are reported on a question by question basis, Chapter 6 will use a thematic approach to report on the findings. The thematic approach will be based on the research questions highlighted in Chapter 3 of the document and linked back to the literature review from Chapter 2.

5.2 Sample Description

5.2.1 Economic sector in which business operates

Results from the study indicate that as much as two-fifth of the sample operates in the Financial and Business Services sector. This is reflective of the composition of South Africa's current industry profile where the services industry dominates South Africa's GDP composition (Statistics South Africa, 2012).

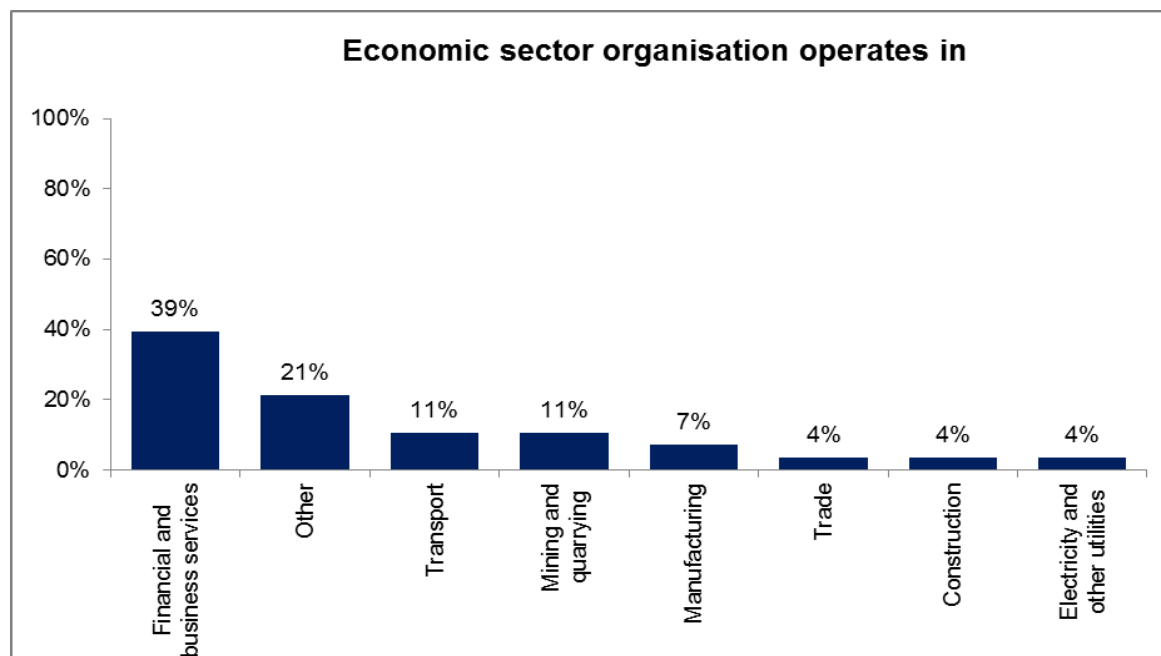


Figure 1: Economic sector in which business operates

5.2.2 Size of the company

The overwhelming majority of the respondents were large companies which is simply a reflection of the characteristics of the companies surveyed. Nearly 9 out of 10 surveyed organisations employ more than 200 individuals. This is also reflective of the profile of JSE listed companies with very large organisations such as mining companies employing as much as 100 000 workers.

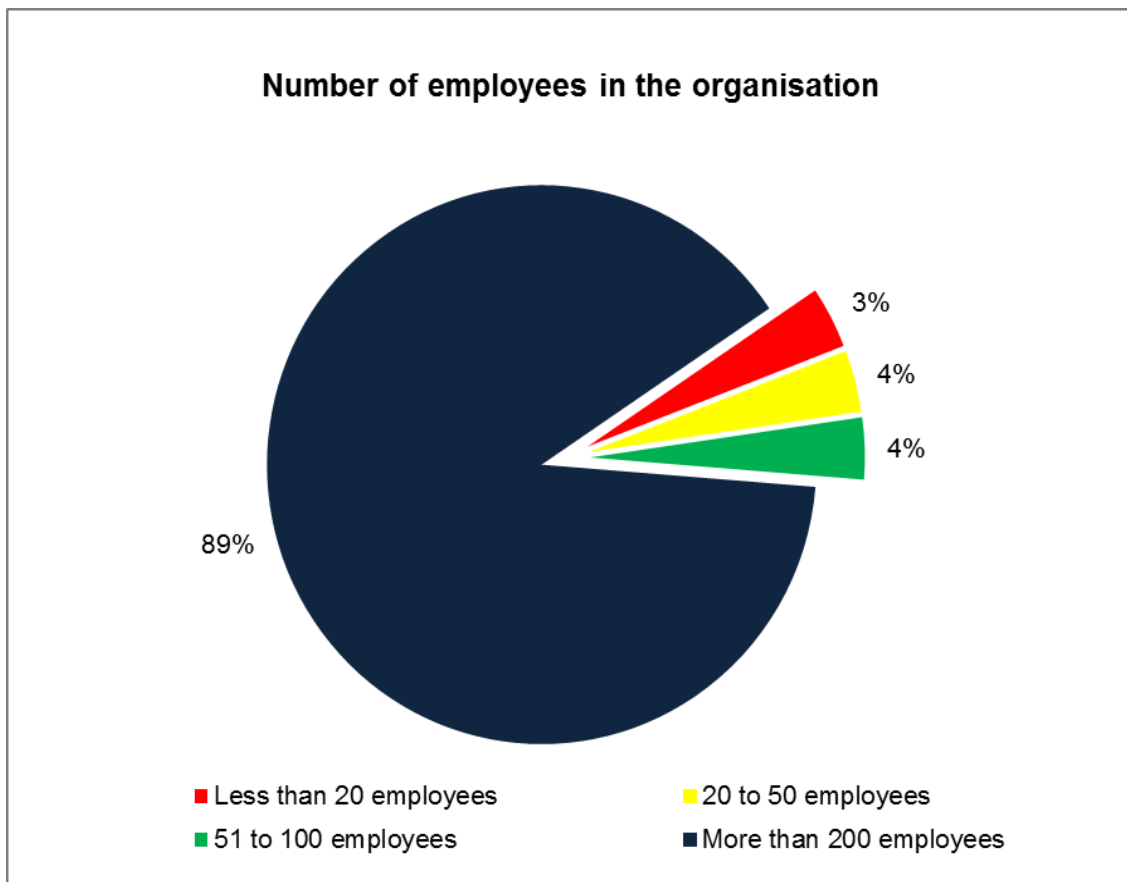


Figure 2: Number of employees in the organisation

5.2.3 Number of sites

In line with the findings from the previous sub section, the results of the study show that the overwhelming majority of the surveyed organisations have more than three sites in South Africa.

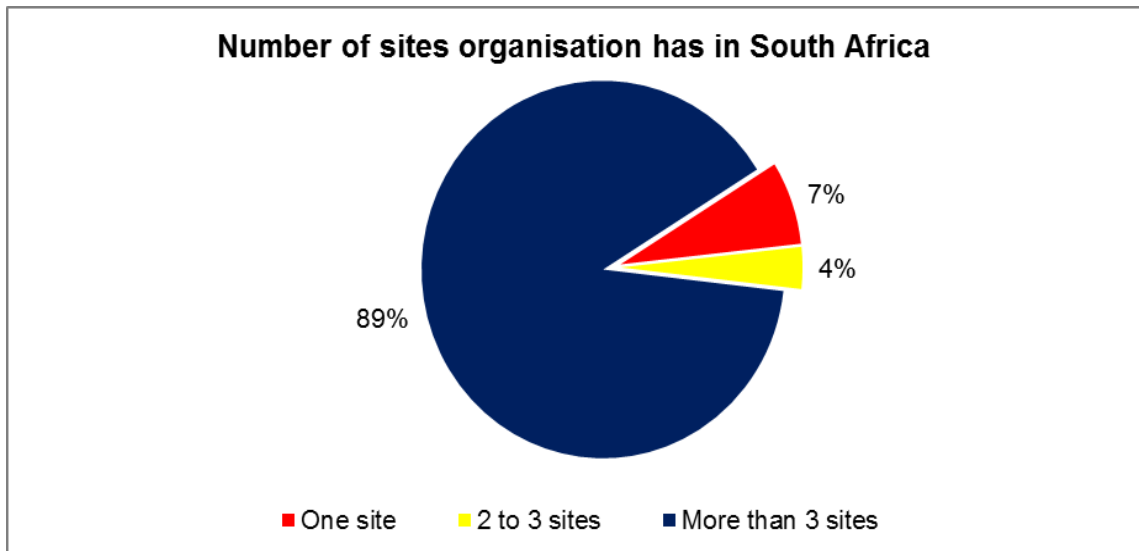


Figure 3: Number of sites the organisation has in South Africa

5.3 Core findings

This section covers the core findings of the study. As stated earlier in this chapter, the findings are reported based on each question contained in the questionnaire. Further analyses based on the research questions and objective of the study are discussed in Chapter 6.

5.3.1 Company policy with regard to greenhouse gas reduction

Nearly half the sample has a detailed policy with regard to greenhouse gas reduction. Although this is encouraging in the context of society's current drive to reduce carbon emissions, it must also be noted that more than half the sample does not currently have a detailed policy with regard to greenhouse gas reduction. In fact, the results show that up to 34% of the surveyed organisations do not have a detailed policy with regard to greenhouse gas reduction and are not in the process of designing one.

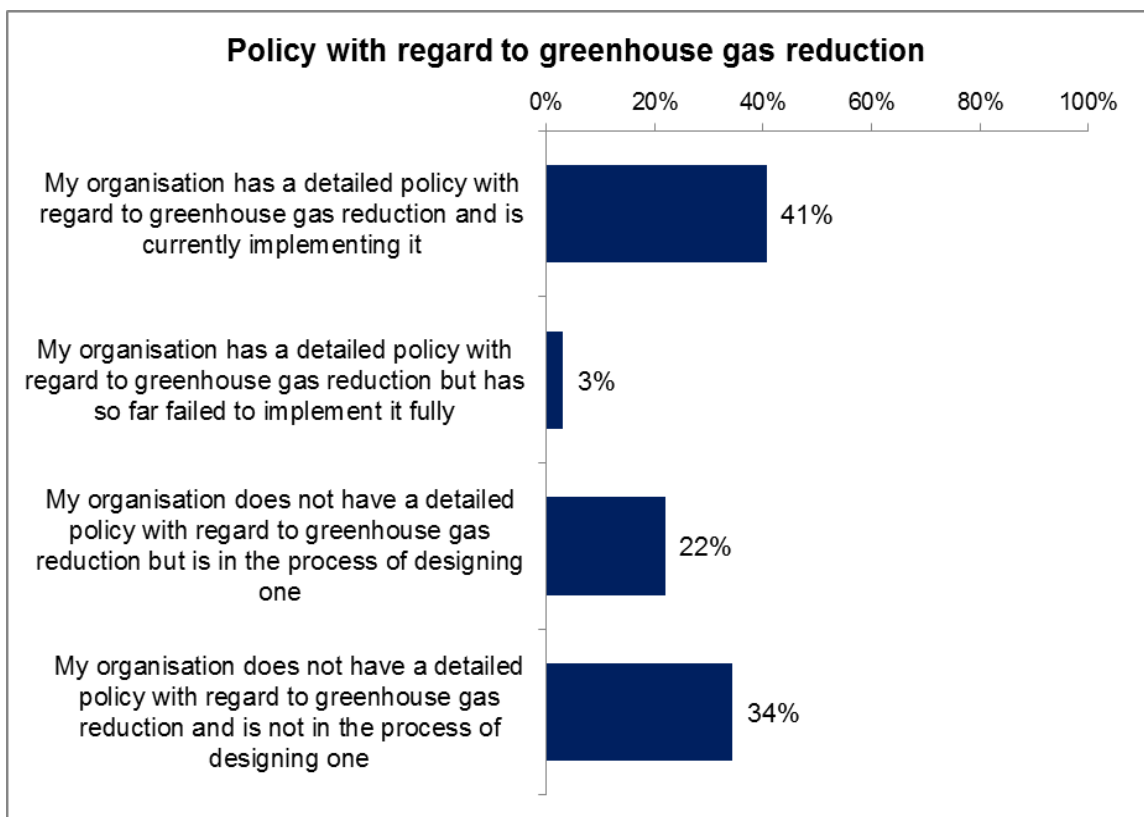


Figure 4: Current policy with regard to greenhouse gas reduction

5.3.2 Whether the organisation has a defined greenhouse gas reduction target

The results indicate that nearly 5 out of 6 organisations which have a detailed policy with regard to greenhouse gas reduction have a defined greenhouse gas reduction target which they assess regularly. This is illustrated in Figure 5.

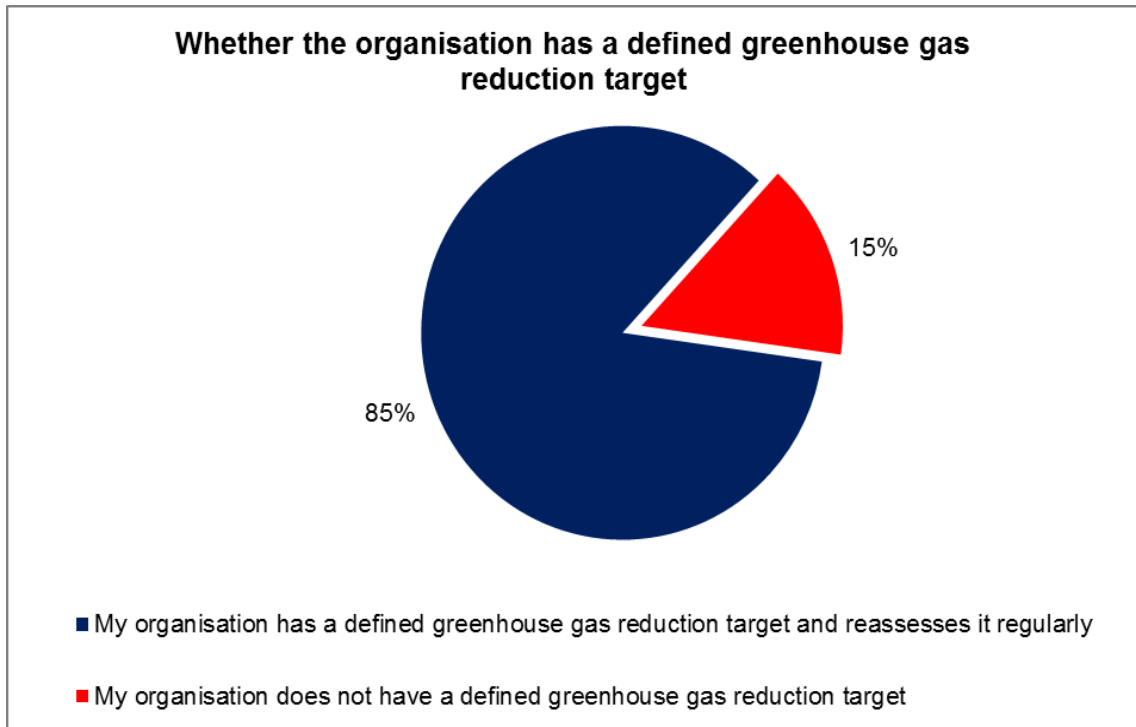


Figure 5: Whether the organisation has a defined greenhouse gas reduction target

5.3.3 Current climate change initiatives

Findings indicate that the most popular climate change initiative undertaken by the surveyed organisations is recycling activities. Results show that 60% of the sample introduced recycling initiatives in the past two years. Other notable findings show that 43% of the sample started disclosing their carbon footprint and introduced sustainable development in group strategy. However, only one in four companies in the sample has invested in renewable energy for its operations in the past two years.

Attributes	%	Count
Introduced recycling initiatives	60%	18
Started disclosing its carbon footprint	43%	13
Introduced sustainable development in group strategy	43%	13
Held campaigns to educate its employees on the need to save energy	40%	12
Started using fuel efficiency equipment for its operations	40%	12
Conducted energy audits	40%	12
Invested in renewable energy for its operations	23%	7
Invested in Research and Development to provide energy-efficient products and services	23%	7
Encouraged employees to choose company vehicles that are fuel efficient and have lower carbon emissions	7%	2
Other (please specify)	7%	2
None of the above	17%	5

Table 2: Current climate change initiatives by business

5.3.4 Role of government in addressing greenhouse gas emissions

The findings highlighted in the table below clearly show that the surveyed organisations believe that the government's role in addressing greenhouse gas emissions is essentially one of providing incentives to businesses. On the other hand, the results also indicate that businesses do not think that the role of government should be about imposing new taxes or punitive strategies to compel companies to reduce their carbon emissions.

Attributes	%	Count
Government should implement tax rebate incentives to encourage businesses to reduce their carbon footprint	75.9%	22
Government should provide incentives for business to use renewable energy rather than a general incentive to reduce carbon emissions	75.9%	22
Government should provide funding for research and development of alternative energy sources	55.2%	16
Government should design comprehensive incentives to encourage businesses to reduce their carbon footprint	55.2%	16
Government should compel businesses to report publicly on their carbon footprint	55.2%	16
Government should encourage business to reduce their carbon footprint by reducing the cost of acquiring alternative energy sources	51.7%	15
Government should design comprehensive laws and regulations to address greenhouse gas emissions	44.8%	13
Government should impose greenhouse gas emission targets on each business sector	20.7%	6
Government should impose additional tax which will be used to fund for renewable energy	17.2%	5
Government should implement punitive strategies to compel businesses to reduce their carbon footprint	6.9%	2
Government should not take any active part in greenhouse gas reduction strategies and leave the initiative to business	10.3%	3

Table 3: Role of government in addressing greenhouse gas emissions

5.3.5 Most important role of government in addressing greenhouse gas emissions

In line with the findings from the previous sub section, the results in the chart below indicate that businesses are of the view that the most important role of government in curbing greenhouse gas emissions are to implement tax rebate incentives to encourage businesses to reduce their carbon footprint. This is closely followed by business' view that government should design comprehensive strategies to encourage them to reduce their carbon footprint.

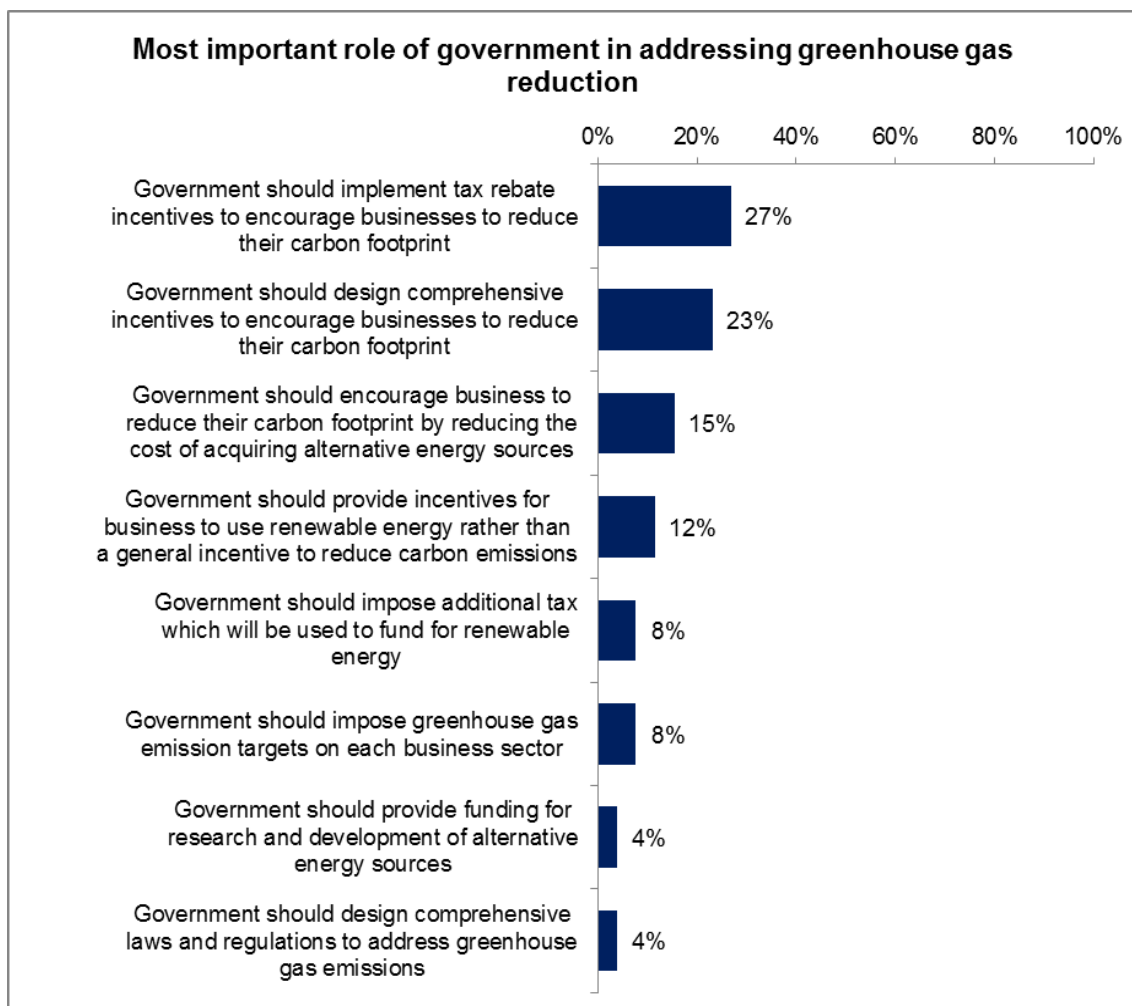


Figure 6: Most important role of government in addressing greenhouse gas emissions

5.3.6 Verbatim comments on government's role in addressing greenhouse gas reduction

Respondents were also asked to indicate in their own words and from a business perspective what role government should play in addressing greenhouse gas emissions. The verbatim comments below highlight some of respondents' feedback on the question.

"The environment is a global public good and international cooperation is required to address it successfully. At a country level, interventions such as uniform technology and performance standards are unlikely to be adequate. A three-year phased approach to carbon tax, based on usage and a company specific emission budget, at a starting price of R120 per tonne could be followed. The three years are a period for business to report their emissions through existing emission calculators in conjunction with the completion of annual tax requirements. In this period no tax is charged. The South African Revenue Service is the best government department in terms of resources and capacity to operationalise this process. It is suggested that firms complete a carbon emission calculator on their income tax forms for the first three years, thereby moving the cost and administration to the private sector, saving public funds. This information is used to build a central database that can be correlated with the tax data to build a predictive carbon emission tool".

"The reality is government does not do enough to address greenhouse gas emissions. There is little to no input and support in the sector of alternative energy. Business organisations cannot be expected to carry the flag singlehandedly. Government needs to invest in research for alternative energy sources and implement rebate structures for business' complying with certain reduction targets and implementation of aforementioned alternatives. Both parties, that is government and industry, need to have the same targets in their sights for any material change or progress to take place".

“Government should be an enabler, guiding business to change behaviour through a combination of taxing bad behaviour (on an escalating basis) while also providing a platform for renewable energy and independent power producers”.

The general feedback from the sample is that government should be an enabler for the adoption of green strategies to reduce carbon emissions. Generally, businesses do not think that the government should adopt punitive strategies to compel them to reduce greenhouse gas emissions.

5.3.7 Greenhouse gas mitigation approaches

Respondents were asked their level of agreement with a series of attributes related to mitigation approaches to greenhouse gas reduction. A 7-point Likert scale where 1 is ‘Strongly Disagree’ and 7 is ‘Strongly Agree’ was used to that purpose. Analysis of results was performed using the top 3 boxes and the mean score. Table 4 summarises the findings.

Interestingly, the findings indicate that businesses are less receptive of a carbon tax since it increases the cost of doing business and will not necessarily compel businesses to change their behaviour. Furthermore, respondents in the sample do not agree that a carbon tax effectively addresses emissions of carbon from every sector of the economy. The most pertinent point however is that a cost attached to carbon emission will simply be passed onto consumers, which will result in higher prices of goods and services.

Although respondents were ambiguous in their feedback on how effective the imposition of energy standards would be in encouraging businesses to reduce their carbon emissions, the findings generally indicate that imposing energy standards on products is not a better approach to dealing with greenhouse gas emissions. In addition, up to 61% of the sample agreed that imposing energy standards on products will result in a significant increase in the cost of Research and Development (R&D) and subsequently an increase in the cost of doing business.

On the other hand, the results show that businesses in the sample generally agree that a carbon trading scheme will be more effective in encouraging companies to reduce their carbon emissions. Up to 75% of the sample agreed that a carbon trading scheme creates a market that rewards companies for lowering their carbon emissions. Encouragingly, businesses do not agree that the implementation of a carbon trading scheme is very complex and not suitable to the South African business environment.

Attributes	Top 3 Boxes	Mean Score (Out of 7)
A carbon tax will increase the price of products and services since businesses but will simply pass the cost to consumers	89%	5.96
A carbon tax on greenhouse gas emissions will significantly increase the cost of doing business in South Africa	86%	5.82
A carbon trading scheme creates a market that rewards companies for lowering their carbon emission	75%	5.29
The best approach to encourage business to reduce their carbon footprint is to impose the use of alternative energy sources	68%	5.07
A carbon tax will not compel businesses who can afford the tax to reduce their carbon footprint	61%	4.75
Imposing energy standards on products will lead to a significant increase in the cost of Research and Development (R&D) and therefore an increase in the cost of doing business	61%	4.50
Imposing energy standards on products such as electrical appliances and motor vehicles is a better approach to dealing with greenhouse gas emissions	46%	4.54
A carbon trading scheme will give businesses carte blanche to pollute more instead of reducing their carbon footprint	43%	3.89
Unlike the carbon trading scheme, a carbon tax effectively addresses emissions of carbon from every sector of the economy	36%	3.57
The implementation of a carbon trading scheme is very complex and not suitable to the South African business environment	32%	3.64
Businesses will be more receptive of a carbon tax on greenhouse gas emissions than a carbon trading scheme	29%	3.21

Table 4: Level of agreement with greenhouse gas mitigation approaches

5.3.8 Potential reasons for businesses to reduce their carbon footprint

Respondents were asked their level of agreement with a series of attributes related to what may drive businesses to reduce their carbon footprint. A 7-point Likert scale where 1 is 'Strongly Disagree' and 7 is 'Strongly Agree' was used to that purpose. Analysis of results was performed using the top 3 boxes.

The findings as highlighted in Figure 7 show that an overwhelming majority of respondents (86%) agree that businesses will only reduce their carbon footprint if there is an economic benefit attached to it. This also ties up with the observation made earlier in this document which stated that businesses would prefer government to devise clear incentives to encourage businesses to reduce their carbon footprint.

Businesses also agree that society has a positive perception of businesses that care about the environment. Furthermore, respondents agree that reducing carbon footprint is a social issue that needs a collective approach if it is to be dealt with effectively.

Although it is evident from the literature that greenhouse gas emissions affect current and future generations, only 36% of respondents agreed that businesses are genuinely concerned about the impact of greenhouse gas emissions on future generations. This implicitly means that businesses will not strive to reduce their carbon emissions out of concern for future generations but only for economic gains.

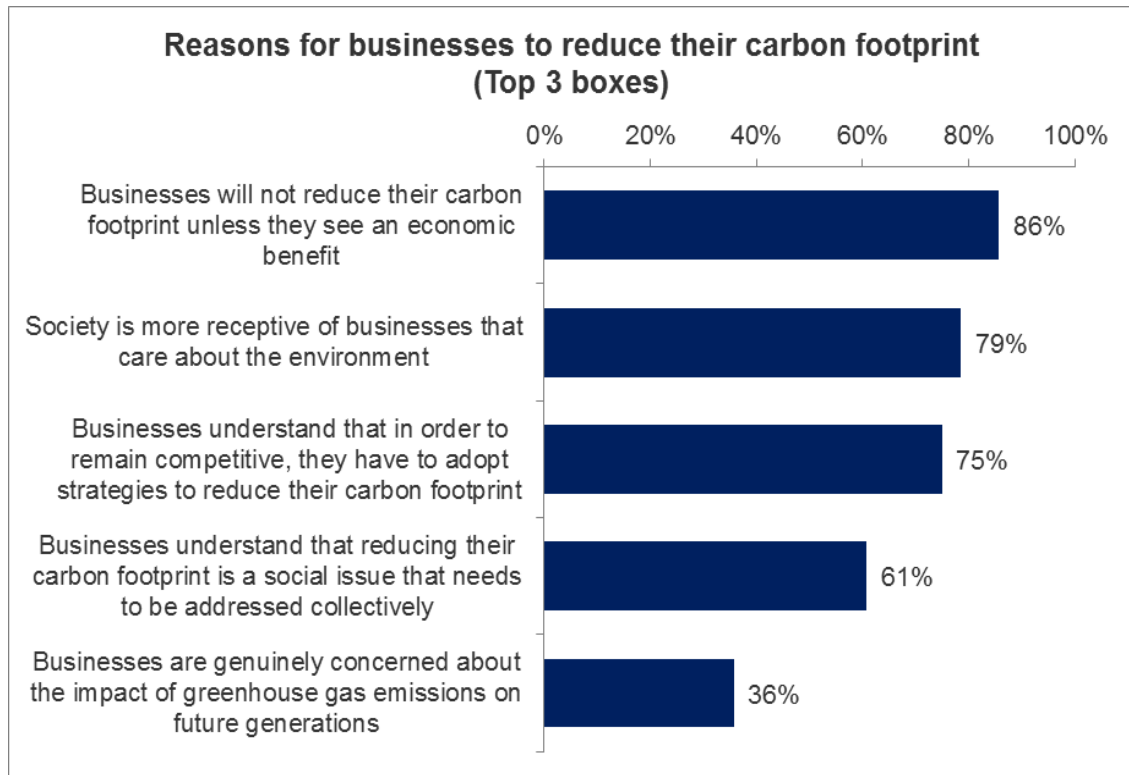


Figure 7: Potential reasons for businesses to reduce their carbon footprint

5.4 Conclusion

In summary, the findings indicated that nearly half the organisations surveyed have a detailed policy with regard to greenhouse gas emissions. However, the results also highlighted the fact that up to 34% of the surveyed organisations do not have a detailed policy with regard to greenhouse gas reduction and are not in the process of designing one.

The findings showed that the most popular green initiative undertaken by the surveyed organisations is recycling activities. Up to 60% of the sample introduced recycling initiatives in the past 2 years and about 2 in every 5 company surveyed started disclosing their carbon footprint and introduced sustainable development in group strategy.

Interestingly, the results clearly show that the surveyed organisations believe that the government should mainly provide incentives to businesses in order to encourage them to reduce their carbon emissions. Furthermore, respondents do not think that the role of government should be about imposing new taxes or punitive strategies. The government's role should be one of an enabler or facilitator with regard to tackling greenhouse gas emissions.

On the core issue of which mitigation strategies businesses perceive to be best in addressing greenhouse gas reduction, the findings indicated that businesses are more in favour of a carbon trading scheme than a carbon tax or the imposition of energy standards on products. Respondents agreed that both a carbon tax and imposing energy standards on products may lead to an increase in the price of products and services. In addition, they do not believe that such measure, especially carbon tax will result in the reduction of greenhouse gas emissions.

CHAPTER 6: DISCUSSION OF THE RESULTS

6.1 Introduction

The purpose of this chapter is to discuss the results presented in Chapter 5. The findings indicated that although organisations have a detailed policy with regard to greenhouse gas emissions, there is still a substantial proportion of businesses without a policy to address carbon emissions. The results also showed that there was a preference for market-based solutions to address climate change, especially the emission trading approach.

The results obtained are essentially discussed in terms of the research questions, the literature reviewed and objective of the study.

6.2 Discussion of the results according to the research questions

6.2.1 Research Question One

Which mitigation approach or combination thereof would business consider best in the South African context?

In order to answer the question effectively, respondents were exposed to a battery of attributes on mitigation approaches and asked to rank them using a 7-point Likert scale where 1 was 'Strongly Agree' and 7 'Strongly Disagree'. The discussion on the result for this question is done according to the various mitigation propositions explored in the research.

The carbon tax proposition

The findings from the research indicated that business was less receptive of a carbon tax since it would increase the cost of doing business, nor would it necessarily lead to a change in behaviour. As stated by Shi-Ling & Elliot (2009), a carbon tax would impose a marginal cost on emissions and was essentially a price instrument. As such, one can argue that a carbon tax in its pure form will lead to an increase in costs for businesses.

Since the main purpose of business is to make sustainable profits, we can argue that a carbon tax may have a negative impact on companies' profits. It is therefore not surprising that the surveyed organisations indicated that a cost attached to carbon emissions will be passed onto consumers. Therefore, details about the design and implementation of the carbon tax are important in order to get business buy-in.

Another pertinent result relates to the fact that respondents did not agree that a carbon tax would effectively address the emission of greenhouse gases from every sector of the economy. This is in contrast with climate change literature and research on carbon tax as a mechanism to tackle carbon dioxide emissions. The literature states that an advantage of carbon taxation is that it addresses greenhouse gas emissions from every economic sector (Yale Environment 360, 2009). Unfortunately the research did not expand onto the possible reasons why most respondents in the sample did not agree that a carbon tax does not address greenhouse gas emissions from all economic sectors.

The command-and-control proposition

With regard to the command-and-control mitigation approach, findings from the research revealed that, in general, respondents did not think that imposing energy standards on products was a better strategy to dealing with greenhouse gas emissions. In addition, more than half of the sample agreed that the imposition of energy standards on products would result in significant increases in the cost of doing business.

Shrum (2007) argued that command-and-control approaches were non-market based solutions to greenhouse gas emissions. As such, command-and-control approaches dictated the method of reducing emission since they imposed the method of reducing emission by means of regulations on certain practices, standards or products.

Shrum (2007) further stated that command-and-control strategies were more expensive and less efficient than market based strategies. In fact, climate change literature tends to favour market based approaches over command-and-control since market based approaches could spur innovation (Metcalf, 2009; Shi-Ling & Elliot, 2009).

The cap-and-trade proposition

Findings from the research revealed that the emission trading approach was the most preferred mitigation strategy by far. This is very much a reflection of the preferred mitigation approach endorsed by international organisations around the world.

Indeed, Storm (2009) and Mastel, *et al.* (2009) have stated that carbon trading as a policy response change had been sanctioned by the European Union, the International Energy Agency, the World Bank as well as the International Monetary Fund. Emission trading or cap-and-trade creates a market where entities have the opportunity to buy or sell emissions rights (Young, 2009).

The system is deemed to be more attractive to business since it provides a financial incentive for organisations that are able to reduce their emissions beyond the baseline (Mastel, *et al.*, 2009). Furthermore, businesses can profit financially from the emission trading system since they have the opportunity to get additional revenue by selling their excess capacity. The literature has also shown that carbon trading as a policy is politically more acceptable to business and consumers (Storm, 2009) and is a more attractive proposition to policymakers (Metcalf, 2009).

The findings from the study, supported by the literature, clearly show that business has a preference for the cap-and-trade approach and by inference a preference for market-based strategies as opposed to command-and-control.

6.2.2 Research Question Two

From a business perspective, what should government's role be in mitigating greenhouse gas emissions?

The findings showed that business believed that the government's role was to provide incentives to businesses in order to encourage them to reduce their carbon footprint. These incentives should take the form of tax rebates to encourage business to reduce their carbon footprint. Furthermore, the findings indicated that business would like the government to provide incentives for the use of renewable energy rather than a general incentive to reduce carbon emissions.

The literature has shown that governments in emerging economies have undertaken to increase funding for renewable energy. This was illustrated by Meltzer & Sierra (2011) who indicated that countries such as China and India had pledged to either increase funding for renewable energy or become more active in developing renewable energy.

In South Africa, the government through the White Paper on The National Climate Change Response Paper (2011) seeks to deploy a range of economic instruments to support the system of desired emission outcomes. This includes the appropriate pricing of carbon as well as economic incentives.

As highlighted in the discussions under Research Question One, business does not think that the role of government is to introduce command-and-control regulations to compel organisations to reduce their carbon footprint.

6.2.3 Research Question Three

In the absence of a legal framework in mitigating greenhouse gas emissions, what are businesses currently doing to contribute to greenhouse gas reduction?

The research findings indicated that a substantial proportion of businesses in the sample had a detailed policy with regard to greenhouse gas reduction. Furthermore, the results showed that businesses had a self-defined emission target which they reviewed regularly. The results above correlate with studies conducted by Ernst & Young (2010) and the Carbon Disclosure Project (2011) which was done among South African companies.

These projects revealed that an increasing number of organisations reported having emission reduction targets. Furthermore, an increasing proportion of companies provided transparent reporting of their greenhouse gas emissions data on a yearly basis (Ernst & Young, 2010).

The main finding from these observations suggests that business is not passive in the fight against climate change. It is encouraging to see that business has been proactive in taking actions to reduce its carbon footprint. It is also a reflection of how important business views the issue of climate change.

More importantly, the findings revealed that South African organisations have started to engage in climate change initiatives to curb their carbon emissions. Actions such as recycling initiatives, the introduction of sustainable development in group strategy, campaigns to educate employees on the need to save energy and the use of fuel efficiency equipment for operations are some of the actions that the surveyed companies have undertaken in the past two years. Interestingly, respondents have also indicated that they have introduced energy audits in the past two years in an attempt to understand their consumption patterns better.

This is essential since the cost of electricity has been increasing in the past few years and it is expected that electricity costs will go even higher in an attempt to fund new power stations to meet the country's growing energy needs.

The findings are supported by results from the Carbon Disclosure Project (2011) which revealed that there was an increase in disclosure on emissions reduction initiatives. The report indicated that most energy efficiency initiatives among businesses in South Africa related to processes and building services. In addition, behavioural change was the second most common approach to reducing emissions. It must be noted that recycling activities are a sign of behavioural change and as such the results from our research correlate with findings from The Carbon Disclosure Project. This is also an indication that business is increasingly aware of the risks and potential opportunities of climate change (The Carbon Disclosure Project, 2011).

Although not evident in the research, findings from The Carbon Disclosure Project (2011) revealed that climate change investment was on the rise in South Africa. In addition to investing in energy efficiency products, companies planned to invest in new products and services with a growing interest in revenue-generating climate change initiatives.

6.2.4 Research Question Four

Which of economic imperatives and social responsibility concerns are the principal drivers behind business' drive to reduce their carbon emissions?

As stated in Chapter Three, there is a fine balance between business' need to reduce its carbon footprint and the motivation to do so. Businesses understand that climate change is a topical issue that needs to be addressed collectively (Knox-Hayes, 2010). As such, inertia is possibly the worst action that business, governments and other stakeholders can take (Tol, 2009). However, it is not always evident that businesses that action to reduce carbon emission do so purely for economic reasons and/or for a genuine concern about the environment.

Respondents were asked their level of agreement with a series of attributes related to what may drive businesses to reduce their carbon footprint. A 7-point Likert scale where 1 is 'Strongly Disagree' and 7 is 'Strongly Agree' was used to that purpose.

The findings indicated that an overwhelming majority of respondents agreed that businesses would reduce their carbon footprint if there was an economic benefit attached to it. This is in line with findings from the study conducted by Ernst & Young (2010) which revealed that new revenue opportunities such as more efficient products or building a portfolio of carbon assets were a key driver for business to fight climate change. This also suggested that businesses viewed climate change activities as an investment rather than an expense. Furthermore, respondents' appetite for a carbon trading scheme as highlighted in our discussions in Research Question One will be underpinned by the findings above. Indeed, as mentioned, businesses can profit financially from the emission trading system since they have the opportunity to get additional revenue by selling their excess capacity.

The study by Ernst & Young (2010) also revealed that another strong driver for business to engage in climate change activities was the desire to meet changes in customer demand. Changing customer expectations were perceived as very important in businesses' need to be involved in climate change initiatives. Changing customer demands also translate to new business or product opportunities for businesses since they will have to adapt their products and services accordingly.

The findings also revealed that society had a positive perception of businesses that cared about the environment. One can argue that this is one of the reasons why an increasing number of businesses are reporting their greenhouse gas emissions data in annual corporate social responsibility reports or sustainability reports (The Carbon Disclosure Project, 2011).

CHAPTER 7: CONCLUSION

7.1 Introduction

Chapter 1 introduced the background to the research and provided the context behind the need to conduct the study. Climate change literature is unequivocal about global warming and the negative effects the phenomenon has on earth's ecosystem in general and our livelihood in particular. Authors such as Storm (2009), Tol (2009) and Fujino, *et al.* (2008) have emphasized the consequences of global warming on the sustainability of our planet and the severe consequences for society at large if nothing is done.

Mastel, *et al.* (2009) indicated that the discussion on international action on climate change had shifted from a scientific one to a more practical one involving politicians and businessmen rather than climatologists and chemists. The authors further stated that a scientific consensus on the role of carbon dioxide in global warming did not necessarily result in global consensus for action, nor did it address the various economic and business concerns that had to be addressed.

It is with this in mind that the objectives of the study were set. In essence, the study aims to answer the following question:

Which mechanism between market-based and command-and-control approaches would be most appropriate in the mitigation of greenhouse gas in the context of an emerging economy?

7.2 Review of the research methodology and research questions

In order to achieve the main objective of the research, the following questions were put forward:

- Which mitigation approach or combination thereof would business consider best in the South African context?
- From a business perspective, what should government's role be in mitigating greenhouse gas emissions?
- In the absence of a legal framework in mitigating greenhouse gas emissions, what are businesses currently doing to contribute to greenhouse gas reduction?
- Which of economic imperatives and social responsibility concerns are the principal drivers behind business' drive to reduce their carbon emissions?

In light of the research objective and research questions, a quantitative survey was conducted among a sample of JSE listed companies. An online questionnaire was used and respondents were sustainability managers or the individuals responsible for setting environmental policy within the organisation.

7.3 Research findings

The findings have been structure as per the research questions highlighted in Chapter Three. These are:

1. Which mitigation approach or combination thereof would business consider best in the South African context?

The findings revealed that the surveyed organisations preferred the carbon trading system to the carbon tax and command-and-control approach. This was also reflected in the literature with Storm (2009) and Mastel, *et al.* (2009) stating that carbon trading as a policy response change was being favoured by most international organisations.

2. From a business perspective, what should government's role be in mitigating greenhouse gas emissions?

The results indicated that the surveyed organisations believe that the government should mainly provide incentives to businesses in order to encourage them to reduce their carbon emissions. Such incentives could be in the form of tax incentives or incentives to use renewable energy for their operations. Furthermore, there was reluctance from respondents with regard to the implementation of new taxes by government.

3. In the absence of a legal framework in mitigating greenhouse gas emissions, what are businesses currently doing to contribute to greenhouse gas reduction?

The findings revealed that the surveyed organisations have started to engage in climate change initiatives to curb their carbon emissions. Actions such as recycling initiatives, the introduction of sustainable development in group strategy, campaigns to educate employees on the need to save energy and the use of fuel efficiency equipment for operations are some of the actions that the surveyed companies have undertaken in the past two years.

The research findings also indicated that a substantial proportion of businesses in the sample had a detailed policy with regard to greenhouse gas reduction and had a self-defined emission target which they reviewed regularly.

4. Which of economic imperatives and social responsibility concerns are the principal drivers behind business' drive to reduce their carbon emissions?

The findings indicated that the majority of respondents agreed that businesses would reduce their carbon footprint if there was an economic benefit attached to it. This was in line with findings from a study conducted by Ernst & Young (2010) which revealed that new revenue opportunities such as more efficient products or building a portfolio of carbon assets were a key driver for business to fight climate change.

Respondents in the sample were also cognisant of the fact that businesses would reduce their carbon footprint to protect their corporate image since society was more receptive of organisations which cared about the environment.

7.4 Implications and recommendations for future research

7.4.1 Implications

The research has highlighted a number of issues that business and government have to be cognisant of. First and foremost, government's move to gazette The National Climate Change Response White Paper implies that South Africa is serious about adopting measures to address climate change in the country. As such, managers have to be forward looking and ready themselves for the challenges ahead. Climate change mitigation and adaptation when possible is a reality and managers need to understand that they have to start adopting strategies to address their carbon footprint. In a nutshell, the following areas have to be addressed by organisations.

Carbon disclosure

It is likely that the government in trying to curb greenhouse gas emissions will compel businesses to disclose their carbon footprint. Currently, carbon disclosure is voluntary and although an increasing number of public entities are already reporting on their carbon footprint, government may want to formalise carbon audits to better understand the challenge ahead. This means that there is a risk that government will pass legislation to punish organisations which refuse to comply with carbon auditing.

Mitigation approach

Any mitigation strategy will result in organisations incurring a cost. Although it is not clear how much of an impact such a cost will be, managers have to understand that their bottomline may be affected to some extent. It is therefore important that managers start engaging with other stakeholders in order to anticipate which mitigation approach the country will use to curb carbon emissions. From the gazetted White Paper, it is evident that South Africa prefers a mix of mitigation approaches with a heavy emphasis on carbon trading.

As such, managers have to be greatly involved in the design and implementation of the system. This will also allow them to anticipate potential costs.

Research and development

The literature has indicated that market-based approaches can spur innovation. In addition to new product development, managers have to be aware of changing market conditions and needs. It is therefore important that they remain close to the market in order to anticipate any new product or service that may be needed. Companies may require bigger budgets for R&D to cater for climate change specific product or service needs

With regard to government, it has to work hand-in-hand with business in order to design a suitable system that will spur climate change action and not stifle it. In addition, government has to be careful not to impose regulations that would result in companies closing down. The White Paper on the National Climate Change Response stated that government will consult with business in designing the most appropriate mitigation strategy for the country. Through this research, it is evident that business would like the government to offer incentives through tax rebates or incentives to shift to cleaner energy. The government has to carefully weigh which incentive or mix of incentives would be best tailored to the South African market. Issues of competitiveness have to be taken into account since the government has to ensure that any mitigation approach does not impact negatively on companies' ability to compete within the South African borders as well as outside the borders.

7.4.2 Recommendations for future research

Our recommendations for future research are based on the limitations of the current study and the findings. Future research could take the form of a case study or a qualitative study to understand the impact of mitigation approaches on an organisation's overall business strategy. A typical question would be:

- How would the implementation of an emission trading scheme impact on organisations' overall business strategy?

Issues that could be explored in this study could relate to sustainability issues, cost structures, operational efficiencies or product-market mix.

In addition, we mentioned that adaptation was an approach to addressing climate change issues. Research could be undertaken around which adaptation measures South African organisations are currently undertaking to address climate change. This could take the form of a case study looking at various industries such as pharmaceuticals, agriculture, manufacturing and mining to cite a few.

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Appendix

GREENHOUSE GAS MITIGATION IN EMERGING ECONOMIES: MARKET-BASED VERSUS COMMAND-AND-CONTROL STRATEGIES

QUESTIONNAIRE

Introduction

Dear Sir / Madam

As part of the fulfilment of the requirements for the degree of Masters of Business Administration, I am doing research on greenhouse gas mitigation in emerging economies. Basically, I would like to determine which approach or approaches business would consider best in reducing greenhouse gas emissions in South Africa. To that end, you are asked to complete the following questionnaire. The questionnaire should take no more than 25 minutes of your time. Please note that your participation is voluntary and you can withdraw at any time without penalty. We subscribe to the SAMRA code of conduct, hence your anonymity and that of your company is guaranteed and all data will be kept confidential. By completing the survey, you indicate that you voluntarily participate in this research. If you have any concerns, please contact me or my supervisor. Our details are provided below.

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Q1. Which one of the following statements applies to your organisation?

SINGLE MENTION ONLY

My organisation has a detailed policy with regard to greenhouse gas reduction and is currently implementing it	1
My organisation has a detailed policy with regard to greenhouse gas reduction but has so far failed to implement it fully	2
My organisation does not have a detailed policy with regard to greenhouse gas reduction but is in the process of designing one	3
My organisation does not have a detailed policy with regard to greenhouse gas reduction and is not in the process of designing one	4

ASK Q2 IF 1 OR 2 IN Q1

Q2. You mentioned that your organisation has a detailed policy with regard to greenhouse gas reduction. Please tell me which of the following applies to you.

SINGLE MENTION ONLY

My organisation has a defined greenhouse gas reduction target and reassesses it regularly	1
My organisation has a defined greenhouse gas reduction target but does not reassess it regularly	2
My organisation does not have a defined greenhouse gas reduction target	3

ASK ALL

Q3. Thinking about the past 2 years, has your organisation...?

MULTIPLE ANSWER POSSIBLE

Invested in renewable energy for its operations	1
Introduced recycling initiatives	2
Started disclosing its carbon footprint	3
Held campaigns to educate its employees on the need to save energy	4
Invested in Research and Development to provide energy-efficient products and services	5
Started using fuel efficiency equipment for its operations	6
Conducted energy audits	7
Introduced sustainable development in group strategy	8
Encouraged employees to choose company vehicles that are fuel efficient and have lower carbon emissions	9
Other (please specify)	10
None of the above	11

Q4. There have been wide discussions about the role governments should play in addressing greenhouse gas emissions. From a business perspective, which statement or statements below would you say apply to government's role in addressing greenhouse gas emissions?

MULTIPLE ANSWER POSSIBLE

Government should impose additional tax which will be used to fund for renewable energy	01
Government should provide funding for research and development of alternative energy sources	02
Government should encourage business to reduce their carbon footprint by reducing the cost of acquiring alternative energy sources	03
Government should design comprehensive incentives to encourage businesses to reduce their carbon footprint	04
Government should implement punitive strategies to compel businesses to reduce their carbon footprint	05
Government should compel businesses to report publicly on their carbon footprint	06
Government should implement tax rebate incentives to encourage businesses to reduce their carbon footprint	07
Government should provide incentives for business to use renewable energy rather than a general incentive to reduce carbon emissions	08
Government should impose greenhouse gas emission targets on each business sector	09
Government should design comprehensive laws and regulations to address greenhouse gas emissions	10
Government should not take any active part in greenhouse gas reduction strategies and leave the initiative to business	11

ANSWER Q5 IF 1-10 IN Q4. OTHERWISE SKIP TO Q6

Q5. Please rank your selected statements about government's role in Q4 from most important to least important with 1 being the most important statement.

	Importance ranking
Government should impose additional tax which will be used to fund for renewable energy	
Government should provide funding for research and development of alternative energy sources	
Government should encourage business to reduce their carbon footprint by reducing the cost of acquiring alternative energy sources	
Government should design comprehensive incentives to encourage businesses to reduce their carbon footprint	
Government should implement punitive strategies to compel businesses to reduce their carbon footprint	
Government should compel businesses to report publicly on their carbon footprint	
Government should implement tax rebate incentives to encourage businesses to reduce their carbon footprint	
Government should provide incentives for business to use renewable energy rather than a general incentive to reduce carbon emissions	
Government should impose greenhouse gas emission targets on each business sector	
Government should design comprehensive laws and regulations to address greenhouse gas emissions	
Government should not take any active part in greenhouse gas reduction strategies and leave the initiative to business	

Q6. In your own words and from a business perspective, please tell me what role government should play in addressing greenhouse gas emissions?

ASK ALL

Q7. On a scale of 1 to 7 where 1 is Strongly Disagree and 7 is Strongly Agree, please rate your level of agreement with the following statements with regard to greenhouse gas mitigation.

SINGLE RATING PER ATTRIBUTE ONLY

1=Strongly Disagree; 4=Neutral; 7=Strongly Agree

		Attribute rating
01	A carbon tax on greenhouse gas emissions will significantly increase the cost of doing business in South Africa	
02	Businesses will be more receptive of a carbon tax on greenhouse gas emissions than a carbon trading scheme	
03	The implementation of a carbon trading scheme is very complex and not suitable to the South African business environment	
04	A carbon trading scheme will give businesses carte blanche to pollute more instead of reducing their carbon footprint	
05	A carbon trading scheme creates a market that rewards companies for lowering their carbon emission	
06	Unlike the carbon trading scheme, a carbon tax effectively addresses emissions of carbon from every sector of the economy	
07	A carbon tax will not compel businesses who can afford the tax to reduce their carbon footprint	
08	A carbon tax will increase the price of products and services since businesses but will simply pass the cost to consumers	
09	The best approach to encourage business to reduce their carbon footprint is to impose the use of alternative energy sources	
10	Imposing energy standards on products such as electrical appliances and motor vehicles is a better approach to dealing with greenhouse gas emissions	
11	Imposing energy standards on products will lead to a significant increase in the cost of Research and Development (R&D) and therefore an increase in the cost of doing business	

Q8. On a scale of 1 to 7 where 1 is Strongly Disagree and 7 is Strongly Agree, please rate your level of agreement with the following statements with regard to what may drive businesses to reduce their carbon footprint.

SINGLE RATING PER ATTRIBUTE ONLY

1=Strongly Disagree; 4=Neutral; 7=Strongly Agree

	Attribute rating
Businesses are genuinely concerned about the impact of greenhouse gas emissions on future generations	
Businesses understand that in order to remain competitive, they have to adopt strategies to reduce their carbon footprint	
Businesses will not reduce their carbon footprint unless they see an economic benefit	
Society is more receptive of businesses that care about the environment	
Businesses understand that reducing their carbon footprint is a social issue that needs to be addressed collectively	

Demographics

Q9. In which economic sector does your organisation mainly operates?

SINGLE MENTION ONLY

Agriculture	1
Forestry	2
Fishing	3
Mining and quarrying	4
Manufacturing	5
Electricity and other utilities	6
Construction	7
Trade	8
Transport	9
Financial and business services	10
Social, personal and community services	11
Other (please specify)	12

Q10. Number of employees in the organisation

SINGLE MENTION ONLY

Less than 20 employees	1
20 to 50 employees	2
51 to 100 employees	3
101 to 200 employees	4
More than 200 employees	5
Other (please specify)	6
Refused	99

Q11. How many sites does your company have in South Africa?

SINGLE MENTION ONLY

One site	1
2 to 3 sites	2
More than 3 sites	3
Refused	99

THANK YOU FOR PARTICIPATING IN THE SURVEY