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A CARBON EMISSIONS TAX AS A MITIGATING STRATEGY FOR REDUCING GREENHOUSE GAS EMISSIONS IN SOUTH AFRICA

by

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ABSTRACT

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Climate Change is fast becoming a reality that is gripping the developed and developing world, its economies and people. Erratic weather conditions, rising temperatures and monsoon like weather has scientists asking questions and some countries moving swiftly to ensure that their economies remain stable whilst trying to deal with climate change.

South Africa has begun to play an influential role, as a developing country, in international negotiations on climate change. South Africa is not under legal obligation to reduce greenhouse gas emissions but as a large contributor of greenhouse gases in Africa and globally, South Africa has a moral obligation to reduce its emissions. Although not obliged to make commitments to reduce emissions, government has seen the importance of considering long term mitigating actions to play its part to reduce emissions.

It can be argued that the policies and strategies being considered are not enough to hold large industries in South Africa more accountable for their own historic responsibility. The “culprits”, the large industries should be more accountable. A tax on greenhouse gas emissions (Carbon Emissions Tax) based on the amount of emissions a corporation produces, should be weighed up as this may be the way towards accountability.

South Africa is faced with the task of juggling development (which is largely based on fossil fuels), the eradication of poverty and climate change. There should be an economic policy in place to address and balance these three aspects, in a positive way. According to this study an appropriate tax on emissions may help South Africa in its mitigating actions

of reducing greenhouse gas emissions, whilst allowing the country to continue on its path of social and economic development.

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OPSOMMING

'N BELASTING OP KOOLSTOF VRYLATING AS 'N VERSAGTENDE STRATEGIE OM DIE VRYLATING VAN KWEEKHUISGASSE IN SUID-AFRIKA TE VERMINDER

deur

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GRAAD: MAGISTER COMMERCII

Klimaatsverandering word vinnig 'n realiteit wat die ontwikkelde en ontwikkelende wêreld, hul ekonomiese welsyn en bevolking in sy greep het. Wisselvallige weersomstandighede, stygende temperature en reënseisoenagtige weer word deur wetenskaplikes bevraagteken en sommige lande neem voorbehoedende stappe om te verseker dat die ekonomie standvastig bly terwyl hul klimaatsverandering hanteer.

Suid-Afrika begin 'n invloedryke rol speel as ontwikkelende land in internasionale verhandelings oor klimaatsverandering. Suid-Afrika verkeer nie onder enige wetlike verpligting om die vrylating van kweekhuisgasse te verminder maar omdat dit grootliks bydra tot die vrylating van kweekhuisgasse in Afrika en wêreldwyd, het Suid-Afrika 'n morele verpligting om sy vrylating te beheer. Hoewel nie verplig om enige onderneming te maak om vrylatings te beheer, het die regering die belangrikheid van langtermyn behoedende aksie gesien, en te oorweeg sodat die regering 'n rol speel om vrylatings te verminder.

Dit kan gesê word dat beleid en strategieë wat tans oorweeg word nie voldoende is om die groot nywerhede in Suid-Afrika meer aanspreeklik te maak vir hul historiese verantwoordelikheid. Die "skuldiges", die groot nywerhede behoort meer toerekeningsvatbaar te wees. Belasting op die vrylating van kweekhuisgas (Koolstof

Vrylatingsbelasting), gegrond op die hoeveelheid vrylating wat ‘n korporasie vervaardig, moet opgeweeg word aangesien dit dalk die weg is tot aanspreeklikheid.

Suid-Afrika het die taak om ontwikkeling op te weeg (grootliks gebasseer op fossielbrandstof), die uitwissing van armoede en klimaatsverandering. Daar behoort ‘n ekonomiese beleid te wees om hierdie drie aspekte op positiewe wyse te balanseer. Volgens dié studie sou ‘n toepaslike belasting op vrylatings dalk bydra daartoe om Suid-Afrika by te staan om behoedende aksie te neem om kweekhuisgas vrylating te verminder, terwyl die land sy sosiale en ekonomiese ontwikkeling voortsit.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

AIDS	Acquired Immune Deficiency Syndrome
CDP	Carbon Disclosure Project
CO^2	Carbon Dioxide
CO^2 -e	Carbon Dioxide Equivalent
DTI	Department of Trade and Industry
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
Gg	Gigagram
GHG/s	Green House Gases
HIV	Human Immunodeficiency Syndrome
IPCC	International Panel on Climate Change
JSE	Johannesburg Stock Exchange
LTMS	Long Term Mitigating Scenarios
LULUCF	Land Use, Land Use Change and Forestry
NCCS	National Climate Change Strategy
SA	South Africa/n
t CO^2 -e	Tonnes of Carbon Dioxide Equivalent
UNFCCC	United Nations Framework Convention on Climate Change
SARS	South African Revenue Services

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

Climate change is a global phenomenon. Concern is rife worldwide because of the foreseeable future damage that climate change may cause to the environment and its natural resources.

"*An overwhelming body of scientific evidence now clearly indicates that climate change is a serious and urgent issue. The Earth's climate is rapidly changing, mainly as a result of increases in greenhouse gases caused by human activities*" (Stern Review, 2006).

Climate change is fuelled largely by the emission of Green House Gases (GHGs). The largest and fastest growing source of GHG emissions is Carbon Dioxide (CO^2). The increase in energy-related emissions of CO^2 is driven by growth in Gross Domestic Product (GDP) per capita and the increase in population numbers. The latter brings with it an increase in the quantity of goods and services that need to be provided, thereby increasing production and hence GHGs (IMF, 2008).

An increase in global temperature due to climate change is expected to cause sea levels to rise and change the amount of precipitation, probably including the expansion of subtropical deserts. Warming is expected to be strongest in the Arctic, with the continuing retreat of glaciers. Other likely effects include the increases in the intensity of extreme weather events, species extinctions and changes in agricultural yields. Warming and related changes will vary from region to region around the globe, although the nature of these regional variations is uncertain (Stern Review, 2006).

A survey on climate change carried out in South Africa (SA) called the Carbon Disclosure Project (CDP) allowed the Top 100 JSE listed corporations to voluntarily measure and report on their carbon emissions. Seventy-four out of the top 100 corporations disclosed their Scope 1 and Scope 2 emissions, reporting total emissions of approximately 233, 6

million metric tonnes of Carbon Dioxide Equivalent (t CO^2-e). SA's provider of electricity had carbon emissions for 2010 of 224, 7 million metric tonnes of CO^2-e (Incite Sustainability, 2010).

SA's total emission is approximately 460 million metric tonnes CO^2-e for 2010 placing SA as the 12th largest emitter of CO^2 in the world (guardian.co.uk, 2010).

As a growing and developing country, SA's economy is highly energy and carbon intensive, with the energy sector responsible for a significant portion of GHG emissions. There is a need for government policy intervention to foster the reduction of GHG emissions, one such method being the possible introduction of a policy on Carbon Emissions Tax. SA does not currently have a Carbon Emissions Tax. According to National Treasury, the Carbon Tax Policy may be a viable option to reduce carbon emissions and shift SA to a low carbon economy (National Treasury, 2010b).

Introducing a new type of tax on carbon emissions can expand on the current tax legislation; provide additional revenue to the fiscus and provide large corporations the opportunity to respond in the reduction of their carbon footprint. Corporations are responsible for a large quantity of carbon emissions as shown by the CDP. Carbon Emissions Tax may encourage large corporations to keep their emissions low by investing in research and development, new technologies or better innovation, the result of which may bring with it long-term benefits for the environment.

There is no direct certainty about which mitigating policy or option will have the greatest impact of achieving the goal of reducing carbon emissions, while keeping the corporations competitive globally as well as reducing the burden that may be shifted onto SA's poorer community. Introducing a Carbon Emissions Tax, appears to be a feasible option, however the reaction to and the implication of the tax should be considered in more detail. There is further uncertainty surrounding structuring of the tax and the method of taxing.

1.2 PROBLEM STATEMENT

The implementation of a Carbon Emissions Tax in SA brings with it implications that may deter SA and its industries from acting now and government from accepting this type of economic policy to reduce carbon and ultimately GHG emissions. These implications are the costs attached to new technologies, impact on corporations' competitiveness globally, the financial impact of the tax, the distributional effect of the tax (corporations passing the cost of carbon tax onto the consumer), the actual structure and administration of the tax.

1.3 PURPOSE STATEMENT

The main purpose of this study is to investigate a Carbon Emissions Tax as a mitigating economic policy for the reduction of GHG emissions and hence climate change in SA. The purpose further is to show the possible impact of the Carbon Emissions Tax may have on sectors in SA and the SA economy. It also aims to show the role that such tax may be able to play in reducing GHG emissions and aiding SA to become a low carbon economy.

1.4 RESEARCH OBJECTIVES

This study will be guided by the following research objectives:

- To determine a feasible Carbon Emissions Tax approach that can be applied in SA;
- To determine the financial implications that Carbon Emissions Tax may have on industry sectors and large corporations in SA;
- To determine the impact that a Carbon Emissions Tax may have on the SA economy and the consumer.

1.5 IMPORTANCE AND BENEFITS OF THE PROPOSED STUDY

At the 16th United Nations Climate Change Conference in Cancun, the world community committed itself to the objective of limiting the rise in global average temperature to no more than 2 degrees Celsius (°C) above pre-industrial levels to prevent further interference of GHGs on the climate.

This study will make a valuable contribution to the government's initiatives and efforts to lower GHG emissions in SA, hence contributing to the world's effort of curbing climate change. The United Nations Framework Convention on Climate Change (UNFCCC) and the Kyoto Protocol called for countries around the world to stabilise GHG emissions and SA has heeded that call.

Furthermore, this study will in principle be of use to the government of SA, to stimulate thinking around the practical application and the effect of a Carbon Emissions Tax. Government may be able to accelerate its efforts by considering a Carbon Emissions Tax. Further insight will be provided into the implementation and possible effects of a Carbon Emissions Tax and when all factors are considered this may have a positive impact.

A tax is viewed as burdensome since there is "more to pay" in the opinion of the taxpayer. Carbon Emissions Tax should not be viewed in the same light. Government should see it as an investment in the future of the country and its people. The long-term benefit may outweigh the cost of this tax. Revenues collected from the tax could be used to further develop any other "green" projects that SA plans to embark on as mentioned in the National Climate Change Response Green Paper.

SA already struggles with poverty, unemployment, low levels of education and the effects of global warming may exacerbate these factors. As a contributor to this global warming and a leading developing nation, SA should act swiftly whilst being realistic.

1.6 DELIMITATIONS

This study is an explorative study. It explores the impact of Carbon Emissions Tax on the different sectors in the economy as well as a sample of large corporations. The findings are not intended to generalise across corporations or even SA.

First World (developed) and Third World (developing) countries' carbon tax and environmental tax policies, where applicable, are considered in arriving at certain opinions.

This study does not include:

- Any commentary from South African Revenue Service (SARS);
- The impact of Carbon Emissions Tax on small corporations; and;
- Details about other environmental policies or mechanisms to reduce carbon emissions. The focus is on (environmental) taxes as an economic policy.

The researcher has l not taken any other factors into consideration but isolated research to Carbon Emissions Taxes.

1.7 ASSUMPTIONS

The assumptions on which this study is based are as follows:

- Implementing a Carbon Emissions Tax in SA may reduce GHG emissions in SA, which in turn helps SA achieve its goal of becoming a low carbon economy and contributes to curbing the negative effects of climate change;
- Implementing a Carbon Emissions Tax in SA may make polluters more accountable for their emissions of GHGs;
- The financial information used can be relied upon; and;
- The voluntary disclosure of CO^2 emissions by the JSE listed corporations is reliable.

1.8 DEFINITION OF KEY TERMS

This study involves a number of key terms, namely carbon dioxide equivalent, Carbon Emissions Tax, climate change, green house gases and global warming, among others. . These terms are defined as follows for purposes of this study:

Annex I Parties include the industrialised countries that were members of the OECD (Organisation for Economic Co-operation and Development) in 1992, plus countries with economies in transition (the EIT Parties), including the Russian Federation, the Baltic States, and several Central and Eastern European States (http://unfccc.int/essential_background/convention/items/php).

Carbon Dioxide Equivalent – a metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential. Carbon dioxide equivalents are commonly expressed as "million metric tons of carbon dioxide equivalents (MMTCO²Eq)". The carbon dioxide equivalent for a gas is derived by multiplying the tons of the gas by the associated global warming potential (https://www.epa.gov/climatechange/glossary.html#C).

Carbon Emissions Tax – "A Carbon Emissions Tax is an environmental tax applied to the burning of fossil fuels in order to discourage the production of green house gas emissions such as carbon dioxide" (http://www.ecolife.com/definition/carbon-tax.html).

Climate Change – Climate change is the long-term shift in weather patterns in a specific region or globally. Climate change refers to changes in a region's overall weather patterns, including precipitation, temperatures, cloud cover and so on (http://www.ecolife.com/definition/carbon-tax.html).

Evapotranspiration – Evapotranspiration is a term describing the transport of water into the atmosphere from surfaces, including soil and from vegetation. The process of evapotranspiration is one of the main consumers of solar energy at the Earth's surface (http://www.eoearth.org/article/Evapotranspiration).

Externalities – "An externality is a market failure that occurs when a cost or benefit is imposed on a third party that is not directly involved in an economic activity or transaction. In other words, externalities refer to situations when the production and/or consumption of goods and services imposes costs or benefits on others that are not reflected in the prices charged for the goods and services being provided. An external cost is often referred to as a negative externality while the benefits are classified as a positive externality" (National Treasury, 2010b).

Global Warming – Global warming is the warming of the earth's surface. Global warming is one kind of change to the climate (http://www.ecolife.com/definition/carbon-tax.html).

Green House Gas – these gases alter the composition of the atmosphere, beyond natural variability of the climate. There are six main GHGs: CO^2, methane, nitrous oxide, hydro fluorocarbons, and perfluorocarbons and sulphur hexafluoride. Each type of GHG has a different warming capacity, referred to as the global warming potential of the gas (National Treasury, 2010b).

Gross Domestic Product – The monetary value of all finished goods and services produced within a country's borders in a specific period of time (usually a year). It includes all of private and public outlays, investments and exports less imports that occur within a defined territory (http://www.investopedia.com/terms/g/gdp.asp#axzz1VC6RvkKD).

Kyoto Protocol – "The Kyoto Protocol was adopted in Kyoto, Japan, on 11 December 1997 and came into force on 16 February 2005. The Kyoto Protocol is an internal agreement linked to the UNFCCC. The major feature of the Kyoto Protocol is that it sets binding targets for 37 industrialised countries and the European community for the reduction of GHG emissions" (Odeku & Meyer, 2010).

Non-Annex I Parties - are mostly developing countries. Certain groups of developing countries are recognised by the Convention as being especially vulnerable to the adverse impacts of climate change, including countries with low-lying coastal areas and those prone to desertification and drought. Others (such as countries that rely heavily on income from fossil fuel production and commerce) feel more vulnerable to the potential economic impacts of climate change response measures. (http://unfccc.int/essential_background/convention/items/php).

Pigouvian Tax – "A Pigouvian tax is a tax levied on market activity that generates negative externalities. The tax is intended to correct market outcome. In the presence of negative externalities, the social cost of a market activity is not covered by the private cost of the activity" (http://en.wikipedia.org/wiki/Pigouvian Tax).

Scope 1 Emission – Scope 1 Emission is a Direct GHG Emission. Direct GHG Emissions occur from sources that are owned or controlled by the company. These include, for example, emissions from combustion in owned or controlled boilers, furnaces

and vehicles, as well as emissions from chemical production in owned or controlled process equipment (Incite Sustainability, 2010).

Scope 2 Emission – Scope 2 Emission is an Electricity Indirect GHG Emission. Indirect GHG emissions associated with the generation of purchased electricity, heat or steam consumed by the company. Purchased electricity, heat and steam are defined as energy that is purchased or otherwise brought into the organisational boundary of the company. Scope 2 Emissions physically occur at the facility where the energy is generated (Incite Sustainability, 2010).

UNFCCC – The United Nations Framework Convention on Climate Change is an organisation that sets an overall framework for intergovernmental efforts to tackle the challenge posed by climate change. It recognises that the climate system is a shared resource whose stability can be affected by industrial and other emissions of carbon dioxide and other greenhouse gases. The Convention came into force on 21 March 1994 (http://unfccc.int/essential_background/convention/items/php).

1.9 RESEARCH DESIGN AND METHODS

1.9.1 Description of Inquiry Strategy and Broad Research Methods

The research is a non-empirical, qualitative study. Non-empirical studies involve a phenomenon that occurs in the real world and studies it in all its complexity (Leedy, P. D & Ormrod, J.E, 2010).

The reasons why a non-empirical research strategy has been chosen is:

- The researcher will be looking into analysis and interpretation of information;
- This study will not depend on numerical data or surveys;
- This study is delicate;
- This study covers sensitive issues;
- The research questions are exploratory, and;
- The available literature on this topic is relatively sparse.

This research is also exploratory. Exploratory research is a method to seek new insights into phenomena and to ask questions. This method of study is appropriate for this research as the researcher is examining something that has not been looked at before. The researcher seeks to provide new insight on the issue of taxing carbon emissions in SA.

For the purpose of this research, the researcher will be gathering data, performing analyses, formulating opinions and thereby seeking new insights with regard to the impact of Carbon Emissions Tax.

1.9.2 Sampling

The researcher also looks at a sample of countries, including developed and developing, that have implemented a tax on carbon emissions. These taxes are analysed and opinions formulated. This information provides the researcher with insight as to how those countries calculated and implemented their tax.

A comparison is made of SA and these countries to determine an appropriate, realistic Carbon Emissions Tax for SA.

A sample of three large corporations listed on the JSE that have disclosed their carbon emissions in the CDP Report are to be evaluated. The Carbon Emissions Tax so calculated is applied to these corporations to provide insight into the impact of the Carbon Emissions Tax on these corporations.

1.9.3 Data Collection

The researcher needs the following data sources to conduct the case studies:

- Carbon emissions disclosure for the different sectors in the economy;
- Information about carbon tax practices in developed and developing countries;
- Financial information for the corporations identified in this study; and;
- Tax information.

Once data has been collected and the analysis completed, the results are to be used to draw conclusions.

1.10 BRIEF OVERVIEW OF CHAPTERS

Chapter 1: Introduction

Chapter One provides an introduction to the background of the study and presents the core research question and research objectives. The importance and benefits of the study as well as the delimitations and assumptions are highlighted. Next, the key terms used in the study are defined after which the research design and methods are described. Chapter One ends by giving an outline of the structure of the rest of the dissertation.

Chapter 2: Literature Review

Chapter Two provides a review of the available literature on climate change globally and in SA. It details the impact of climate change thereto. The chapter addresses SA's response to the issue of climate change and what policies are being developed to address the problem. The chapter goes further into the background and design of a carbon tax.

Chapter 3: Extended Literature Review

Chapter Three provides an in-depth look into what developed and developing countries have implemented by way of a carbon tax. Each country's policies are analysed and comparisons made to SA. Progress as a result of the implementation of the tax is highlighted. The chapter looks at the results of the data analysis and important aspects of the research findings, concluding on the findings thereto.

Chapter 4: Conclusion

Chapter Four sets out what the researcher has discovered and the worth of the findings. The main findings are recapped here. The impact of Carbon Emissions Tax is addressed in detail. The conclusion also shows what the research has added in terms of new knowledge on the topic and the implications thereof.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

The purpose of this chapter is to provide insight into the reality of climate change and how it affects the world. The chapter also looks at how climate change is perceived in SA and responses by the SA government. Finally the chapter takes an in-depth look at a mitigating economic instrument in the form of a Carbon Emissions Tax.

2.2 CLIMATE CHANGE

The sun emits solar radiation or energy. Some of the energy is absorbed by the earth's atmosphere, some is absorbed by the clouds and water vapour before it hits the ground and the rest is absorbed by the earth's surfaces such as forests, deserts, city roads, buildings and the oceans. The energy absorbed by the Earth is later emitted as thermal infra-red energy. The burning of fossil fuels such as coal, oil and natural gas has a negative effect on the climate. The combustion of these fuels generates CO^2 and other GHGs. GHGs absorb the thermal infrared energy emitted by the Earth's surface, trapping solar heat in the atmosphere so the atmosphere warms resulting in an increase in average temperatures. This increase is known as the greenhouse effect or global warming. Climate change is attributed to global warming.

The Earth underwent its natural greenhouse effect before the industrial revolution. Since the start of the industrial revolution human activities have contributed to the additional injection of GHGs into the atmosphere causing the Earth's temperature to be pushed up faster than would have naturally occurred. As people burn more fossil fuel, they add more CO^2 to the atmosphere. As this continues, the average temperature of the atmosphere is expected to rise (Fry, 2008).

Sceptics may argue that human activity does not make a marked difference in the change in global temperature. The increasing temperatures and increased rainfall may be

consistent with the understanding of the physics of the atmosphere. Similarly, increasing levels of CO^2 are expected to occur as the earth and environment evolve and change. It may be true that global warming cannot be solely attributed to human activities, which generate large quantities of GHGs. But as time passes it has become increasingly obvious that humans are the culprits and are beginning to take control of the Earth's climate.

Certain climatic patterns are being observed with extreme weather patterns emerging. These patterns are becoming more frequent. Their effects are becoming evident. Certain weather events are occurring faster than would have naturally occurred. These changes in the climate, with extreme weather conditions have raised concerns leading investigation of other attributes to climate change. One of the concerns emerging being the emission GHGs.

2.2.1 Climate change and its implications globally

Global temperatures have risen rapidly over the past 30 decades. The temperature has continuously increased at a rate of 0.2°C per decade. Changes to the environment started being seen in physical and biological systems as well as seasonal events. Climate change threatens the basic elements of life for people across the world – access to water, food, health, use of land and the environment. On current trends the increase in global temperatures could rise by 2 – 3 °C within the next fifty years or so and having severe impact. The increase in average temperatures across the globe may cause irreversible damage to the climate and threaten lives. Studies have begun to predict the impact that the rise in temperature will cause (Stern, 2006a).

The table below illustrates how the world will change if it continues to warm without any intervention to curb the rise of GHG emissions. It shows the possible impact on the climate, the effect on people and the environment related to every single degree of increase.

Table 1: Possible impacts of climate change

Temp rise (°C)	2°C	3°C	4°C
Human Health	Between 90 million and 200 million more people will be at risk of malaria and other vector and water borne diseases. More people in low-income countries will suffer from diarrhoeal disease and malnutrition.	More than 300 million people will be at risk of malaria globally, and 5-6 billion more people could contract dengue fever. Human health will be threatened by water stress and flooding, especially in Africa and south Asia	Mosquitoes will thrive, exposing 80 million more people to malaria in Africa; 2.5 million more people are likely to become exposed to dengue fever.
Agriculture	A decline in agricultural production will lead to increased hunger in sub-Saharan Africa and South Asia. Canada, Russia and Scandinavia may benefit from a boost to crop yields but rapid rates of warming here could damage roads and buildings.	50-120 million more people will face hunger. A decline in agriculture will cause food prices to rise globally.	Droughts will cause African crop yields to slump by 15-35%. Global food production could fall by 10 %.
Water	Between 662 million and 3 billion people will be at risk from water shortages. Dwindling global water supplies and parched soils will result in land being used more intensely, resulting in desertification.	As many as 3.5 million more people could be at risk of water shortages. Migrations caused by drought could lead to socio-economic and political instability. There will be high risk of drought for southern Europe, West Africa, Central America, the Middle East and parts of North America, Amazonia and China.	The available freshwater will be halved in southern Africa and the Mediterranean.
Ice and Glaciers	A 60% loss of summer sea ice in the Arctic is likely. Antarctica's sea ice could decrease by 25%. A 1.5% increase in temperature could trigger melting of Greenland's ice sheet	Scientist's expect the summer sea ice to almost completely disappear from the Arctic. A 3°C warming over several centuries will destroy the Greenland ice sheet and the Antarctic ice shelves.	Half the Arctic tundra will be at risk. Europe stands to lose 80% of its Alpine glaciers. Melting of the West Arctic and Greenland Ice sheets will speed up.
Ecosystems	We stand to lose one quarter of current species. 95% of most corals could perish by the middle of the century, with adverse impacts to subsistence and commercial fishing, tourism and the coastal protection provided by reefs. The associated economic cost could be A$4.3 billion per year for Australia's Great **B**arrier Reef alone. There will be a 43% risk of change in global forest to non-forest ecosystems, along with the expansion of forests into the Arctic and semi-arid savannas.	About 33% of current species could be lost. There will be little hope of recovery from annual bleaching of the remaining coral owing to the increased acidity of the oceans from abnormally high levels of absorbed CO^2. There is an 88% risk that global forests will change to non-forest systems, along with risks of forest losses in parts of Eurasia, Amazonia and Canada. Forests may also disappear from eastern China, Central America and the Gulf coast of the USA. Scientists anticipate the loss of half of wetland in the Mediterranean and Baltic, along with several migratory bird habitats in the USA. Many ice dependent species will likely become extinct, including polar bears.	Half of land species may now be threatened with extinction.

Temp rise (°C)	2°C	3°C	4°C
Sea-Level Rise	Between 25 million and 50 million people will be t risk from sea-level rise and coastal flooding, costing nations hundreds of billions of dollars	180 million people will be at risk of coastal flooding due to sea-level rise and water stress. Hundreds of thousands of people may have to migrate to other regions or countries.	Sea levels could rise by as much as 59cm. Bangladesh and Vietnam will be worst hit, along with coastal cities such as London, New York, Tokyo, Hong Kong, Calcutta and Karachi. Small islands in the Caribbean and Pacific would become uninhabitable. There would be 1.8 million people at risk from coastal flooding in Britain alone.
Extreme Weather	Increase in the frequency and intensity of floods, droughts, storms, heat waves, tropical cyclones, hurricanes and other extreme events will drive up economic costs and decrease opportunities for development	Scientists expect massive increases in the frequency and intensity of fire, drought, storms and heat waves. Socio-economic losses from global damage could range from 3-5% of GDP for developing countries, with a global average of 1-2% for warming between 2.5°C to 3°C.	Hurricane wind strengths could increase by 15-25%, causing great damage to buildings, roads and telecommunications infrastructure.

Source: Adapted. IPCC, 2007 & Fry, 2008

According to the Stern Review the rise in global temperatures should be limited to less than 2°C on preindustrial levels. If not, the effects of warming and climate change will be felt worldwide even if it impacts each part of the world on a different scale. Developing countries are more vulnerable to the impacts due to their geographic exposure, low incomes and greater reliance on climate sensitive sectors (Stern, 2006a).

Some systems, sectors and regions are likely to be especially effected by climate change. The systems and sectors include:

- Particular ecosystems:
    - Terrestrial: tundra, boreal forest and mountain regions because of sensitivity to warming;
    - Mediterranean-type ecosystems because of reduction in rainfall; and tropical rainforests where precipitation declines;
    - Coastal: mangroves and salt marshes, due to multiple stresses;
    - Marine: coral reefs due to multiple stresses; the sea-ice because of sensitivity to warming;
- Water resources in some dry regions at mid-latitudes and in the dry tropics, due to changes in rainfall and evapotranspiration and in areas dependent on snow and ice melt;
- Agriculture in low latitudes, due to reduced water availability;
- Low lying coastal systems, due to threat of sea level rise and increased risk from extreme weather events;
- Human health in populations with low adaptive capacity.

The regions include:

- The Arctic, because of the impacts of high rates of projected warming on natural systems and human communities;
- Africa, because of low adaptive capacity and projected climate change impacts;
- Small islands, where there is high exposure of population and infrastructure to projected climate change impacts;

- Asian and African mega deltas, due to large populations and high exposure to sea level rise, storm surges and river flooding (IPCC, 2007).

2.2.2 Climate change implications in South Africa

Africa is seen to be vulnerable to the impact of climate change. It has a high dependency on natural resources and agriculture for income, taxes, export, employment and food. With most of Africa's wealth tied up in natural resource assets and with its already poor infrastructure, adverse weather conditions will affect the African continent and SA in a very harsh way (Stern, 2006b).

Scientific models were used to explore the potential impact of climate change on SA over the next 50 years, and predicted the following:

- A continental warming of between 1 and 3 °C;
- Broad reductions of approximately 5 – 10 percent of current rainfall, but with higher rainfall in the east and drier conditions in the west of SA;
- Increased summer rainfall in the northeast and the southwest, but a reduction of the duration of the summer rains in the northeast, and an overall reduction of rainfall in the southwest of SA;
- Increased rainfall in the northeast of the country during the winter season;
- Increased daily maximum temperatures in summer and autumn in the western half of the country, and;
- Wetter conditions with a reduction in frost, which could see malaria mosquitoes, expand their range onto the Highveld.

A rise in temperature may cause sea levels to rise, causing those people living on coastal areas to lose their homes or retreat inland; water resources may dry up causing restrictions on water usage impacting crops and livestock thereby effecting food supplies. A rise in temperature may also change the amount of precipitation causing some areas to experience torrential rains. Many vulnerable regions, with high levels of population may be adversely affected.

As the climate changes, it is SA's poor, being the majority of the population, who will be the hardest hit. Climate change worsens existing vulnerabilities and adds to the pressures on the environment and natural resources on which so many South Africans directly rely. Poor people have limited resources to cope with the impact of global warming and are more dependent on the ecosystems for their livelihood. This has been exacerbated by SAs history of apartheid. Poor people were pushed into areas that may in the future be severely impacted by climate change both in rural areas and urban informal settlements.

Climate change could increase the prevalence and distribution of vector-borne diseases such as malaria and dengue fever and water-borne diseases such as cholera and dysentery. Such things mean that people living with HIV and AIDS in particular are in more danger of being put at risk (Earthlife Africa & Oxfam International, 2009).

Corporations too will feel the impact of climate change. As weather patterns become extreme infrastructure may be damaged, transport systems breakdown, agriculture affected, insurance costs increased, working conditions changed and resources impacted on negatively (The Government of SA, 2010).

2.3 THE PERCEPTION AND RESPONSE TO CLIMATE CHANGE IN SOUTH AFRICA

SA a non-annex I country announced it willingness to undertake mitigating actions to reduce GHG emissions by 34 percent by 2020 and 42 percent by 2025. This took place during the Copenhagen Climate Change negotiations held in December 2009.

The possible effects of climate change are now well documented as being potentially drastic. These effects are estimations and predictions of future occurrences implying that there is uncertainty over the specifics in climate change. Quantifying the magnitude of damage is unknown. However, climate change is a real threat. This should encourage corporations and government to react.

2.3.1 Government's perception

SA has initiated a number of actions that may reduce the pace of carbon emissions. These include policies to restructure the energy sector, stimulate economic development, increase access to affordable energy services, and manage energy-related impacts, as articulated in the government's 1998 Energy White Paper (Odeku & Meyer, 2010).

The SA cabinet commissioned a process to examine the potential for mitigation of our countries GHG emissions (most important of which is CO^2). The process was to be backed by the best information available. The aim was to produce Long-Term Mitigating Scenarios (LTMS) that would provide a sound scientific analysis from which cabinet could draw up a long-term climate policy. The LTMS focuses on mitigation. The cost of inaction is very real for SA. Even though the cost of the negative impact of climate change is not quantified in monetary value, the ultimate cost for SA of not acting proactively exceeds that of inaction.

Most of the GHG emissions are attributed to the energy sector so most of the work focused on achieving reductions in this sector. However, mitigation may be achieved through many sectors, not only by means of technology, but also by means of behavioural change.

A scenario building team defined the scenarios for mitigation plans. The first scenario was a Growth Without Constraint (GWC) scenario. GWC showed that if the SA economy grows with constraint over the next few decades, GHG emissions would continue to escalate. If other countries did the same, the implications are that global emissions would increase dramatically and dangerous climate change would very likely be upon us. The predicted impacts of climate change would be at the higher end of the projections, rather than the more cautious estimates. This would in turn have a serious impact on SA.

The second scenario is a Required By Science (RBS) scenario. This scenario asked, what if SA reduced its emissions by the same percentage that is needed globally i.e. SA joins the world community in taking action to stabilise GHG emissions and negotiates a target as its fair contribution to the vision shared by the world. According to the IPCC, to stabilise GHG emissions, global reductions of between -60% to -80% from 1990 levels should be achieved by 2100. This target should be shared between nations and the burden is subject to negotiation.

Looking at the RBS scenario, SA's burden sharing looks to be in the range of -30% to -40% from 2003 to 2050. This 'discounted' percent takes into account SA's position as a developing country. To get to its burden sharing position, further discounting depends on a number of factors as follows:

- SA's status as a developing country;
- Its imperative to reduce poverty;
- The coal-based nature of the economy, and the effect and cost to make the necessary changes required, and;
- Technology and financial resource transfer as required.

The two scenarios discussed are very different approaches under consideration. With the GWC scenario, the prediction is that SA continued growing successfully up to 2050. No negative impacts of climate change were taken into account. However, SAs GHG emissions have quadrupled.

The RBS scenario sees SA in a very different way by 2050. Through joint international action SA has managed to reduce emissions to -30% to -40% of 2003 levels. New technologies dominate, the largest emission reduction is seen in the fuel and energy sectors and further emission reduction occurs through the widespread change in human behaviour. Most citizens are actually concerned about emissions and have adopted a low emission lifestyle.

To follow GWC SA would have to ignore the (carbon-conscious world's) calls to reduce GHG emissions and the predictions of the catastrophic impacts climate change could have due to the increase in GHG emission. Therefore GWC is not a plausible option.

The LTMS then looks at RBS and what options are available to reduce GHG emissions; focusing on the energy sector given that most emissions are attributable to this sector. A group of mitigating options are considered in the LTMS, including one alluding to an economic instrument, as well as its impact on the economy. The options offered are implementable and require a significant amount of effort. Despite the cost associated with the effort, the LTMS shows that SA government is on a positive path with its intention to

reduce GHG emissions. With the support of its citizens and strong, committed leadership much may be achieved (Energy Research Centre, 2007).

The SA government has thus far played a positive role in pushing for firm action in climate change negotiations on the international stage. With the release of the LTMS, the government announced that targets would be set for reducing emissions, and that government may impose a carbon tax to limit the country's contribution to global warming. The LTMS proposes a carbon tax of about R100 per ton of CO^2 emitted.

This is reiterated in The National Climate Change Response Green Paper. The paper outlines policies that serve as government's commitment to the stabilisation of global GHG concentrations in the atmosphere and the protection of the country and its people from the impacts of unavoidable climate change. The objective is to get a climate change response that may be applied and is realistic. Strategies to achieve the said objectives are outlined. The paper relays government's concerns, intentions and plans to address the problem of climate change. It shows government's willingness to adopt policies and processes to target the problem of the climate change, addressing implications and actions for the different sectors of the economy (SA Government, 2010).

Many of the actions and plans focus on educating the public, raising awareness and implementing specific policies and practices to target improved technology, research and development. The responses put forward are adequate to achieve our aim of becoming a low-carbon economy. The deadlines indicated are specific and measurable. However, the deadlines are also short, with some targets needing to be achieved in 2012. Concern should be given to the possibility that these deadlines may not be met in time and the speed at which emission reduction occurs may not be quick enough.

National Treasury is currently leading the development of economic instruments to manage GHG emissions, with its primary medium focus being the introduction of a carbon tax of some kind.

To date government implemented the electricity generation tax on 01 July 2009. This is the closest resemblance to a carbon tax that SA has seen. The Minister of Finance in his 2009

Medium Term Budget Speech stated, “The electricity levy should be seen as the first step towards the introduction of a more comprehensive emissions based carbon tax”.
In addition to the electricity levy, the government has also introduced over the last three years:

- Energy efficiency savings tax incentives;
- Energy efficiency-related criteria in the Industrial Production Policy incentive, developed in conjunction with the DTI;
- Tax exemption of income derived from the sale of primary certified emissions reductions (CERs) from Clean Development Mechanisms Projects;
- A specific tax on new passenger vehicles based on their carbon emissions; and
- An increase in the general fuel levy with the intention to, in future, equalise the levy on petrol and diesel.

The budget speech highlighted the need for environmental taxes to be explored to raise more revenue and to meet environmental objectives (National Treasury, 2010a).

The issue of the environment and innovation is of importance to government because market forces alone do not properly address either issue. There is no price for polluting therefore it is perceived that corporations and consumers pollute too much. Government has a range of environmental policy tools at its disposal. No single instrument can be considered best to address every environmental challenge but there seems to be a growing movement towards environmentally related taxation (Devarajan, Go, Robinson & Thierfelder, 2009; OECD, 2010).

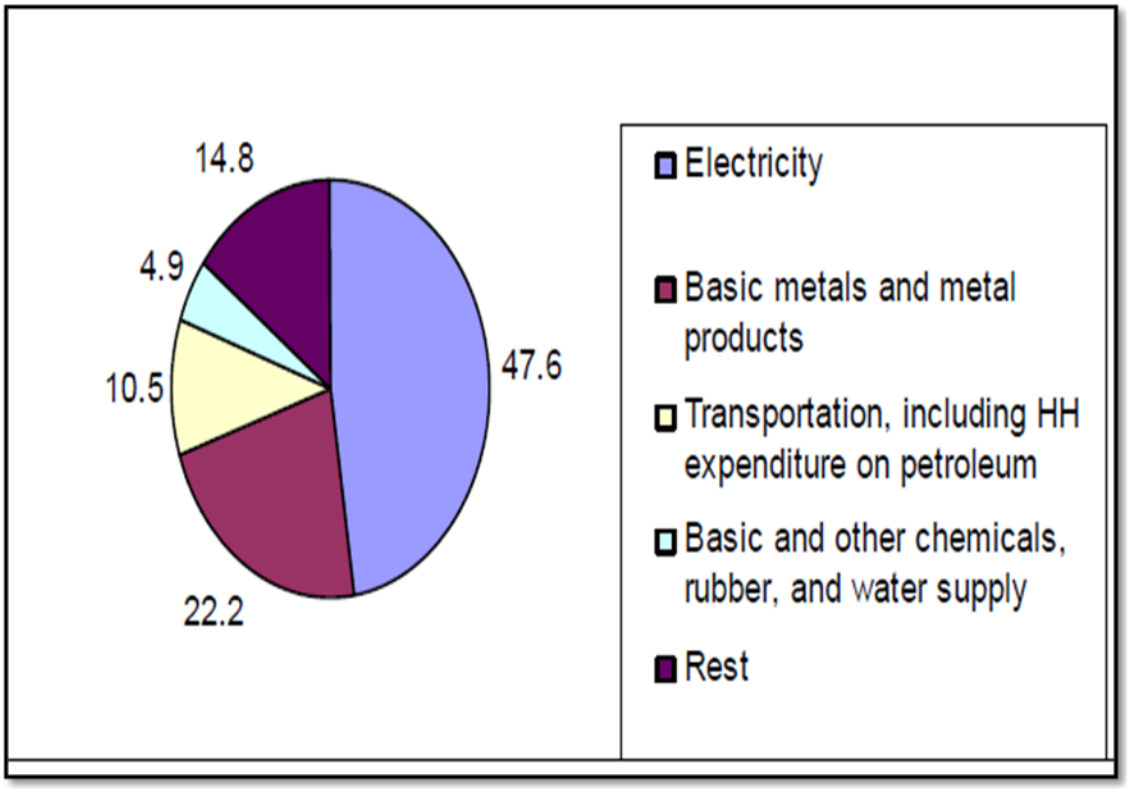
2.3.2 Large Corporations’ perception

There are a few large corporations whose GHG emissions contribute to most of the emissions in SA. If corporations are serious about contributing to containing their carbon emissions in alignment with the commitment made by the SA government at the Copenhagen summit, then it needs to actively participate in the transition.

Looking at SA's GHG emissions different sectorial (figure 1) emissions can be identified. Because of its heavy reliance on coal as input, the power sector is the largest emitter of CO^2 is SA, accounting for 48 percent of total CO^2 emissions. Metallic products use coal to fire up furnaces and emit about 22 percent of CO^2. The transportation sector including household use of petroleum accounts for 10.5 percent of CO^2 emissions. The chemical, rubber, water supply, other mining and food manufacturing sectors are also notable contributors to CO^2 emissions (Devarajan, *et al*., 2009; National Treasury, 2010b).

The figure below shows CO^2 emissions per sector.

Figure 1: Emissions of CO^2 by sector



Source: Devarajan, S., Go, DS. Robinson, S. & Thierfelder, K. 2009. Tax Policy to Reduce Carbon Emissions in South Africa.

The Carbon Disclosure Project Report showed that large corporations are aware of the industry specific risks that are associated with climate change and extreme weather. These corporations are aware of the negative impact that would be made to their sectors if GHG emissions are not controlled and reduced. There is an improved understanding across most sectors of the potential business implications of climate change. Corporations

are beginning to quantify the potential financial implications of climate change (Insight Sustainability, 2010).

The target of reduction by 34 percent by 2020 is nine years away. It is clear that more needs to be done in conjunction with already existing mitigating practices and processes to achieve this target. Where there is uncertainty around specific climatic effects but these effects have potentially significant impacts, risk management should be implemented by corporations to address exposure. There should be precautionary; cost effective measures in place even where probability is low.

Government has developed policies on climate change as seen from above. These policies should be accompanied by implementable plans and actions and more importantly a visible changed government policy to hold industry accountable. The energy sector may be the place to start if SA wants its mitigation approach to indeed be a success.

2.4 CARBON EMISSIONS TAX

2.4.1 What is a Carbon Emissions Tax

A Carbon Emissions Tax is an environmental tax that is levied on the carbon content of energy products. A Carbon Emissions Tax seeks to reduce GHG emissions by pricing it directly. An environmental tax is a market based pricing instrument, putting a price on GHG emissions. Market based instruments offer corporations flexibility in the way they reduce their emissions and the quantity of emission reduction to be achieved. This pricing of emissions allows for the internalisation of an otherwise unaccounted for externality (OECD, 2009).

A Carbon Emissions Tax is a type of Pigouvian Tax, helping to address the problem of emitters of GHGs not facing the full social cost of their actions. This is a regressive tax in that it disproportionately affects low-income groups. The regressive nature of the tax can be addressed by using tax revenues to favour low-income groups.

In economic theory, pollution is considered to be a negative externality, a negative effect on a party not directly involved in a transaction, which results in market failure. To confront parties with the issue the economist Arthur Pigou proposed taxing the goods (in this case fossil fuel) that was the source of the negative externality (carbon dioxide) so as to accurately reflect the cost of the goods' production to society, thereby internalising the costs associated with the goods' production. (Wikipedia, 2010)

The theory behind using taxes to internalise externalities dates back over seventy years to writing of Arthur Pigou but there is little experience with the design of these taxes and almost none with a "Pigouvian Tax" that covers a substantial portion of the economy, as would a Carbon Emissions Tax. A Carbon Emissions Tax is one way in which external costs can be internalised into consumption and production decisions (Metcalf & Weisbach, 2009; National Treasury, 2010b).

Metcalf explains further that the principles for setting the correct tax rate were established in the past by Pigou, that at any level of emissions, the tax rate should equal the social marginal damages from producing an additional unit of emissions or more or less equivalently, the social marginal benefit from abating a unit of emissions. If the tax had to be set at a fixed rate the optimal rate should be where the marginal benefit of abatement equals the marginal cost of abatement.

To estimate the optimal tax rate would be difficult and there would be wide variations. The calculation too would be difficult because it involves combining uncertainties, including predictions of the local effects in climate change, with predictions about economic and technological developments in the distant future (Metcalf & Weisbach, 2009).

An environmental tax does not require the regulator to understand in detail the technicalities of the operations being regulated, or to specify which technologies are to be allowed to control pollution. The environmental tax gives the polluter a direct financial incentive to control pollution regardless of the level of pollution being produced. Imposing a fee on the amount of pollution a firm generates aims to penalise harmful activities and discourage use of goods that result in damage to the environment.

The National Treasury views a Carbon Emissions Tax to be a favourable mechanism to catch high emitters. Climate change and its effects can be attributed to GHG emissions, which are not being paid for by emitters. The environment is a "public good" and these so-called high emitters are seen to be depleting and putting strain on this public good. With a Carbon Emissions Tax in place the emitters can be held more accountable for their "behaviour" and can ensure that their activities result in less tax being paid and hence less GHG are being emitted. By placing a direct cost on environmental damage this may force polluters to consider the full set of consequences from emissions.

Various authors have contributed to the topic of a carbon tax in SA, including Van Heerden *et al*, Pauw, Devarajan *et al* and Kearney all attempting to measure the impact of taxes on emissions and/ or mitigating strategies in SA. The paper by Van Heerden focuses on finding double or triple dividend from revenues raised from energy related taxes if recycled to households and industry by lowering existing taxes, while Pauw focuses on the impact of the LTMS scenarios specifically and Devarajan focused on the economic impact of various taxes aimed at reducing carbon emissions. Kearney's paper used Dynamic Computable General Equilibrium to assess the combined impact of the LTMS scenarios and taxes on energy emissions. This paper aims to add value to the debate of adopting a Carbon Emissions Tax in SA to lower GHG emissions.

2.4.2 The design of a Carbon Emissions Tax

Certain things need to be considered when a carbon tax is designed. The idea behind taxes on pollution is also to provide incentives to the polluter to reduce emissions and ultimately seek cleaner alternatives. The main thrust of the tax should not only be to tax emissions but also ensure that emissions start to at least slow down in the near future, thereby slowing climate change. The tax policy created in this regard should not have room for negotiation.

Under consideration should be environmental effectiveness and the ability of the tax to reduce GHG emissions. The tax should encourage reduced emissions. There should be incentives in place for corporations who are on an ongoing path of reducing their emissions. Similarly, corporations that do not show any indication of wanting to reduce

emissions but rather pay the tax should be penalised by paying a greater amount of tax. The intention is to prevent corporations from becoming complacent and becoming comfortable with paying a tax.

Competitiveness of corporations that participate in international trade should be considered. These corporations may be at a disadvantage when competing with countries that do not price emission. The tax should be designed to neutralise the effect of competitiveness through sectorial exemptions and tax reduction.

Other important considerations are the ultimate impact on low-income households and job loss due to corporations cutting costs. The Carbon Emission Tax should not contribute to issues of poverty and unemployment. It should be low enough to implement and sustain without passing too great a burden onto consumers.

Ideally, a tax to reduce GHG emissions should be levied directly on the entity responsible for the emission and based on the quantity emitted. A tax based directly on measured emissions can be precisely targeted. When the polluters' emissions increase the polluter's tax liability increases and they pay additional tax in proportion to the increase in emissions. If the polluter wishes to reduce their liability, it may result in a reduction in emissions (National Treasury, 2010b).

2.5 CONCLUSION

It would be difficult to determine what the appropriate tax rate would be. When looking at a carbon tax on emissions maybe there should be a different tax rate applied to each sector. The tax rate may depend on the energy and CO^2 intensity of the sector. It has been established that the energy sector appears to be the target to reduce emissions. Doing this may appear to favour certain sectors and probably make the rate even more difficult to determine.

A tax based on measured emissions may obtain the desired results. Who would provide these measurements? Would scientists vary them? Is this to be an administrative burden on the government and corporations? Would it include holding corporations and their

domestic and international subsidiaries? These are some of the questions that would possibly need to be addressed when designing the tax.

Ultimately the implementation of a Carbon Emissions Tax should be two-fold. It should not be perceived or treated as a revenue generating mechanism for the fiscus but rather a way to penalise corporations and force them to lower emissions thereby focusing on reduced emissions. The revenue collected should be clearly distributed to all funds and projects whose objectives are aimed at environmental conservation.

CHAPTER 3

EXTENDED LITERATURE

3.1 INTRODUCTION

The purpose of this study is to look at Carbon Emissions Tax as an option for SA to reduce its GHG emissions. Carbon and environmental taxes are being implemented around the world; mainly by Annex I developed nations, in response to their commitments under the UNFCCC and the Kyoto Protocol. Non Annex I parties have shown their commitment by producing nationally appropriate mitigating scenarios they wish to implement to reduce their GHG emissions. There are a few Non-Annex I nations who have taken the bold step to implement carbon taxes as a way forward for their country. Looking at what these countries have done can provide insight into a way forward for SA with a carbon tax option. This chapter looks at a sample of countries and the taxes they have implemented.

3.2 DATA ANALYSIS

Before turning to policy options for SA, it is worth looking at the environmental taxes implemented by some countries to gain knowledge from international experience. In countries where carbon taxes have been implemented, differential rates have been applied based on both carbon and energy content.

Table 2 below shows the summary of the GHG inventory for the Annex 1 and Non-Annex 1 parties above. The GHG submission is made by each country per GHG gas per category. The GHG gases recorded are Carbon Dioxide, Methane, Nitros Oxide, Hydrochlorofluorocarbons and Chlorofluorocarbons.

The categories include Energy, Industrial Processes, Solvent and other product use, Agriculture, LULUCF, Waste and Other (Emissions from Biomass, International bunkers and Multinational operations).

Table 2: GHG Inventory

Annual greenhouse gas (GHG) emissions, in Gg CO^2 equivalent							
Total GHG emissions including LULUCF							
Country	**1990**	**1994**	**1995**	**1996**	**2000**	**2005**	**2009**
Costa Rica	8,529.46	No record	No record	10,069.83	7,872.81	8,606.73	No record
India	No record	1,228,540.14	No record	No record	No record	No record	No record
Demark	72,526.41	82,351.04	78,477.10	90,327.80	72,173.86	68,659.61	61,176.53
Finland	55,325.75	60,797.77	57,490.87	53,830.25	48,225.14	40,813.38	25,777.89
Ireland	54,255.09	56,456.79	57,705.89	59,772.87	67,076.99	67,857.21	60,221.79
Netherlands	214,543.96	222,426.14	225,788.28	233,666.96	215,736.39	213,792.48	201,346.62
Switzerland	50,396.52	46,325.94	47,963.06	48,804.58	53,394.03	53,816.79	52,037.43

Source: Adapted. UNFCCC, online

Non-Annex I Parties

Costa Rica

In 1997, Costa Rica imposed a 3.5% carbon tax on fossil fuels. A portion of the funds generated by the tax are channelled to a "Payment for Environmental Services" (PSA) programme which gives incentives to property owners to practice sustainable development and forest conservation. Approximately 11% of Costa Rica's national territory is protected by the plan. The programme now pays out roughly US$15 million a year to around 8,000 property owners.

In addition to the above Costa Rica has decided to declare its goal of becoming a carbon neutral territory by 2021. The country is designing an integrated climate change strategy to achieve carbon neutrality of its economy in a way that this complex goal can be replicated in other countries with similar characteristics.

Costa Rica is the only developing country to have early implementation of a carbon tax. It is also the greenest and happiest country in the world according to a new list that ranks nations by combining measures of their ecological footprint with happiness of citizens.

Table 2 above shows Costa Rica's GHG Inventory record. It shows how low the GHG emission is in the country and any increase is very slight.

A 3.5% tax is high for SA. Costa Rica has approximately 10 percent of the population size of SA. With a small population and a small percentage of unemployment, it is easier for Costa Rica to implement such a direct tax. SA has more to take into consideration and cannot implement a tax at the risk of making the country worse off.

India

On July 1, 2010 India introduced a nationwide carbon tax of 50 rupees per metric tonne ($1.07/t) of coal both produced and imported into India. In India coal is used to power more than half of the country's electricity generation.

India's total coal production is estimated to reach 571.87 million tons in the year ending March 2010 and is expected to import around 100 million tons. The carbon tax expects to raise 25 billion rupees ($535 million) for the financial year 2010–2011. According to Finance Minister Pranab Mukherjee, the clean energy tax will help to finance a National Clean Energy Fund (NCEF). Industry bodies have not favoured the levy and fear that the resultant higher price of coal could trigger inflation.

While many remain apprehensive, a carbon tax represents a step towards helping India meet its voluntary target to reduce the amount of carbon dioxide released per unit of gross domestic product by 25% of its 2005 levels by 2020. Environment Minister Jairam Ramesh told reporters in June 2010 that a domestic tax should come before a global carbon tax, and India has imposed one while others debate the issue.

The only inventory recorded for India was in 1994 (Table 2). No other entries were made.

India is very similar to SA in that it also has a high GHG emission, which may be problematic for the country. India is overpopulated and like SA, poverty is a concern. India sees a GDP growth that is higher than SA but due to its population size the GDP Growth per capita is much lower than in SA. With these demographics the government still decided to implement a carbon tax. India has shown that being a poor developing nation does not deter a country from its moral obligation in terms of acting swiftly to reduce its GHG emissions (Wikipedia, 2010).

Annex I Parties

Denmark

As of the year 2002, the standard carbon tax rate since 1996 amounts to 100 Danish Krone (DKK) per metric ton of CO^2, equivalent to approximately 13 Euros (€) or 18 US Dollars ($). Net carbon emission tax from fuel combustion can vary depending on the level of pollution each source emits, the tax rate varies between 402 DKK per metric ton of oil to 5.6 DKK per metric ton of natural gas and 0 for non-combustible renewables. The rate for electricity is 1164 DKK per metric ton, equivalent to .013 € or .017 US $ per kWh. The CO^2 tax applies to all energy users, including the industrial sector. But the industrial companies can be taxed differently according to two principles: the process the energy is used for, and whether or not the company has entered into a voluntary agreement to apply energy efficiency measures. Danish policies like this provide incentives for companies to put in place more sustainable practices.

In 1992 Denmark issued a carbon dioxide tax that was about $14 for business and $7 for households, per ton of CO^2. However, Denmark offers a tax refund for energy efficient changes. One of the main goals for the tax is to change people's habits, because most of the money collected would be put into research for alternative energy resources. Denmark also needs to be behind this by actually showing they are investing and not just collecting money.

Finland

Finland introduced the world's first CO^2 tax based on the carbon content of fossil fuels in January 1990, as an instrument of climate change mitigation. The tax rate evolved from 1.12 € per litre of CO^2 in 1990 to 20 € per litre of CO^2 in 2010. Some deviations existed: natural gas met a reduced rate, and peat (a source of fuel from decaying vegetation matter) was exempted from 2005 to 2010. From 1994 to 1996, a combined CO^2 base of carbon + energy content was applied. Since 1997, the carbon tax was imposed only on traffic fuels and heating fuels; electricity was taxed per kilowatt-hour and the fuels were exempted. Short haul emissions of traffic fuels have been handled in the past variously by differentiation of the main (Fiscal) component of the fuel tax, beginning in 1986 with lead

and petrol. Individual tax rates were defined only for “traditional” main fuels (petrol, diesel oil, and so forth), and the substitutes (e.g. bio – components) met the same rate.

The general structure of energy taxation in Finland was changed as of 1 January 2011 – for the first time after the tax reform in 1997. Taxation of liquid fuels and coal again takes account of both the energy content and CO^2 emissions and, in a more refined way, emission into the local environment that has adverse health effects. The revised fuel tax has an energy component and a CO^2 component while the replaced tax had a “faceless” fiscal main component (for transport fuels) and a CO^2 component. The energy component of liquid fuels is largely based on energy content but differentiated according to local emissions (and diesel oil having a reduced rate). The new CO^2 is based on a life cycle approach to emissions, rather than on combustion gas emissions only. Quite a few new objects (notably renewables) appear in the tax scale. Changes were made to the carbon tax to partially exclude energy-intensive firms. This had the effect of increasing the costs of reducing CO^2 emissions (Wikipedia, 2010; www.environmental.fi, Not dated).

Netherlands

The Netherlands initiated a carbon tax in 1990. However, in 1992 it was replaced with a 50/50 carbon/energy tax called the Environmental Tax on Fuels, the taxes are assessed partly on carbon content and partly on energy content. The charge was transformed into a tax and became part of general tax revenues. The general fuel tax is collected on all fossil fuels. Fuels used as raw materials are not subject to the tax. Tax rates are based 50/50 on the energy and carbon contents of fuels. In 1996 The Regulatory Tax on Energy was another 50/50 carbon/energy tax that was also implemented. The Environmental tax and the regulatory tax are 5.16 Dutch guilder, or NLG, (~$3.13) or per metric ton of CO^2 and 27.00 NLG (~$16.40) per metric ton CO^2 respectively. Under the general fuel tax, electricity is not taxed, though fuels used to produce electricity are taxable. Energy-intensive industries used to benefit from preferential rates under this tax but the benefit was cancelled in January 1997. In addition, since 1997 nuclear power has been taxed under the general fuel tax at the rate of NLG 31.95 per gram of uranium.

More recently, in 2007, The Netherlands introduced a Waste Fund that is funded by a carbon-based packaging tax. This tax encourages producers to create packaging that is recyclable and was implemented to help reach the goals of recycling 65% of used

packaging by 2012. The company Nedvang (Nederland van afval naar grondstof or The Netherlands from waste to value), which was set up in 2005, is the largest organisation supporting producers and importers of packaged goods reaching individual company goals under the Dutch packaging decree. This decree was signed in 2005 and states that producers and importers of packaged goods are responsible for the collection and recycling of that waste, and that at least 65% of that waste has to be recycled. Producers and importers can choose to reach the goals on an individual basis or by joining an organisation like Nedvang.

The Carbon-Based Tax on Packaging consists of taxing:

- Glass: € 71,80/ tonne (~$ 91.99/ tonne);
- Aluminium (including Alloys): € 950,60/ tonne (~$ 1,219.00/ tonne);
- Ferrous metals: € 158,50/ tonne (~$ 203.09/ tonne);
- Plastics: € 470,50/ tonne (~$ 602.75/ tonne);
- Paper/Cardboard: € 79,50/ tonne (~$ 101.86/ tonne);
- Wood: € 21,00/ tonne (~$ 26.90/ tonne)

Ireland

Initially the Irish Government rejected the introduction of a carbon tax as a policy option. However, in the 2010 budget the country's first carbon tax was introduced. The new tax was levied at €15 per tonne of CO^2 emissions (approx. $20 per tonne).

The carbon tax applies to kerosene, marked gas oil, liquid petroleum gas, fuel oil, and natural gas. The Natural Gas Carbon Tax does not apply to electricity because the cost of electricity is already included in pricing under the Single Electricity Market (SEM). Similarly, natural gas users are exempt from the tax if they can prove they are using the gas to "generate electricity, for chemical reduction, or for electrolytic or metallurgical processes". A partial relief from the tax is granted for natural gas delivered for use in an installation that is covered by a greenhouse gas emission permit issued by the Environmental Protection Agency. The natural gas concerned is taxed at the minimum rate

specified in the EU Energy Tax Directive, which is €0.54 per megawatt hour at gross calorific value." Pure biofuels are also exempt.

There is concern that the carbon tax may disproportionately affect elderly persons and low-income households. The tax is paid by companies to the Collector General. Fraudulent violation is punishable under section 1078 of the Taxes Consolidation Act 1997 which allows for a jail sentence of up to 5 years or a fine of no more than €126,970. Failure to comply with the tax violates section 73 of the Finance Act of 2010. Payment for the first accounting period was due in July 2010.

Switzerland

In January 2008, Switzerland implemented a CO^2 incentive tax on all fossil fuels, such as coal, oil and natural gas, unless they are used for energy. Gasoline and diesel fuels are not affected by the CO^2 tax. The tax is collected by the Swiss Federal Customs Administration. It is an incentive tax because it is designed to promote the economic use of fossil fuels. The tax amounts to 12 Swiss Franc (CHF) per metric tonne CO^2 ($11.41 per metric tonne CO^2), which is the equivalent of CHF 0.03 per litre of heating oil ($0.0076 per gallon) and CHF 0.025 per m3 of natural gas ($0.024 per m3). This tax comes from Switzerland's 1999 Federal Law on the Reduction of CO^2 (CO^2 Law). Although Switzerland prefers to rely on voluntary actions and measures to achieve emissions reductions, the CO^2 Law mandated the introduction of a CO^2 tax if voluntary measures proved to be insufficient. In 2007, the CO^2 tax was approved, coming into effect in 2008. In 2010, the highest tax rate was CHF 36 per metric tonne of CO^2 (US $34.20 per metric tonne CO^2).

Companies are allowed to exempt themselves from the tax by participating in a Swiss cap-and-trade emissions trading scheme where they voluntarily commit to legally binding targets to reduce their CO^2 emissions. Under this scheme, emission allowances are given to companies for free, and each year emission allowances equal to the amount of CO^2 emitted must be surrendered by the company. Companies are allowed to sell or trade excess permits. However, should a company fail to surrender the correct amount of allowances; they must pay the CO^2 tax retroactively for each tonne of CO^2 emitted since the exemption was granted.

The Swiss carbon market still remains fairly small, with few emissions permits being traded. Swiss domestic law tends to favour the use of a CO^2 tax to achieve emissions reductions. The tax is revenue neutral, and its revenues are redistributed proportionally to companies and to the Swiss population. For example, if the population bears 60% of the tax burden, they will receive 60% of the redistribution. For companies, revenues will be redistributed to all companies, except those who chose to exempt themselves from the tax through the cap-and-trade programme.

The revenues from the tax that were paid by the Swiss population are redistributed equally to all Swiss residents through health insurance companies and a deduction on their insurance premiums. In June 2009, the Swiss Parliament decided to allocate about one-third of the revenue from the carbon tax to a ten-year building programme for climate-friendly building renovations. This programme promotes building renovations, the use of renewable energies, the utilisation of waste heat, and building engineering.

In 2008 alone, the tax of CHF 12 per tonne of CO^2 raised around CHF 220 million ($209 million) in revenue. As of June 16, 2010, a total of around CHF 360 million ($342 million) has become available for distribution to the Swiss population and economy. It is estimated that in 2010, at the highest tax rate of CHF 36 per tonne of CO^2, the revenue from the tax was about CHF 630 million ($598 million). The International Energy Agency (IEA) commends Switzerland's CO^2 tax for its excellent design and notes that the recycling of the tax revenues to all citizens and enterprises is "sound fiscal practice".

Switzerland is currently on track to meet its Kyoto Protocol commitment of an 8% reduction in greenhouse gas emissions below 1990 levels between 2008 and 2012. The combination of the CO^2 tax and other voluntary measures by businesses and private individuals is enabling Switzerland to achieve these reduction goals.

The Annex I countries mentioned above have been able to successfully implement carbon taxes resulting in low and decreasing GHG emissions as indicated in Table 3. These taxes are able to work for these countries, as they do not face the same challenges that SA has. Most notable is that SA's population size is far greater than that of these countries and SA's poverty problem is far worse. The Annex I countries GDP per capita alone stands as follows:

- Denmark: $ 56.790 (2010)
- Finland: $ 35.300 (2010)
- Netherlands $ 41.949 (2011 estimate)
- Ireland $ 37.700 (2009),
- Switzerland $ 75.440 (2010).

SA GDP per capita for 2010 was approximately $7.158 (Wikipedia, 2010).

It is evident that these countries are still doing well after the implementation of various carbon taxes. Even though they do not face the challenges of SA as a developing nation with a high rate of unemployment and income inequality, their policies are still worth looking at as much can be learnt from what they have done to date.

Denmark's emissions tax varies on the level that each source emits, whilst offering refunds for energy efficient changes. This method of taxing can be adopted and factored into the design of a Carbon Emissions Tax. However, SA cannot tax households and businesses the way Denmark does, as this would negatively impact the majority of the population which is poor.

Finland's policies have partially excluded energy intensive firms. In SA it is evident that energy intensive firms and the sector need to be the focus of GHG reduction if SA wants to see any success in its mitigating actions. A tax on energy content and carbon emissions together may prove difficult in SA. It may push the tax and its burden beyond what can be expected due to the fact that the SA economy is energy intensive.

The same applies for The Netherlands' 50/50 method of taxing and its tax based on packaging. Implementing a tax on packaging in SA would see a rise in production costs as well as price of goods only to impact the cost of living negatively.

Ireland has shown the same concerns that affect SA i.e. the disproportionate impact of the carbon tax on the poor and elderly. A group in Ireland called "Active Retirement Ireland" suggested that state pension be increased to aid the poor and elderly to deal with the disproportionate effect. This can be adopted in SA as well so that the effect of a proposed tax is not borne alone by the poor as some of it is subsidised by the government.

Switzerland's distribution of revenue collected from carbon taxes and passed on to its population and companies are another positive mechanism in designing the Carbon Emission Tax. Not only will it aid with the tax burden but also it may facilitate the buying in of the concept by people for this type of tax. It will bring the SA citizens and taxpayers comfort and security to know that the tax generated here may not be lost in government coffers but used for the purpose of developing green projects and being recycled to them.

3.3 CONCLUSION

A Carbon Emissions Tax can be reality for SA. If there are sound fiscal practices in place and the structure of the tax is realistic and developed in a manner that is fair to all polluters, this type of tax may be accepted by the people and corporations of SA. The tax should encourage a reduction in GHG emissions. The method of taxing emission in SA may be different from those used in the countries above but there is value in learning about their approach and knowing more about the contributions provided by these countries in taking the lead in the reduction of their own and global GHG emissions. These lessons and policies can be factored into the decision and structure when establishing a Carbon Emissions Tax in SA.

CHAPTER 4

CONCLUSION

4.1 INTRODUCTION

Establishing a realistic Carbon Emissions Tax “package or structure” is important to obtain buy-in on the part of government and corporations. An effective emissions tax may see the reduction of GHG emissions in the future. This chapter looks at a feasible design for a Carbon Emissions Tax in SA and the impact that this tax may have on the country.

4.2 SUMMARY OF FINDINGS

In the previous chapters the various carbon tax options implemented by Annex I and Non-Annex I countries were examined. No specific tax implemented so far appears to be suitable for SA. As previously mentioned SA is unique in its demographics, economic focus and its history hence something should be designed to suit SA’s needs. There is, however, something to be gained from what others have done in designing this so-called Carbon Emissions Tax.

Table 3 below shows the amount of GHGs each sector emitted for the 2010 year as disclosed by the Top 100 Corporations listed on the JSE.

Table 3: GHG Emissions per Sector

CDP 2010: Overview of GHG Emissions per Sector in SA			
Sector	**Scope 1***	**Scope 2***	**Total**
	t CO^2 -e	**t CO^2 -e**	**t CO^2 -e**
Consumer	3,758,377	4,456,615	8,214,992
Energy**	61,768,000	9,553,000	71,321,000
Financials	448,149	2,419,149	2,867,298
Health Care	52,326	547,727	600,053
Industrials	2,846,400	1,223,201	4,069,601
IT & Telecoms	331,822	730,884	1,062,706
Materials	60,942,357	84,516,826	145,459,183
			233,594,833
* Refer to definition of key terms **Does not include SA's electricity provider as it is not a listed JSE company but is part of this sector.			

Source: Adapted. Insight Sustainability, CDP 2010

The use of coal, fossil fuel, petrol, electricity and energy sources in the production of goods and services cause the emissions of GHGs. Hence, all sectors as indicated above contribute to the emission of GHGs and not only the energy sector. High emitters can also be found in other sectors like the Materials Sector e.g. Mining and Industrials Sector e.g. Construction.

The design of the Carbon Emissions Tax for SA

Table 4 below indicates a possible method of levying a Carbon Emissions Tax, as designed by the researcher.

Table 4: Carbon Emissions Tax: Sliding Scale

Carbon Emissions Tax	
Sliding Scale Estimate based on Tonnes of CO^2-e	
Quantity	**Rate of Tax**
Less than 1,000,000	R 10 million
1,000,000 - 25,000,000	R 10 million + R 9 per ton above 1,000,000
25,00,000 - 50,000,000	R 226 million + R 7 per ton above 25,00,000
50,000,000 - 100,000,000	R401 million + R 6 per ton above 50,000,000
100,000,000 - 150,000,000	R 701 million + R 5 per ton above 100,000,000
150,000,000 - 200,000,000	R 951 million+ R 4 per ton above 150,000,000
Above 200,000,000	R1151 million + R 3 per ton above 200,000,000

The researcher designed the tax system in the following way:

- Emission Quantity:

- The quantity of emissions as per the CDP 2010 Report was considered to give an indication of the range of emissions. Emissions were sporadic with some sectors having enormous emissions and others a small amount. Hence the emissions were grouped together on a sliding scale;
- The scale starts at 1 million tonnes and ends at over 200 million to factor and includes all corporations. The ranges were designed to ensure that a corporation in a sector would be included in the correct scale and pay the correct amount. Hence seven ranges were created.

- Emission Rates:
  - The tax should start at an amount great enough to ensure that there is some financial impact on the corporation's profit. The tax rate is based on emissions made by JSE listed corporations. Hence, the researcher set the starting rate at R 10 per tonne, fixing it at R 10 million for the purpose of this specific research. If a Carbon Emissions Tax like this were to be applied to smaller corporations further consideration would have to be given to the rate calculated as R 10 million would be too high for a small corporation to afford. Instead of fixing the tax at R 10 million a small corporation can pay R 10 per tonne;
  - Various starting rates were populated but they were not feasible. Higher rates resulted in the Carbon Emissions Tax increasing substantially. This starting rate was also feasible compared to the rates other countries were using. Further the LTMS suggested a rate of R 100 per tonne. This implied that the Consumer sector for example would pay around R 800 million in carbon taxes. This was not in line with the researcher's aim of deriving a reasonable rate;
  - The rate per ton was set to decrease as the amount of emissions increased so the amount of the tax was not too high. The fixed consideration amount found at every level is calculated based on the prior level as follows; the fixed amount plus the difference in emissions multiplied by the R/tonne. To illustrate further: Level 3 - R 266 million is calculated at R 10 million plus R 216 million [R 9 x (25 million tonnes – 1 million tonnes)]. Level 4 - R 401 million is calculated at R 266 million plus R 175 million [R6 x (100 million tonnes – 50 million tonnes)] and so forth;

- Therefore, for emissions below 1 million tonnes, corporations would incur a tax of R 10 million. Between 1 million and 25 million tonnes - the tax is calculated at R 10 million plus R 9 multiplied for every tonne over 1 million; and so forth. Refer to the example in Table 6 that explains it further.

The tax designed should be reasonable and effective in slowing down and eventually reducing emissions. It should have an impact on the profit of a corporation but not to such an extent as to cause closure of businesses. It should be effective in holding emitters accountable for their emissions whilst at the same time encouraging them to make an effort to reduce their emissions, consider its negative impact on the environment and the people of SA. Instead of separate taxes on the carbon content of fossil fuels, gases and certain manufactured products , as adopted in other countries, this tax seeks to tax the result of manufacturing and producing goods and services i.e. the GHG emissions itself. The tax is designed to be a “catch-all” mechanism so that all emissions are taxed. These factors were considered in designing this sliding scale of tax.

The rand value per ton decreases as the quantity of GHGs increases. This is done to keep the tax payable at a level where the burden is not shifted dramatically to the consumer. E.g. if the tax for the electricity provider was very high and they chose to factor it into the price of electricity, it may result in most of SA being in darkness due to the high electricity cost. A sliding scale of taxing can be a feasible option for SA. This process of taxing can assist in catching high emitters.

The rates would be applied against emissions as reported by corporations in each sector. Upon initial implementation a Carbon Emissions Tax should be applied to the top corporations listed on the JSE. These corporations all have environmentally sustainability commitments and can help SA with the first launch of the tax.

Taxing corporations is a way of holding them accountable for their pollution. However, with the tax, corporations should have an incentive for making the effort of reducing emissions. This should not only be in the form of paying less tax should a corporation fall into a lower bracket on the sliding scale. but additional rebates should be considered. The amount of

the rebate should be high enough to encourage corporations to want to reduce emissions. However, the rebate should not be so high that it negates the effect of the tax.

Table 5 below indicates rebates, as designed by the researcher, which can be offered to corporations that make an effort to reduce their GHG emissions.

Table 5: Carbon Emissions Tax: Rebates

Rebates	
Percentage based on Tonnes of CO^2-e	
1% - 9%	R 50 per tonne of CO^2-e decrease
10% - 19%	R 60 per tonne CO^2-e decrease
11% - 19%	R 70 per tonne CO^2-e decrease
20% - 29%	R 80 per tonne CO^2-e decrease
30% - 39%	R 90 per tonne CO^2-e decrease
40% - 49%	R 100 per tonne CO^2-e decrease
Over 50%	R 110 per tonne decrease

The following were considered in designing the table:

- Various corporations were looked at in the CDP 2009 and 2010 report. Consideration was given to types of corporations, the sector they fell into and how the emissions changed. Based on this information the rebate rate started at R 50 per tonne;
- The percentage was determined to ensure that all corporations could get a rebate and that the rebate was indicative of the effort to reduce emissions;
- The incremental increase in the rebate was to ensure that where there was a marked improvement in reducing emissions the rebate was high.

Each year's emissions would have to be disclosed and verified, as with levying the tax, before the rebates are afforded. The greater the reduction of GHG emissions by corporations, the higher the amount of the rebate will be. Table 6 illustrates how the rebate is calculated and applied.

Impact of proposed tax per sector

The financial impact of the above tax structure per sector is illustrated in Table 6 below. This is a simulation of tax payable for 2010. It is calculated on the actual emissions as reported by the top 100 JSE listed companies in CDP 2010 and CDP 2009 and the

emissions of the electricity provider. The emissions are a total of Scope 1 and Scope 2 emissions for each year. The carbon emissions tax is calculated based on the scale in Table 4. The rebate is calculated based on Table 5.

For example in the consumer sector the total emissions for 2009 and 2010 were 5,553,219 and 8,214,992, respectively. The Carbon Emissions Tax for 2010 is R 74,934,928. This is calculated using 2010 emissions and Table 4 scale. The consumer sector saw an increase in emissions from 2009 to 2010, of 48%. No rebate would be available.

In the industrial sector the Carbon Emissions Tax was calculated to be R 37,626,409. There was a decrease in emissions from 2009 to 2010 and hence a rebate was calculated according to Table 5. There was a large decrease in emissions resulting in the rebate being higher than the tax calculated hence the amount due is shown to be nil.

The Table below is intended to show the impact per sector in order to illustrate the overall financial impact that can be expected.

Table 6: Carbon Emissions Tax: Simulation of Tax for Sectors

Taxing of GHG Emissions per Sector, including the electricity provider							
	Actual as per CDP		A simulated tax for the 2010 year				
Sector	Total Emissions 2009 tCO2-e	Total Emissions 2010 tCO2-e	Increase / (Decrease): 2009 to 2010	% Increase / (Decrease)	Carbon Emissions Tax	Rebate	Total Tax Due
Consumer	5,553,219	8,214,992	2,661,773	48%	R 74,934,928	R 0	R 74,934,928
Energy - other	72,680,000	71,321,000	-1,359,000	-2%	R 528,926,000	R 67,950,000	R 460,976,000
Energy - Electricity	221,700,000	224,700,000	3,000,000	1%	R 1,225,100,000	R 0	R 1,225,100,000
Financials	1,459,118	2,867,298	1,408,180	97%	R 26,805,682	R 0	R 26,805,682
Health Care	489,849	600,053	110,204	22%	R 10,000,000	R 0	R 10,000,000
Industrials	12,223,053	4,069,601	-8,153,452	-67%	R 37,626,409	R 407,672,600	R 0
IT & Telecoms	443,792	1,062,706	618,914	139%	R 10,564,354	R 0	R 10,564,354
Materials	125,649,571	145,459,183	19,809,612	16%	R 928,295,915	R 0	R 928,295,915
	440,198,602	**458,294,833**	**18,096,231**		**R 2,842,253,279**	**R 475,622,600**	**R 2,736,676,870**

Source: Adapted. Insight Sustainability, CDP 2010/ CDP 2009

Impact of proposed tax on large corporations

The impact of the Carbon Emissions Tax on a sample of large corporations is illustrated in Table 7 below.

Table 7: Carbon Emissions Tax: Simulation of Tax for Large Corporations

Taxing of GHG Emissions for 3 large corporations			
Sector	**Materials**	**Energy**	**Consumer**
Sub Sector	Paper and Forest Products	Electricity	Food products
Total Emissions 2009 tCO2-e	6,003,000	221,700,000	514,308
Total Emissions 2010 tCO2-e	5,868,801	224,700,000	1,097,099
% Increase / (Decrease)	-2.2%	1.4%	113.3%
Carbon Emissions Tax (CET)	R 53,819,209	R 1,225,100,000	R 10,873,891
Rebate	R 6,709,950	R 0	R 0
Total Tax Due	R 47,109,259	R 1,225,100,000	R 10,873,891
Profit after tax*	R 2,673,300,000	R 3,620,000,000	R 680,000,000
Net Profit After CET	**R 2,626,190,741**	**R 2,394,900,000**	**R 669,126,109**

* Information obtained from the group annual financial statements for 2010 as found on respective websites

This table shows the financial effect of the Carbon Emissions Tax on three large corporations. The total tax due is deducted from the profit after tax (normal taxes as per the Income Tax Act, Act 58 of 1962) to give net profit after the Carbon Emissions Tax.

This tax may be high in the year's post implementation. Where corporations take the initiative to reduce GHG emissions thereby taking advantage of the measures offered to them; they would see a decrease in the tax. Government should bear in mind additional penalties for those corporations who opt to pay the tax and instead of reducing GHG emissions.

The above Carbon Emissions Tax structure is designed without considering the existing incentives already in place as follows:

- Allowances in the Income Tax Act, Act 58 of 1962: S12K, 12L, 12I and 11D allowances, and;

- Existing grants: Critical Infrastructure Programme, Renewable Energy Finance and Subsidy Office and Enterprise Investment Programme.

With a combination of a Carbon Emissions Tax, possible rebates, incentives, mitigating actions and policies and other voluntary measures SA may be able to achieve its targeted reduction of business as usual CO^2 emissions by 34 % by 2020.

4.3 CONCLUSION

There are many effects that can be anticipated as a result of implementing a Carbon Emissions Tax. Measures may also be in place to aid in distributing and alleviating the negative impact.

4.3.1 The impact on corporations in different sectors

Implementing a Carbon Emissions Tax would raise the costs to all corporations across the sectors and may have negative economic impact. There may be further challenges and concerns that face corporations as a result of the Carbon Emissions Tax:

- This increase in cost to the corporation would bring with it increases in the price of goods and/ or services to the consumers;
- There may be job losses, adding to the unemployment issue currently experienced in SA;
- If the tax is too stringent, carbon emission intensive activities may relocate to other jurisdictions, and;
- Where domestic output competes with products of foreign producers not subject to similar environmental taxes, the impact on the competitive position of domestic corporations is a concern.

The simulation in table 6 shows the possible financial impact for each sector. Along with the tax there should be measures that not only provide some relief but also promote buy-in of corporations. In order to reduce some of the burden and cost for the certain corporations the following can be examined:

- Provide incentives to corporations to reduce their emissions, in turn they would then reduce their taxes;
- The efforts of developing nations are conditional on international funding and technology transfer. If this becomes available it may alleviate the pressures of a Carbon Emissions Tax on the corporations;
- Financial assistance may be provided to corporations who aim to have cleaner technologies, and;
- Exempt certain industries that may be affected by competition.

Corporations would experience costs at some stage as a result of climate change. The costs may arise as a result of mitigation or adaptation. They should at least be willing to bear the cost of a Carbon Emission Tax periodically to curb the high rand value impact of climate change in the future or bear the total cost of climate change when it actually occurs.

4.3.2 The impact on the economy

The advantages of implementing a Carbon Emissions Tax are as follows:

- Sustainability of the earth and its natural resources;
- Increase SA's efforts to move to a low carbon developing economy in accordance with the appeal made by UNFCCC and the Kyoto Protocol;
- There is potential for large tax revenues. This revenue can be used to further develop cleaner technology, aid in creating awareness and social responsibility, and help develop green projects;
- Cleaner economies tend to attract more foreign direct investment (FDI). Investors would tend to go into stable areas, and;
- There are long-term health benefits associated with the reduction of pollutants in the air and water.

There are also disadvantages associated with a Carbon Emissions Tax:

- The implementation of a Carbon Emissions Tax may cause a shift in the tax expense burden from producer to consumer in the form of increased prices of goods and services e.g. food and transport;
- The cost of petrol continues to rise, again affecting necessities like food and transport;
- Low-income households may not be able to cope with the additional cost of living;
- Corporations may seek to retrench staff, contributing to the unemployment level in SA, and;
- The population embarks on further strikes against high food prices and job losses that would have a negative impact on the economy.

Just as the cost is real there must be measures in place that can assist with these additional costs that the consumer has to carry. Similar to what other countries have adopted, the following measures can be applied:

- Increase government grants to the poor, elderly and infirm;
- Redistribute the revenue collected to corporations and citizens i.e. revenue neutrality;
- Utilise money to grow green programmes and job creation programmes in rural areas like the Working for Water/ Wetland and working on fire as mentioned in the National Climate Change Response green paper, and;
- Money can also be utilised to educate subsistence and smallholder farmers on the risks of climate change and further support them in developing adaptation strategy and agricultural practices.

Recycling of the revenue is a factor that can aid in the success of the implementation of a Carbon Emissions Tax. It is critical that the tax is not applied one its own. There should be balancing measures in place in the form of additional incentives and rebates so that the consumer and essentially SA's poor do not have to bear the ultimate burden.

4.4 SUMMARY OF CONTRIBUTIONS

The current polices and strategies in place to mitigate GHG emissions are not sufficient for fostering a low carbon economy in SA. The time has come for more concrete measures to

implement mitigating action and promote green growth. One such measure would be to introduce a Carbon Emissions Tax in the near future.

More attention needs to be paid to increasing knowledge on the design of a Carbon Emissions Tax. It is important to maintain transparency and ensure the participation of corporations/ industry and the SA people in the planning and the use of a tax. This can aid in reducing the potential opposition to an additional tax charge. Parties to the tax may be more inclined to support a new Carbon Emissions Tax if the revenue it generates can be used to fund environmental projects and/or enhanced capital allowances for investment in certain energy saving or green technologies.

SA may be a developing country, faced with challenges of poverty and unemployment; it does not imply that a carbon tax is not the answer for our GHG emission containment. By making use of the correct structure, implementing it and utilising it with other mitigating options, it may become more feasible.

The purpose of this study is to provide insight into the implementation of a Carbon Emissions Tax as a mitigating strategy to reduce GHG emissions in SA. This study has provided that insight by addressing among other things the research objectives as follows:

- A Carbon Emissions Tax was explained and a method of taxation determined;
- The tax thus calculated was applied against the different sectors and a sample of corporations to show the financial impact, and;
- The impacts on the economy, both positive and negative were addressed.

This study makes a contribution to the ongoing research and strategies government is looking at to mitigate climate change. The intention of this Carbon Emissions Tax is not to enrich the fiscus but to act as a deterrent to those who continue polluting without there being any consequences. Government should be active in ensuring that the objective of the tax is not compromised or misunderstood. It is critical to raise awareness amongst the private sector and the public by promoting the tax positively and campaigning to educate SA's people and corporations. This should be seen as an opportunity for change rather than an additional cost. SA, its people and economy have grown and progressed making SA one of the leading developing nations. This should not come at the cost of causing

damage to the environment to the extent that climate change starts to affect the people of SA.

4.5 SUGGESTIONS FOR FURTHER RESEARCH

There are some aspects of the research that needs to be studied further:

- How will the implementation of a carbon emissions tax affects climate change and the environment, in terms of curbing climate change;
- Quantifying the impact on the economy.

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