

# **INVESTIGATING WAYS TO REDUCE GREENHOUSE GAS EMISSIONS BY MEANS OF TAX MEASURES**

by

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## SUMMARY

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The objective of this study is to restrict the emission of greenhouse gasses by investigating if this objective would be reached by the implementation of a tax.

Global warming is caused by the emission of greenhouse gasses into the atmosphere. In order to restrict global warming it is necessary for individuals and entities to act in a more environmentally friendly manner and to emit less greenhouse gasses.

A further objective of this study is to investigate various measures that can be used as an incentive to restrict the emission of greenhouse gasses. This study found that the main emitters of greenhouse gasses are power stations, industries and the transport sector. This study will therefore focus on the reduction of greenhouse gasses in these areas.

The way to identify methods used to reduce greenhouse gas emissions, is to investigate the techniques that first world countries use to reduce greenhouse gas emissions, to judge the level of success they achieved and to compare their methods to the definition of a “good tax”.

It was found that “cap-and-trade” is a better model than carbon tax for the reduction of greenhouse gas emissions by power stations and industries. It was also found that a combination between a tax on fuel and a tax calculated on greenhouse gas emissions per

kilometre for each individual vehicle will result in the greatest reduction in the emission of greenhouse gasses produced by the transportation sector.

**Keywords:**

*Greenhouse gas*

*Emissions*

*Carbon dioxide*

*Tax*

*Global warming*

*Tax incentives*

*Cap-and-trade*

## OPSOMMING

# **‘N ONDERSOEK NA MANIERE OM GROENHUIS UITLAATGASSE TE VERMINDER DEUR BELASTINGAANSPORINGS IN TE STEL**

deur

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Die doelwit van hierdie studie is om die vrystelling van groenhuus uitlaatgasse te beperk deur ondersoek in te stel of die doelwit bereik kan word deur die implementering van ‘n belasting.

Globale aardverwarming word veroorsaak deur ‘n oormaat vrystelling van groenhuusgasse in die atmosfeer. Om globale aardverwarming te beperk, sal individue, sowel as entiteite, meer omgewingsvriendelik moet optree deur minder groenhuusgasse vry te stel.

‘n Verdere doelwit van hierdie studie is om verskeie metodes, insluitende belasting, te ondersoek waardeur die vrystelling van groenhuusgasse verminder kan word. In die studie is vasgestel dat kragstasies, industrieë en vervoerstelsels die hoofvrystellers van groenhuusgasse is. Die fokus van die studie is dus gerig op die vermindering van groenhuusgasvrystelling spesifiek in hierdie areas.

Die wyse om metodes, wat gebruik word om groenhuusgasvrystellings te verminder, te identifiseer, is om die tegnieke wat in eerste wêreldlande gebruik word te ondersoek, om die vlak van sukses wat daarmee bereik word, te bepaal en om daardie metodes teen die definisie van ‘n “goeie belasting” te toets.

Daar is gevind dat “uitlaatgas handel” ‘n beter model is as koolstofdioksiedbelasting ten einde ‘n vermindering van groenhuusgasvrystellings deur kragstasies en industrieë te

bewerkstellig. Daar is ook gevind dat 'n kombinasie van 'n belasting op brandstof en 'n belasting bereken op groenhuiskgasvrystellings per kilometer van elke individuele voertuig die grootste vermindering in groenhuiskgasvrystellings in die vervoerstelsel sal meebring.

**Sleutelwoorde:**

*Groenhuiskgas*

*Uitlaatgasse*

*Koolstofdioksied*

*Belasting*

*Aardverwarming*

*Belastingaansporings*

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## CHAPTER 1

### INTRODUCTION AND PROBLEM STATEMENT

#### 1.1 INTRODUCTION

The increase in the production of green house gases (GHG) by humans increase exponentially each year, increasing at the same pace is global warming. Humans contribute to these gases mainly by generating power, industrial processes and transportation. As fuel prices, the amount of cars on the roads and global focus on environmental protection increase a conscious effort must be made to think of ways to decrease the amount of harmful gases that are emitted into the atmosphere and the influence it has on the environmental conditions. One of the most effective tools that the government has to reduce emissions is taxation, be it tax being levied to polluters and/or a tax rebate being given to non-polluters. Government must realise that they need to act now. Two success stories of the implementation of these proposed green taxes are from Europe and the USA. This study investigates to what extent Europe and the USA have achieved success and whether South Africa can implement the same measures as these countries.

#### 1.2 RESEARCH PROBLEM

The core research question is if a tax and/or tax incentive would influence:

- power stations to change the processes and methods of producing electricity in order to produce less GHG's;
- industries to change the processes and methods of their production of goods in order to produce less GHG's; and
- individuals to buy a more environmentally friendly vehicle or would encourage citizens of South Africa to convert to these vehicles.

This question will be investigated in the following chapters and a conclusion will be made in the final chapter.

## **1.3 RESEARCH OBJECTIVES**

The objective of this study is to answer the following questions regarding the proposed tax incentive scheme aimed at reducing GHG emissions, namely:

- will a tax or tax incentive influence power stations, industries and individuals in South Africa to be more environmentally friendly and produce less GHG's;
- what type of tax incentive scheme would be more effective for SARS to use in order to achieve the desired results regarding the reduction of GHG emissions;
- to what extent do the tax incentives implemented in Europe and the USA reduce GHG emissions and to measure the degree of success achieved by implementing these incentives and
- will the expected reduction in pollutants as a result of implementing green tax have a noticeable effect on the overall ecosystem. By answering this question one would be able to conclude whether the implementation of green tax is a worthwhile exercise or not. This question would be answered by investigating the effect of green tax on the ecosystems of both the USA and Europe. The final question is if it is worthwhile to further research and investigate this type of green tax and does it deliver the required results.

The importance and benefits of the study is to enable government regulators to further investigate and make an informed decision in relation to the implementation of a green tax. If the decision is made to implement this tax we can expect to see the same success rate as seen in the USA and Europe. This type of environmental incentive could decrease the amount of pollutants that we as South Africans produce and would therefore be an effective nature conservation tool.

## **1.4 DELIMITATIONS AND ASSUMPTIONS**

### **1.4.1 Delimitations**

The context of the study is the environmental effect a green tax being levied or a tax deduction being given will have in South Africa. This is done by comparing the results of specific USA states and identified European countries.

The relationships between these results and the expected results in South Africa will be studied. The expected results in South Africa will be limited to the above mentioned countries only and not be compared to any other country as this will make the study too broad and would not add further value.

Literature streams that will be consulted are electronic academic journals and articles on the internet. A study of research (on ways to decrease pollution and increase nature conservation through tax incentives) will not be done as that is not the focus of this study and this field is always changing.

The specific target population that will be investigated is the medium income group in South Africa that owns cars or uses public transport. The high and very low income groups in South Africa will be excluded from the study because a tax incentive to buy a different car will not affect their actions.

#### **1.4.2 Assumptions**

Because of the fact that one of the biggest contributors to GHG pollution in the USA and Europe is power stations, industries and road transportation, we assume that these emitters will also be the biggest contributors to green house gas pollution in South Africa.

We make the assumption that the South African power stations, industries and road transportation would react in a similar way to emissions tax and rebates than the American and European emitters reacted to it a few years ago.

We assume that South Africa has enough expertise and the technology to implement the proposed tax incentives.

#### **1.5 DEFINITION OF KEY TERMS**

This study involves a number of key concepts, namely green tax, incentive as well as deduction. The manner in which these key terms are defined for the purpose of this study is considered below.

“Cap-and-trade”: “Cap-and-trade” (else known as emissions trading) is an organisational methodology that presents fiscal incentives for realising decreases in the production of pollutants and is therefore an instrument used to manage pollution. A cut-off point or cap is usually set by a parliamentary body on the quantity of a pollutant that can be emitted. Companies or other parties are issued emission permits and are obliged to maintain a corresponding amount of credits (or allowances) which represent the permission to produce a particular quantity. The total quantity of credits and allowances cannot surpass the cap, restricting total pollution to that point. Allowances can be purchased by entities that want to increase their credits for emissions, and these extra allowances can be purchased from those who emit less. Therefore when these allowances are passed on, it is labelled trade. The result of this trading is that the supplier is compensated for having a decrease in pollutants below the mandatory level and the purchaser is paying a penalty for the amplified emissions. It is therefore the presumption that those who can cut back on emissions at the smallest amount of expenses will do so, and will in return realise the emission reduction at the least amount of cost to society (Montgomery, 1972:395-418).

Carbon tax: A carbon tax is an environmental tax on emissions of carbon dioxide. Carbon dioxide is considered to be a heat-trapping "greenhouse" gas, and the purpose of a carbon tax is to protect the environment by penalizing emissions of carbon dioxide, which may cause global warming. Some environmental taxes include other greenhouse gases; the global warming potential is an internationally accepted scale of equivalence for other greenhouse gases in units of tonnes of carbon dioxide equivalent (Anon, 2009i).

Green tax: Green tax refers to taxes intended to promote ecologically sustainable activities via economic incentives. Such a policy can complement or avert the need for regulatory (command and control) approaches. Often, a green tax policy proposal will attempt to maintain overall tax revenue by proportionally reducing other taxes (e.g. taxes on human labour and renewable resources); such proposals are known as a green tax shift towards ecological taxation (Anon, 2009e).

Hybrid car: A hybrid electric vehicle (HEV) combines a conventional internal combustion engine (ICE) propulsion system with an electric propulsion system. The presence of the electric powertrain is intended to achieve either better fuel economy than a conventional

vehicle, or better performance. A variety of types of HEV exist, and the degree to which they function as electric vehicles varies as well. The most common form of HEV is the hybrid electric car, although hybrid electric trucks (pickups and tractors) also exist (Anon, 2009h).

**Tax incentive:** A tax incentive is an aspect of the tax code designed to incentivise, or encourage, a certain type of behaviour. This may be accomplished through different means, e.g. tax holidays or tax deductions (Anon, 2009f).

**Tax deduction:** A tax deduction or a tax-deductible expense affects a taxpayer's income tax. A tax deduction represents an expense incurred by a taxpayer. They are variable amounts that you can subtract, or deduct, from your gross income (Sheffrin, 2009:366). It is subtracted from gross income when the taxpayer computes his or her income taxes. As a result, the tax deduction will lower overall taxable income and thus lower the amount of tax paid (Anon, 2009g).

**Table 1: Abbreviations used in this document**

<b>Abbreviation</b>	<b>Meaning</b>
CDM	Clean development mechanism
CER	Certified emissions reductions
CO <sub>2</sub>	Carbon dioxide
CTL	Coal-to-liquid
DTI	Department of Trade and Industry
Eskom	Eskom is a South African electricity public utility, established in 1923 as the Electricity Supply Commission (ESCOM) by the government of South Africa in terms of the Electricity Act (1922). It was also known by its Afrikaans name <i>Elektrisiteitsvoorsieningskommissie (EVKOM)</i> .  The two acronyms were combined in 1986 and the company is now known as Eskom (Anon, 2010a).
EU	European Union

EU ETS	European Union's European Trading Scheme
GHG	Green house gas
GTL	Gas-to-liquid
HEV	Hybrid electrical vehicle
IRS	Internal Revenue Service
JI	Joint Implementation
MAC	Marginal abatement costs
MSC	Marginal social cost
PPB	Parts per billion
PPM	Parts per million
PPT	Parts per trillion
SARS	South African Revenue Service
SUV	Sports utility vehicles
UK	United Kingdom
USA	United States of America
VER	Voluntary emissions reductions

## 1.6 DESCRIPTION OF OVERALL RESEARCH DESIGN

The sources that will be used for this study is academic and non-academic articles and journals to gain information on the reasons, implementation and success of the implementation of green tax in the USA and Europe. Academic and non-academic articles and journals with information on the implications that green tax will have on South Africa will also be used.

The reason for including articles and journals of studies in the USA and Europe is that these countries have already implemented green taxes and South Africa can learn a lot from their successes and failures. These countries' vehicle driving culture is also very

similar to South Africa, thus the challenges they encountered would most likely face South Africa.

The reason for choosing to do a non-empirical study is that this study will focus on the rate of success of other countries and not on the opinion of the people of South Africa about green taxes. Studies show that the citizens of the USA and Europe, as well as those in South Africa, have a very negative attitude towards green taxes. These studies are based on public opinion as documented in the journals I used in my research. However the proof of the success of green tax is in the practise thereof. I found that the public opinion stands in contrast with the reality - that green tax does influence the emitters. Therefore this study is based on the results of the USA and Europe where green tax has been implemented.

The results of these studies done on green tax in the USA and Europe will then be used to comment on the possible effectiveness and margin of success South Africa can expect to achieve with the implementation of green tax. This paper will make a number of proposals on the best way to implement green tax, the incentives that showed the best results in the USA and Europe and also list a number of possible outcomes to the implementation of green tax.

## **1.7 CONCLUSION**

This study will investigate ways to reduce GHG emissions by means of tax measures. Methods to reduce GHG used by various first world countries will be investigated and evaluated. These measures would then be used to suggest a GHG reduction tool for South Africa.

Chapter two will focus on the effect of GHG's on the environment and shows the importance of finding ways to reduce the emission of GHG's.



## CHAPTER 2

### EFFECT OF GREEN HOUSE GASES ON THE ENVIRONMENT

#### 2.1 INTRODUCTION

It is important to determine whether GHG's have a substantial effect on the environment in order to conclude that a reduction in GHG emissions is necessary and very important. In this chapter a short study will be conducted on the effect that GHG emissions have on global warming in South Africa and the rest of the world.

#### 2.2 GLOBAL WARMING CAUSED BY GHG

In 1896 a Swedish scientist, Svante Arrhenius (1859-1927), claimed that fossil fuel combustion may eventually result in an increase in global warming. His proposal stated that there is a relation between temperature and atmospheric carbon dioxide concentrations. His finding was that the earth's average surface temperature is about 15°C due to the infrared absorption capacity of carbon dioxide (CO<sub>2</sub>) and water vapour. This is termed the natural greenhouse effect. Arrhenius suggested (Anon, 2010b:1) that if the CO<sub>2</sub> concentration doubled, it would lead to a 5°C increase in temperature. He and Chamberlin calculated that the earth could be warmed by human activities due to adding of carbon dioxide to the atmosphere. This research came about as a by-product of research of whether carbon dioxide would explain the causes of the great Ice Ages. This aspect was not verifiable until 1987. (Enzler, 2009:1.)

There is a concern amongst scientists who have elaborated on the theory of global warming that increases in greenhouse gas concentrations in the atmosphere, is leading to a rise in global temperatures. This rise in global temperatures is resulting in harmful consequences for the human health and the environment. (Lerner, Lee & Wilmoth, 2006:65).

Human activities since the start of the industrial era around 1750 have increased the levels of greenhouse gases in the atmosphere. The earth's temperature is therefore increasing

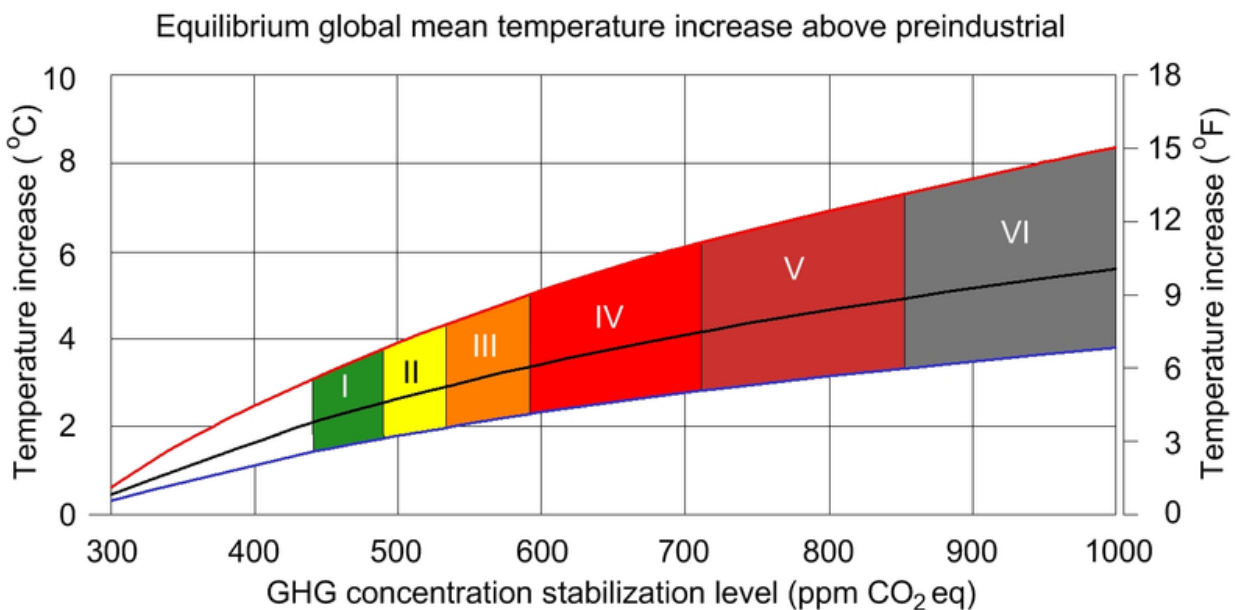
because of the effect that humans have on the environment. The table below shows the increase in parts per million (ppm) of the four major GHG's from the year 1750 to 2008 (Prentice, 2001).

**Table 2: PPM of four major GHG's from 1750 to 2008**

Gas	Pre-industrial level	Current level	Increase since 1750
Carbon dioxide	280 ppm	387ppm	107 ppm
Methane	700 ppb	1745 ppb	1045 ppb
Nitrous oxide	270 ppb	314 ppb	44 ppb
CFC-12	0	533 ppt	533 ppt

Figure 1 (Anon, 2007b) shows how the earth's temperature will increase as CO<sub>2</sub> levels increase. Table 2 shows that the current CO<sub>2</sub> levels are 387ppm. Using the current CO<sub>2</sub> levels at 387ppm, figure 1 shows that the earth's temperature already increased with more than 1 degree over the last 260 years.

**Figure 1: Equilibrium global mean temperature increase above pre-industrial.**



## 2.3 NATURAL VS. HUMAN GREEN HOUSE GAS PRODUCTION

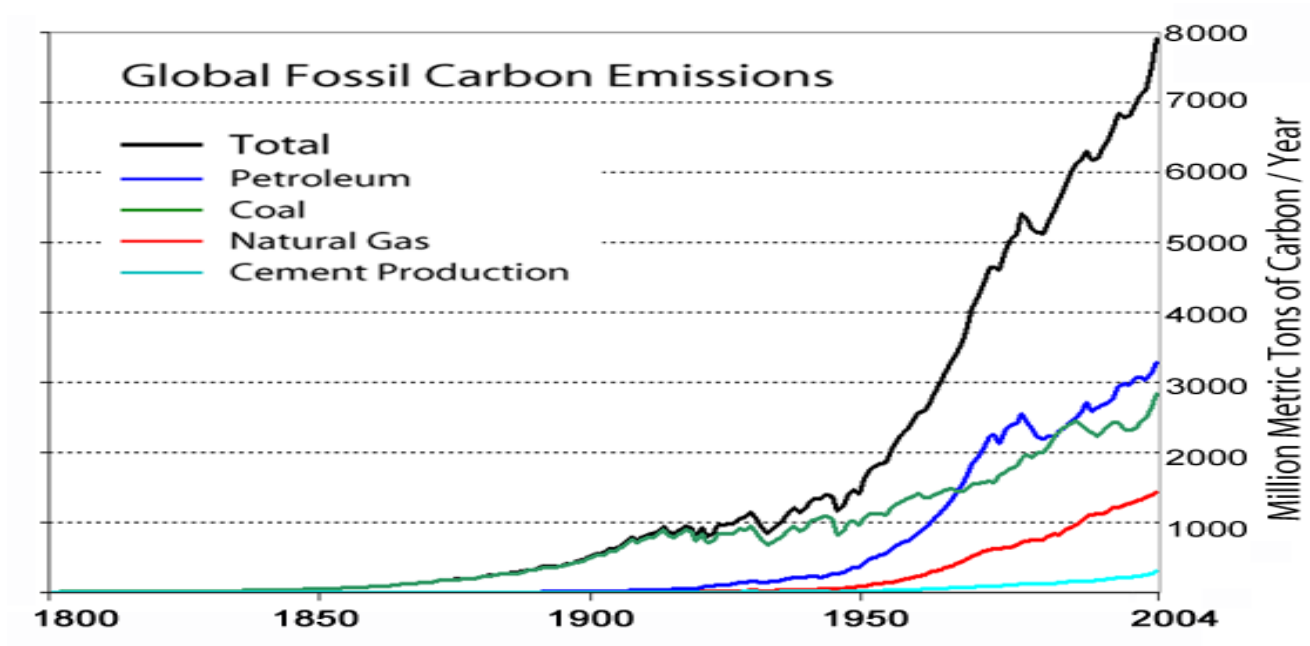
Apart from entirely human-produced halocarbons, most GHG's have both biological and human-caused origins. Concentrations of existing gases were more or less stable, throughout the pre-industrial Holocene. During the industrial era, human behavior have increased GHG's to the environment, largely through deforestation and burning of fossil fuels (Intergovernmental Panel on Climate Change, 2007).

According to the Forth Assessment Report (AR4) (Anon, 2009j) compiled by the IPCC during 2007, it was noted that "changes in atmospheric concentrations of greenhouse gases and aerosols, land cover and solar radiation alter the energy balance of the climate system", and concluded that "increases in anthropogenic greenhouse gas concentrations is very likely to have caused most of the increases in global average temperatures since the mid-20th century". Where "most of" is defined as more than 50%.

Recent data and available data of 1960 of the concentration of GHG's were compared. It shows that the annual increase of GHG from 2000 to 2007, was higher than the annual increase of 37% measured in the basis year (1960) (Twomey, 1977:1149-1152).

The graph below (Thorpe, 2007) emphasise the rapid increase in carbon emissions over the past 200 years. From the graph it is clear that emissions will keep on rising at an exponential rate if nothing is done to reduce carbon emissions.

**Figure 2: Global fossil carbon emissions.**



## 2.4 MAIN SOURCES OF GHG'S

The main sources of greenhouse gases due to human activity are:

- burning of fossil fuels and deforestation leading to higher carbon dioxide concentrations. Land use change (mainly deforestation in the tropics) account for up to one third of total anthropogenic CO<sub>2</sub> emissions;
- livestock enteric fermentation and manure management, paddy rice farming, land use and wetland changes, pipeline losses, and covered vented landfill emissions leading to higher methane atmospheric concentrations (Russell, 2007). Many of the newer style fully vented septic systems that enhance and target the fermentation process are also sources of atmospheric methane;
- use of chlorofluorocarbons (CFCs) in refrigeration systems, and use of CFCs and halons in fire suppression systems and manufacturing processes; and
- agricultural activities, including the use of fertilizers, which lead to higher nitrous oxide (N<sub>2</sub>O) concentrations (Kiehl & Trenberth, 1997:197-208).

CO<sub>2</sub> from fossil fuel combustion consist mainly of seven sources, (with percentage contributions for 2000–2004) namely:

- solid fuels (e.g., coal): 35%;
- liquid fuels (e.g., gasoline, fuel oil): 36% ;
- gaseous fuels (e.g., natural gas): 20% ;
- industrial and oil well flaring gas: <1%;
- cement production: 3% ;
- non-fuel hydrocarbons: < 1%; and
- "international bunkers" of shipping and air transport not included in national inventories: 4% (EPA, 2008).

## **2.5 EFFECT OF GLOBAL WARMING ON THE ENVIRONMENT**

Many physical and biological systems are noticeably influenced by anthropogenic warming, such as that due to elevated greenhouse gas levels and it is projected that warming will affect various issues such as health, food, freshwater resources and industry. (Schmidt, 2005.)

In a statement on GHG issued by the US Environmental Protection Agency on 7 December 2009, they declared that the public health and welfare of the American people are threatened by GHG's. Their ruling was applicable to the "six key well-mixed greenhouse gases" namely nitrous oxide, carbon dioxide, hydrofluorocarbons, methane, perfluorocarbons and sulfur hexafluoride named in the Kyoto Protocol (Petit, 1999:429-436.)

## 2.6 CONCLUSION

Based on the information above it is clear that global warming is accelerated by increasing GHG levels. From the industrial era up to present day humans have been responsible for producing huge quantities of GHG pollution by means of burning fossil fuels and deforestation. The effect of global warming on the environment and human beings should not be underestimated.

In the following chapter South Africa's contribution to GHG pollution will be investigated as well as a breakdown of the specific industries or individuals who produce the most GHG's.

## CHAPTER 3

### CURRENT GHG POLLUTION LEVELS IN SOUTH AFRICA COMPARED TO THE REST OF THE WORLD

#### 3.1 INTRODUCTION

In this chapter a detailed investigation regarding the current GHG emissions and more specifically the CO<sub>2</sub> pollution for which South Africa is responsible will be done. This will give the ability to determine the importance of implementing a carbon tax in South Africa as a means to reduce GHG pollution. A comparison will be drawn between the quantity of CO<sub>2</sub> emissions both per capita and per GDP for South Africa and compared to other developing and first world countries. The results of the above mentioned comparison will assist in determining the extent of South Africa's contribution to world wide GHG emissions.

A brief breakdown of the industries and individuals that is in large responsible for GHG emissions will be given. This would show where the need for reduction of GHG emissions is most crucial. This reduction may serve as a tax incentive – this would be the focus of the remainder of the chapters.

#### 3.2 CURRENT SITUATION IN SOUTH AFRICA

South Africa is known to be one of the world's worst polluters from the perspective of emissions intensity as well as *per capita*. Although South Africa is regarded as a 'non-Annex 1' country (largely developing countries) meaning it has no explicit emissions reduction targets, it also signed the 1997 Kyoto protocol, the latter primarily focussing on reducing GHG emissions. South Africa already judged by others as a big polluter in the 'non-Annex 1' group which also includes, India, China and Brazil, is under increased international pressure to start taking alleviative actions of their own. Regarding the next phase of negotiations to take place after 2012, emphasis were placed on the urgency for stronger action to be taken to increase cuts by all involved in the project, but especially the non-Annex 1 group and industrialised countries (Anon, 2009d:7). There is also increased

pressure felt in South Africa regarding the current energy crisis in the country, which also emphasise the need for South Africa to re-evaluate their current energy policy as well as the policy for the future (Anon, 2009d:7).

This challenge of re-evaluating the current energy policy and reducing GHG emissions, have been addressed by South Africa by starting a “National Climate Change Response Policy” and completing this policy by the end of 2010. Climate change imperatives will be translated into fiscal, legislative and regulatory policy by policy-makers, between now and 2012. Carbon tax is one of the tools that government is considering to use to contribute to the reduction in current GHG emissions. The first step in this direction was taken by government when they announced that the electricity generated from non-renewable resources will be subject to a levy of 2c/kwH (Anon, 2009d:7). Based on the fact that the disciplinary action of the “tax only” relates to electricity, this type of tax will not be extensive enough to change the behaviour regarding reductions in future emissions or decision-making on energy generation in future. The Treasury noted in the 2008 Interim Budget Policy Statement, that the “electricity levy should be seen as the first step towards the introduction of a more comprehensive emissions-based carbon tax”. Whilst the debate over a carbon tax is globally focussed on the carbon tax’s merits relative to cap-and-trade systems, the cap-and-trade systems have already been implemented in both North America and Europe. It is also foreseen that the Australian cap-and trade system is set to begin in 2010. It is expected that the system will expand at a great speed in these countries. (Anon, 2009d:7.)

### **3.3 CONTRIBUTORS TO CO<sub>2</sub> EMISSIONS IN SOUTH AFRICA**

In order to reduce GHG emissions it must be determined what or who the greatest contributors toward GHG emissions are. The rankings awarded to major global greenhouse gas contributing end-users, by the US Environmental Protection Agency (EPA) are as follows: industrial, transportation, residential, commercial and agricultural (Spahni, 2005:1317–1321). Individual’s GHG is mainly a result of electricity consumption, home heating and cooling and transportation. Home building is also being improved as a means of taking conservation measures. By installing geothermal heat pumps and



compact fluorescent lamps, conservation measures are presently incorporated in home building insulation techniques (Anon, 2009n).

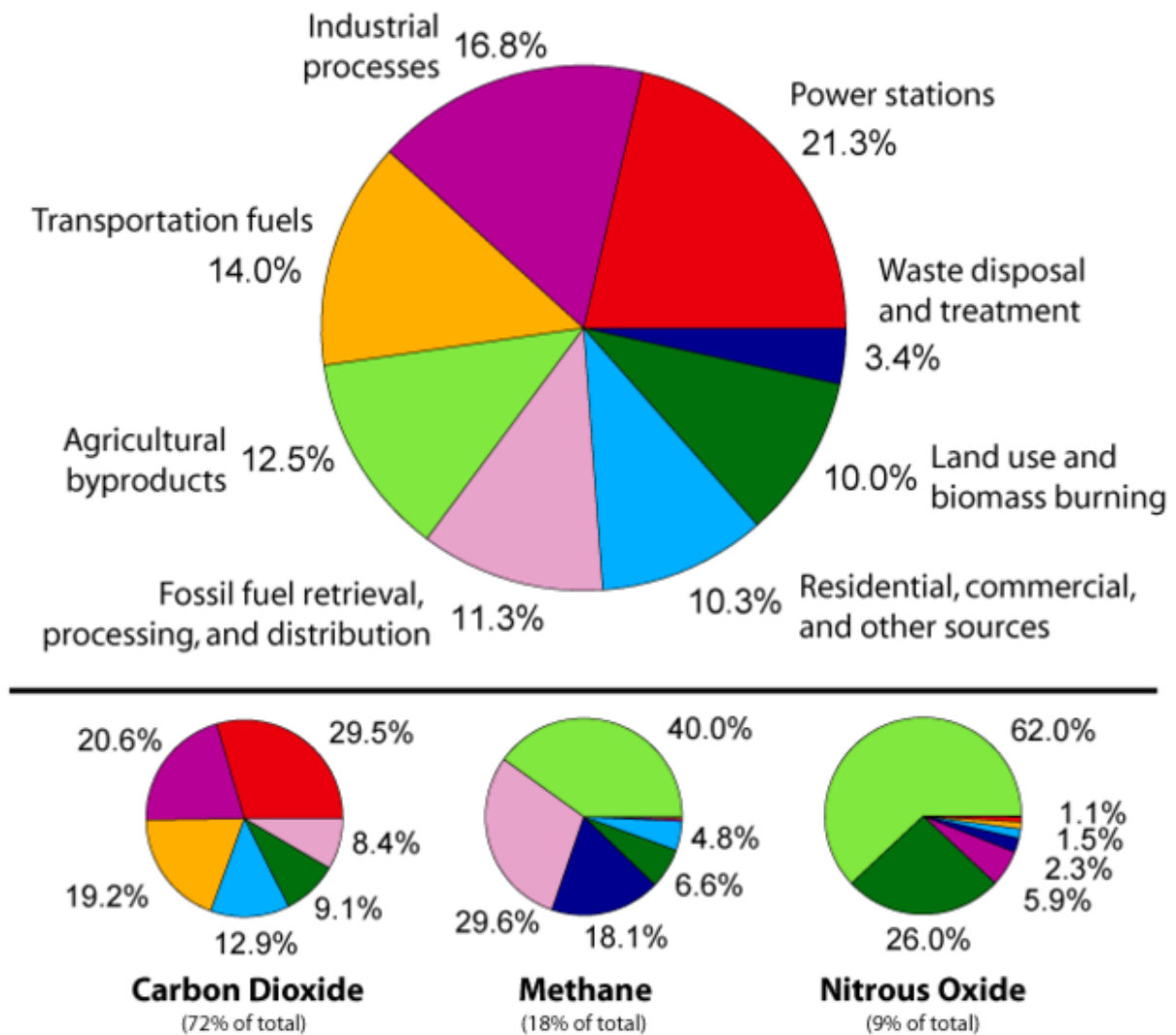
The abundance and characteristics of gas determines its contribution to the greenhouse effect. For example, comparing different gases on a molecule-for-molecule basis it was found that although methane is an eight times stronger greenhouse gas than carbon dioxide, it presently exists in much smaller concentrations and therefore its total contribution is smaller (Houghton, 2005:1362). Ranked in order by way of their contribution to the greenhouse effect the most important are:

- water vapor, which contributes 36–72%;
- carbon dioxide, which contributes 9–26%;
- methane, which contributes 4–9% ; and
- ozone, which contributes 3–7% (Kiehl and Trenberth, 1997:197-208).

It is not possible to state that the exact percentage of the greenhouse effect of a certain gas can be ascertained. Because some of the gases absorb and emit radiation in equal volumes compared to others, it can not be assumed that the total greenhouse effect is simply the sum of the influence of each gas. Therefore it is important to point out that whilst the lower ends of the ranges accounts for overlaps with the remainder of the other gases the higher ends of the ranges represents each gas alone. Through absorbing and emitting infrared radiation, clouds being a major non-gas contributor to the Earth's greenhouse effect, also have an effect on the radiative properties of the greenhouse gases. (Anon, 2005.)

The chart below (Anon, 2006) shows the major contributors to GHG emissions per sector. From the chart it is easy to conclude that the largest GHG emitters are power stations, industrial processes and transportation fuels. Focus should therefore be put on these sectors, as a reduction in the emissions by these sectors will have the biggest impact on the environment.

**Figure 3: Annual GHG emissions by sector**



### 3.3.1 Power stations

Energy in South Africa is in large provided by Eskom, It generates approximately 95% of electricity used in South Africa. The utility is the largest producer of electricity in Africa, is among the top seven utilities in the world in terms of generation capacity and among the top nine in terms of sales. (Anon, 2009a.)

Eskom operates a number of notable power stations of which most are coal fired (Anon, 2009a). It is therefore fair to say that Eskom is one of the major GHG emitters in South

Africa. A reduction in Eskom's GHG emissions is thus essential in order to reduce the rate of global warming.

### **3.3.2 Industrial processes**

A large contributor to the South African economy is industries. The mining industry is regarded as the cornerstone of the South African economy (Anon, 2009o). This industry coupled with the other industries in South Africa produce large quantities of GHG's. South Africa's economy is to a great extent based on industrial activities. As industrial processes are rated as the second largest producer of GHG in the world, one can make the assumption that it is also responsible for a major part of South Africa's total GHG emissions. It is therefore fair to say that industries (including mining) are one of the major GHG emitters in South Africa. A reduction in Industry's GHG emissions is thus essential in order to reduce the rate of global warming.

### **3.3.3 Transportation fuels**

With reference to the chart above it seems that human and freight transport emits the third most GHG's. There are however two different views on this specific topic. There are those who agree that transportation fuels are responsible for a major part of GHG's emissions and therefore the rise in global warming (Grassl, 2010). There is also some who disagree and claim that the emissions of transportation is generally overstated and that transportation is responsible for only an immaterial amount of GHG emissions (Venter, 2008:128-132). These two contradicting schools of thought will now be discussed in more detail.

#### **3.3.3.1 Research suggesting that cars are one of the main GHG polluters.**

According to Grassl (2010) of the German meteorological institute more than one quarter of the world's CO<sub>2</sub> emissions – 2.5 billion ton - is produced by road, air and water transportation. Of these mentioned contributors, motor vehicles are responsible for the most emissions by far (Oosthuizen, 2009:9).

It is estimated that from as early as the 1750's, human activity contributed increasingly to the concentration of carbon dioxide and other greenhouse gases. Compared to known pre-industrial levels it is established that the measured atmospheric concentrations of carbon dioxide are presently 100 ppmv higher (Weart, 2008). Although natural sources of carbon dioxide are at present 20 times greater than concentrations of carbon dioxide sources due to human activity it is generally accepted that natural sinks such as weathering of continental rocks and photosynthesis of carbon compounds by plants and marine plankton, will over periods longer than a few years have a contra effect. Due to the so-called contra effect, it is assumed that between the end of the last glacial maximum and the start of the industrial era, approximately 10,000 years, the atmospheric concentration of carbon dioxide remained between 260 and 280 parts per million (Kiehl & Trenberth, 1997:197-208.)

### **3.3.3.2 Research suggesting that cars are not the main CO<sub>2</sub> polluters.**

According to Venter (2008:128-132) cars are not the main culprit. This statement is based on his research on information gathered in the US Department of Energy's website. Below are his findings in brief.

There are five major groups that GHG's can be divided into:

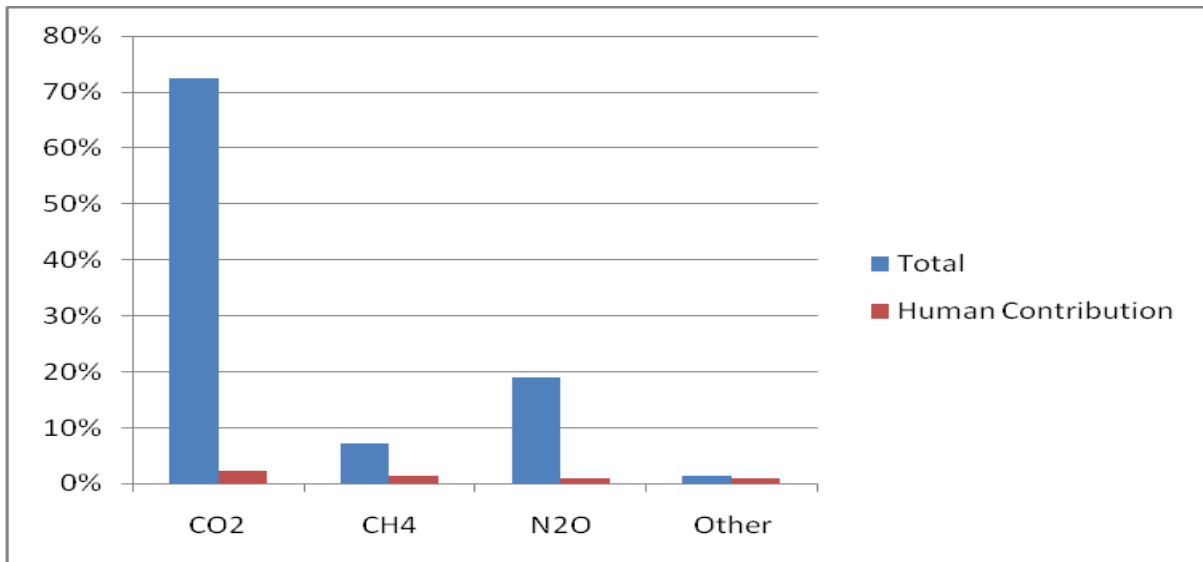
- water vapour (H<sub>2</sub>O);
- carbon dioxide (CO<sub>2</sub>);
- methane (CH<sub>4</sub>);
- nitrous oxide (N<sub>2</sub>O); and
- other gases such as members of the fluorocarbon family.

Due to its variable atmospheric lifetime, carbon dioxide cannot correctly be specified (Soden & Held, 2005:3354–3360). Indicators obtained from a recent study regarding the recovery from a large input of atmospheric CO<sub>2</sub> from burning fossil fuels, shows that it may result in an effective lifetime of tens of thousands of years (Stocker, 2001).

When the contributions of the above substances to the green house effect are presented to the press and politicians the picture is often deliberately skewed by ignoring the effects of natural water vapour. This is done to emphasise the human contribution, but this fact is seldom mentioned. (Venter, 2008:128-132.)

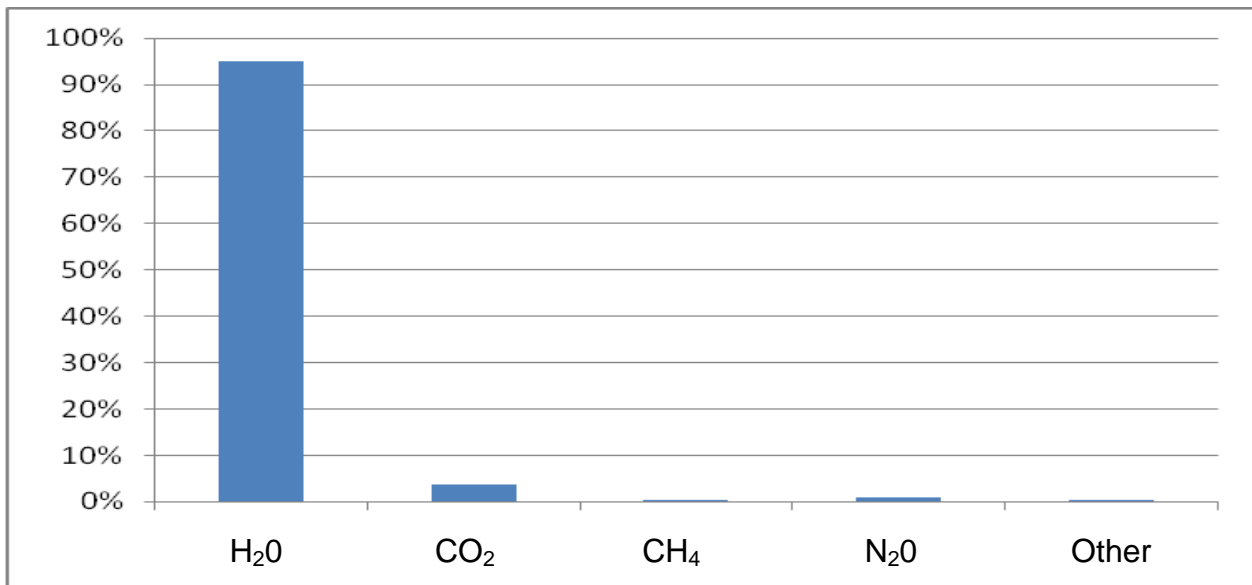
Below are the two charts by Venter (2008:128-132) showing the contribution of various gases to the warming effect of the earth in percentages. The first chart ignores the effect of water vapour but shows the human contribution towards the GHG effect. The result of this chart suggests that of all the GHG emissions, humans can only control and influence a very small part of the total pollution that contributes to the global earth warming effect.

**Figure 4: Human contribution to GHG (excluding water vapour)**



The second chart takes the effect of water vapour into consideration. Water vapour (H<sub>2</sub>O) accounts for by far the largest contribution to the green house effect. Water vapour occurs in condensed (clouds) and uncondensed form, making it very difficult to assess its contribution. In addition, vapour concentrations vary considerably from place to place. Human activity has very little effect on the global picture when considering the major role played by the large amount of ocean water. (Venter, 2008:128-132.)

**Figure 5: Human contribution to GHG (including water vapour)**



The results show that, taking the human contribution to water vapour as 1%, the total human contribution to GHG is 1.23% (Venter, 2008:128-132). Since cars are responsible for about 17.7% of the global warming effect of fuel combustion, this shows that the global warming effect due to vehicles is actually close to negligible.

It should however be considered that the “unnatural” or emissions for which humans are responsible - even though it is minimal - could cause the atmospheric balance of GHG to shift to a point where it results in a more than natural increase in global warming. Investigating this theory further is however not within the scope of this document.

### 3.3.4 Conclusion

Research is still ongoing in order to determine the effect that cars have on global warming and the amount of GHG emissions cars are responsible for. What research has however proved is that cars are responsible for emitting GHG’s that are harmful to the environment to a greater or lesser extent. It must be said that the majority of studies show that transportation fuels are a large contributor to GHG’s and subsequently global warming.

### 3.4 SHOULD THE SOUTH AFRICAN GOVERNMENT INTERVENE?

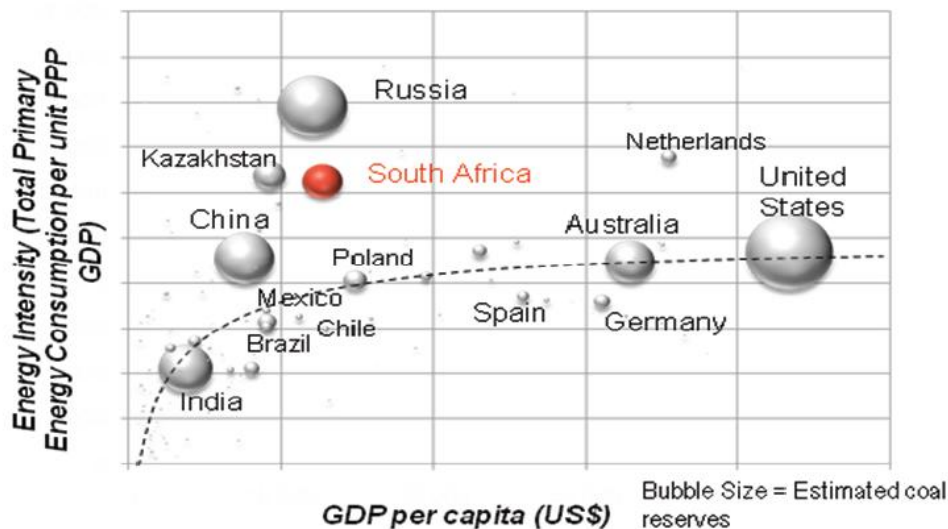
Whether the South African government should alter or just expedite the altering of the present economic structure to reduce its GHG emissions, now that it bears the dubious distinction of being among the worst polluters, *per capita*, is not a forgone conclusion. It is however a general accepted economic principle that government intervention is justified when a *market failure or a government failure* takes place. The latter being the result of the functioning of the market leading to a sub-optimal allocation of resources. Government failure on the other hand occurs when its policy leads to a sub-optimal allocation of resources. It may be argued that both market and government failures are instrumental to the current high levels of GHG emissions. (Anon 2009d:7.)

The South African resource component attributes mainly to its market failure. Although South Africa is in a privileged position of being rich in gold, platinum and coal, it is the exploitation of these three resources being largely responsible for the demise of the environment. Whilst it is common knowledge that gold and platinum mining is extremely energy intensive, it is particularly the deep-level shafts found in South Africa that use most energy. Due to South Africa's abundant coal reserves, about 95% of all electricity generated comes from coal-fired power stations. It is this energy that powers the mining industry. One of the country's technological achievements has been the development of Coal-to-liquid (CTL) and Gas-to-liquid (GTL) processes. Whilst both of these have been made possible by developing processes for the relatively easy extraction of coal and gas, it was distinctive that both processes would require large amounts of energy to operate. On the down side it would produce extraordinary amounts of emissions. (Anon, 2009d:7.)

South Africa's energy intensive economy is accentuated when comparing its performance against that of similar countries. When compared to other developing countries such as Mexico, Chile and Brazil (Figure 6), it is clear that South Africa outranks them all by consuming more energy per unit of GDP. Energy used per unit of GDP is based on a number of factors such as South Africa's historical reliance on minerals, but mostly its abundance of cheap and relatively dirty coal. South Africa's reliance on its mining industry, with gold and platinum as the main earners of foreign exchange, is inseparably linked to a relatively high energy usage level for extracting minerals which is known to require enormous amounts of energy. (Anon, 2009d:8.)

Although Australia is more resource based, it uses substantially less energy per unit of GDP. Taking into account the aforementioned factors, South Africa still compares unfavourable to other extremely energy-intensive economies such as Russia and Kazakhstan, which both depend on gas and natural resources to drive their economies, although their resource intensity can be contributed to their sheer size and cold weather conditions. (Anon, 2009d:8.)

**Figure 6: Energy intensity and economic expansion**



Though unintentional, South Africa's industrial policy, throughout both the apartheid and post-apartheid governments, heavily subsidising the energy for industry (including the aluminium industry) by encouraging the CTL processes, contributed actively to the country's energy intensity (Anon, 2009d:8). The economic development of the country undoubtedly profited from this policy. It is increasingly clear that, not only from an environmental, but also from an affordability perspective, these policies would not be sustainable in the longer term (Anon, 2009d:8).

The recent Eskom catastrophe and the demand for the increase of the electricity capacity, has highlighted the fact that for South Africa to sustain an industrial-led growth of 6%+ per annum, a substantial cash investment will have to be made, not only by the government, but also by all users of electricity (Anon, 2009d:8).



### 3.5 CONCLUSION

Although South Africa does not produce the largest amount of GHG's in the world South Africa is one of the countries that produce the largest amount of GHG emissions per capita and per unit GDP. This is because South Africa has a very energy intensive economy as stated above. In order to reduce global warming it is important for South Africa to reduce its GHG emissions. In the following chapters this study will attempt to identify the most effective taxation that can be used to influence GHG emitters' behaviour in order to produce less GHG's.

In the following chapter the principles of a good tax will be explained and carbon tax will be measured to the definition of good tax.

## CHAPTER 4

### PRINCIPLES OF A “GOOD TAX”

#### 4.1 INTRODUCTION

For the effective implementation of taxes, these taxes are required to comply with the principles of a good tax. Ten key principles for the South African tax system were identified in 1987 by a Commission of Inquiry led by Justice Margo, better known as the “Margo Commission”.

These principles will be discussed below and the current and proposed taxes and incentives will be measured against these principles in Chapter 9.

#### 4.2 BACKGROUND TO WHY CARBON TAX IS LEVIED

Carbon taxes, also referred to as environmental taxes, are designed and implemented to achieve the goal set to simultaneously changing the behaviour of consumers by monetising the cost of pollution on society and giving a decrease in the cost of clean technology.

Monetisation usually involves two objectives namely (Anon, 2009d:9):

- giving compensation to society for the cost of pollution; and
- discouraging pollution by making it expensive to pollute.

For example, if by making use of coal resources to generate electricity and the latter being taxed, this tax should encourage consumers to change their behaviour and rather make use of electricity which is generated by other resources.

These taxes levied as counter-force for any harmful activity on the general public, also known as “Pigouvian taxes” can be referred to as “negative externalities”.

(Anon, 2009d:9.)

Pollution can be judged as an exceptional illustration of negative externality. This is due to the fact that the polluter will gain revenue from his production, and then adds costs to his products as a means to then shift the increased cost of the pollution in his product onto the consumers. (Anon, 2009d:9.)

For illustration think about an industry which is situated right next to a dam or river and this industry produces a lot of pollution. As part of its production process, the industry may obtain clean water from the dam or river only to dispose the waste at a later stage into the same dam or river. Other people and industries further downstream is now deprived from making use of the river's clean water and may thus experience a decrease in their economic benefits as a result of this pollution. This is due to the fact that the industries and people downstream now have to incur higher costs to enable them to rid the water of the river of the pollutants and make it user friendly for their own production and use.

If the downstream industry has access to the right legal system, they may have the ability to be reimbursed for their increased costs by the upstream industry, which will then transfer the high cost of the pollution back to the upstream industry (Anon, 2009d:9). This is rarely the case as the legal system and industry is much more complex in reality. It is thus apparent that GHG's emitted by one industry, could have an enormously negative impact on many other industries, and possibly even industries or people in other parts of the world. Other impacts of the pollution are not necessarily just limited to the economy, but might also be non-economic. An example of such a non-economic impact of pollution is the health of people. A carbon tax could thus be a means used by people to allocate a monetary cost to the pollution produced. Income then generated by this carbon tax, could then be used to decrease the cost of the pollution. As an additional benefit of the carbon tax, it could influence the cost of pollution creating activities, by discouraging industries and people to make use of dirty technology. This would then serve as encouragement to make use of cleaner technologies and alternatives available. The effective and user friendly design of such a carbon tax would however greatly impact on its ability to achieve such a change in the behaviour of industries and people, to shift from making use of dirty technology by making use of more environmentally friendly alternatives. (Anon, 2009d:9.)

### 4.3 PROBLEMS ARISING FROM CARBON TAXES

Carbon taxes however are anything but simplistic. The implementation of carbon taxes poses quite a number of complexities of which one is the accurate and efficient way of allocating a cost to the pollution on society. The ideal situation for the government would be to have a full recovery of the costs of pollution to the society from industries for each additional tonne of GHG emissions produced by them. Such a cost is known as the marginal social cost (MSC). (Anon, 2009d:9.)

Another worry regarding this type of tax is the evaluation of such a carbon tax as part of the broader tax system already implemented. To enable such an evaluation of the carbon tax, an understanding of the tax's ability to comply with the standard principles of a "good tax" is of utmost importance. Such principles include equity, neutrality and simplicity. These principles are however discussed and considered in more detail below. (Anon, 2009d:9.)

### 4.4 ARE THE CURRENT ENVIRONMENTAL TAXES A BURDEN TO "GOOD" TAXES?

The electricity and the fuel levy are currently the two main environmental taxes to be locally utilised. The governments' current environmental tax system mainly consists of these two levies. Because the electricity and the fuel levy do not fulfil the majority of requirements of a "good tax" it is generally recognised that an alternative approach to reducing GHG emissions is needed. (Anon, 2009d:10.)

**Table 3: Principles of a good tax**

Principle	Evaluation	Carbon tax
Adaptability	?	Taxes ought to be adaptable to the degree that they permit the tax structure to keep up with commercial and technological advancements. An unsophisticated fuel levy or electricity levy will not keep up with technological developments as it does not correlate with the amount of GHG's emitted.
Objectivity	<b>Not applicable</b>	A carbon tax is, by design, not objective as it intends to alter behaviour.

Equity	?	Presently inequitable, because the electricity levy only effects Eskom, while the fuel levy only ultimately affects SASOL, and does not differentiate between clean fuel and unclean fuel.
Distributional efficiency	?	This is linked to equity, and the same matters emphasised there is relevant here.
Certainty	?	Presently, there is not much certainty for affected taxpayers on the prospect of the emissions system. Agreed that the probable legal responsibility for firms is billions of rand, this has considerable consequences for their investment preparation practice.
Administrative efficiency	✓	<p>There are fundamentally three options:</p> <ol style="list-style-type: none"> <li>1. Tax the end user – this is administratively the most straightforward, but not inevitably the most efficient as it transfers the weight of the tax onto the end user.</li> <li>2. Tax the unclean input – this is achieved by escalating the price of the input, which promotes the use of substitutes.</li> <li>3. Tax the manufacturer – in this case the actual quantity of GHG's emitted. This might be the most successful from an emissions view, but is administratively very complicated due to the need to calculate GHG emissions.</li> </ol>
Simplicity	?	Several types of the carbon tax are simple to initiate (e.g. the fuel levy). Nevertheless, this will decrease their efficiency.
Cost effectiveness	?	A well-thought out tax will be costly, generally because objective confirmation of the quantity of carbon emissions will be complicated.
Steadiness	✓	Taxes should provide reasonably constant tax revenues, and carbon tax would achieve this (as would almost any other tax).
Balance between direct and indirect tax	✓	The tax can without difficulty be designed to guarantee that there is an adequate equilibrium between direct and indirect taxes.

Adapted from Margo Commission Report (1987:3).

## **4.5 BACKGROUND OF THE ESTABLISHMENT OF THE TEN PRINCIPLES**

The “four maxims” of a “good tax” as referred to by Smith (1776:888) are certainty, equality, economy in collection and convenience of payment. Built on these well-established principles of taxation, the recommendations by the Margo Commission Report (1987:3) added neutrality and distributional effectiveness to Smith’s referral and hence formed the basis of the South African tax reforms of the post-apartheid era. Arising from these recommendations the ten principles are as follows:

- equity;
- neutrality;
- simplicity;
- certainty;
- administrative efficiency;
- cost effectiveness;
- flexibility;
- stability;
- distributional effectiveness; and
- a fair balance from the point of view of taxpayers between the respective burdens of direct and indirect tax (Anon, 2009d:9).

It is thus apparent that these above mentioned ten principles should be applied in the evaluation of any carbon tax or incentive.

## **4.6. DESCRIPTION OF EACH PRINCIPLE**

### **4.6.1 Equity**

Equity consists of two parts. Firstly, it is clear that two individuals with the same income and conditions should pay equal amounts of tax. It would be unfair if they were to be taxed on different basis. By definition the current system seems to be grossly unfair when made applicable to carbon tax. While one company in particular (Eskom) is taxed, it can be freely argued that almost all South African companies produce GHG emissions. The amount

levied (2c/kWh) seems to be utterly discretionary and not related to the underlying GHG's, but rather coupled to the amount of electricity produced. (Anon, 2009d:11.)

Although these factors are at present closely related, one can imagine that should Eskom's electricity production in future were to become more environmentally friendly, the levy per kWh would be reduced. (Anon, 2009d:11.)

Secondly, Smith (1776:888) acknowledged that not only should tax be fair over a wide spectrum but also tax payers should pay tax "in proportion to their respective abilities". The concept of a progressive tax is widely accepted firmly established in South Africa as being most reasonable – i.e. whilst those individuals below a certain threshold are excluded from paying tax at all, other individuals who falls in a lower-income bracket, pay a smaller percentage of their income in tax. (Anon, 2009d:11.)

The question around progressive versus flat rate taxes is outside the scope of this dissertation, aside from stating that few would still dispute that the most fair tax is one where one and all pays an equal percentage of their income in taxes. Arguably this is certainly not practised anywhere in the world. However, in certain countries such as the USA, the system provides for negative tax or "Earned Income Tax Credits" where the poor get taxes paid back to them. (Anon, 2009d:11.)

By extending these arguments to any proposed carbon tax, two broad options were identified, namely:

- a flat tax where all polluters should be taxed the same, no matter if they are small or large. While this seems initially quite workable, it does mean that car owners should pay for the GHGs their cars produce. In the extreme, all citizens should be charged for the carbon dioxide they breathe out; and
- a progressive tax where bigger polluters should be taxed more – i.e. a sliding scale. In reality a fairer sliding scale would be to tax polluters relative to their income, e.g. GHGs produced per rand of revenue. Thus small companies producing relatively enormous amounts of emissions in their production processes would be highly

taxed. On the other hand, large companies that produce lots of emissions in absolute terms, but little per unit of output, would not be highly taxed. (Anon 2009d:12.)

When considering the above two options a third option, namely a progressive tax system may also be considered where the tax levied is in relation to the amount of pollution i.e. by making use of a sliding scale.

The latter to be based on the principle of the higher the GHG emissions the higher the tax rate, regardless of revenue. Polluters under a certain level of emissions will be exempt from GHG tax and could possibly even earn income tax credits as is the current situation in the USA.

#### **4.6.2 Neutrality**

The principle of neutrality in its simplest form means that behaviour should not be altered in any way whatsoever by any proposed revenue tax or levy. Behaviour should therefore neither be stimulated nor burdened by any form of tax or levy. To a great extent, the South African government has, to quote Shakespeare, honoured this specific Margo Commission principle “more in the breach than in observance”.

The so-called “sin tax”, is by far the least popular amongst society whilst it constitutes the largest category of behaviour-changing taxes. Alcoholic beverages and cigarettes, among others, known to be classified as “unhealthy goods” or often called “bads”, are usually subject to more severe taxes than “healthy goods” to discourage their use. In order to encourage the development of certain industries, like the motor industry, taxes imposed on such designated industries prove to be more favourable than those in other categories. Likewise, a carbon tax is by intent not neutral, as it promotes an adjustment in behaviour. However the National Treasury’s opinion differs insofar as to “where the primary intention of a tax is to change taxpayer behaviour and to raise revenue in the process, the neutrality principle becomes secondary” (National Treasury, 2006:69). When the goal is to reduce carbon emissions by means of a tax, change in companies’ and individuals’ behaviour is



required and therefore the neutrality principle will not be one of the primary measurement criteria of a tax to reduce carbon emissions (Anon, 2009:12).

#### **4.6.3 Simplicity**

Taxes have to be simple, easily measurable and adaptable to the different characteristics of carbon tax. The quantity of GHG emitted per annum by a specific industry or business, however, might not be instantly quantifiable, especially for smaller businesses. This is due to the fact that insufficient means of accurate measurement of carbon emissions for all the South African companies have been developed. Data would have to be collected and processed for all the companies on a regular basis to ensure fair and accurate measurement of emissions. This would be a very challenging exercise for South Africa as it even proved to be difficult for developed countries in Europe. If the measurement of the carbon emissions are so challenging for smaller companies, it would be even more difficult to do this for individuals. The greatest contribution to carbon emissions by individuals are through their motor vehicles. This fact could however simplify the measurement of carbon emissions by individuals, as proofed by measurement techniques and subsequent taxes developed and successfully implemented in developed countries such as the USA, Germany and the UK – the specific techniques developed by other countries will be discussed in detail in Chapter 8. The price of quantifying the emission of GHG's opposed to the income raised by the proposal would need to be weighed up as such measurements are possibly very costly and can easily cause carbon tax to be uneconomical. (Anon, 2009d:12.)

#### **4.6.4 Certainty**

To enable a taxpayer to calculate his tax liability in advance based on known facts, guesstimates and prevailing conditions at a certain time, taxes should be clearly defined and easily understood. As a carbon tax may have a significant financial impact on industries and individuals it is important for the taxpayers to be able to calculate the amount of tax that they need to pay. The tax can not be based on an estimate made by the tax collector on the amount of GHG's that is produced as this would be in direct contrast with the "certainty" principle. There should be a measurement technique whereby

industries and the tax collector can accurately monitor the carbon emissions throughout the year. Individuals should be able to calculate their carbon emissions by using their kilometres travelled during the year and the decision about what vehicle to buy should be influenced by the amount of emissions produced by the vehicle. This information should be available to the individual in order to budget for and calculate their carbon tax. (Anon, 2009d:12.)

#### **4.6.5 Administrative efficiency and cost effectiveness**

It is important to maintain a balance between efficiency and fairness. From this point of view arises effectively three ways to levying tax, namely:

- tax the final consumer. It is generally the easiest way to raise a tax at the consumer level, with both the fuel levy and the electricity levy currently levied on the final consumer at this level. However, this may not be the fairest place to raise a levy, nor may it have the right economic impact. For example, one of the problems with a cigarette tax levied on the consumer is that cigarette consumption is relatively inelastic, meaning that whatever the cost of the cigarette tax levied is, consumers of cigarettes will still buy cigarettes. As a result, a levy has only a small impact on consumption of cigarettes. Similarly, while it may be more administratively efficient to levy a carbon tax on the end user (e.g. through a larger fuel levy or an electricity levy), this may not have the desired effect of changing behaviour on the part of producers. Alternatively a new tax may be implemented where the individual are taxed on the amount of GHG emissions of his vehicle. This would possibly impact the individual's behaviour to produce fewer emissions. This statement and the results achieved in other countries with this type of tax will be further investigated in Chapter 8;
- tax the dirty input. An input tax (e.g. a tax on coal) may be better suited to change behaviour at the producer level, by changing the economics of using coal in a production process. However this only works if there are substitutes – for example if one taxes a type of coal with low calorific value (e.g. brown coal), a producer may choose to rather burn less of a type of coal with higher calorific value (e.g.

anthracite). In many processes, there is limited ability for a producer to change his production process to a cleaner approach. In this case, the producer simply passes on the additional cost onto the final consumer, and the tax becomes equivalent of a tax on the consumer; or

- tax the producer. A more administratively complex tax is to tax the producer directly for his/her emissions. For example, the volume of GHG emissions produced could be taxed, as noted earlier, possibly using a progressive tax and using a measure relative to revenue. Such a tax may prove to be more effective, however, as it directly punishes the polluter for producing large amounts of emissions. By directly linking the amount of emissions produced to the tax, it may make installing carbon scrubbers or more efficient technologies economically viable. While such a tax may have the biggest impact, it is not necessarily the most cost-effective. (Anon, 2009d:12-13.)

As mentioned earlier, the “polluter-pays principle” accentuate the believe that the polluter is liable for the costs of pollution (Anon, 2009d:12-13). As part of landowners so-called “right to pollute” he may by polluting the environment infringe on the rights of others by also polluting their property. This action is better known as negative externality. By discarding waste onto their property or by releasing pollutants into rivers etc. owned by them, such material may pollute the property of others which pollution may well led to the reduction in property values coupled with the cost of restoring the said property to its former state. The “pollutee” is henceforth justifiably entitled to recover these costs from the pollutant, or the public may recover it through a tax. (National Treasury, 2006:69.)

#### **4.6.6 Flexibility**

Taxes should be adaptable in such a way as to accommodate all changes brought by technological commercial developments. By not relating to the amount of GHG’s produced, the simplicity of the fuel and electricity levies will therefore could not keep pace with the current technological improvement. Whether current taxes could adapt if there are to be substantial advances in terms of reducing emissions (e.g. carbon scrubbers), is yet not clear. (Anon, 2009d:13.)

#### **4.6.7 Stability**

Taxes should be structured in such a way that it attributes to render a relatively stable tax revenue. Carbon tax would be an ideal vehicle (as would almost any other tax) to achieve such a goal. This criterion is met rather easily by Carbon taxes, as emissions are expected to remain relatively unchanged in the years to come. It must be understood, however, that there is a restricted incentive for government to establish other strategies to decrease emissions as these will in fact result in a deterioration of tax revenue. Whether proposed taxes and incentives are a stable revenue generator are not yet known, but an additional tax on individual carbon emissions will not only increase government revenue but also decrease carbon emissions. Therefore even if there is a decrease in individual emission with a resulting decrease in taxes paid, the government will still receive normal carbon tax revenue and achieve the goal of less pollution produced by individuals. (Anon, 2009d:13.)

#### **4.6.8 Distributional effectiveness**

The same criteria which applied to equity mentioned earlier, is also applicable here i.e. carbon tax is currently focussed on Eskom and larger petrochemical players (Anon, 2009d:13).

#### **4.6.9 Balance between direct and indirect taxes**

The carbon tax can easily be planned to guarantee that there is an adequate equilibrium between direct and indirect taxes. For this reason, if properly intended, a carbon tax / fuel and electricity levy can realise the requirements of a balanced tax. (Anon, 2009d:13.)

## 4.7 CONCLUSION

From this chapter it is clear that all taxes should be measured against the principles of a good tax as pioneered by Adam Smith and later expanded by the Margo Commission. Not only will this ensure that the tax is fair to all but also that it will stand the test of time and be effective and efficient in also reducing the amount of GHG emissions.

In the following chapter the focus will be on the carbon taxes that are currently levied in South Africa.

## CHAPTER 5

### CURRENT ENVIRONMENTAL TAXES LEVIED AND INCENTIVES IN SOUTH AFRICA

#### 5.1 INTRODUCTION

This chapter will focus on the current environmental taxes levied and incentives in South Africa. This will be done in order to evaluate the current taxes and incentives. The effectiveness of these measures will be discussed and proposals for new and possibly more effective measures will be investigated.

#### 5.2 CURRENT ENVIRONMENTAL TAX

##### 5.2.1 Power stations and Industries

South Africa is known to be a frontrunner when speaking of worst polluters on both a *per capita* basis and from the perspective of emissions intensity (Anon, 2009d:7). Despite South Africa also having signed the 1997 Kyoto protocol, with its main focus on reducing international GHG emissions, South Africa is categorised as a 'non-Annex 1' country representing fundamentally developing countries, which has no definite emissions decreasing goals. South Africa already judged by others as a big polluter in the non-Annex 1 group which includes India, China and Brazil is under increased global pressure to start taking justifying actions of their own. (Anon, 2009d:7.) Regarding the next phase of negotiations to take place after 2012, emphasis was placed on the urgency for stronger action for increased cuts by all involved in the project, especially the 'non-Annex1 group of industrialised countries. There is also increased pressure felt in South Africa regarding the current energy crisis in the country, which also emphasises the need for South Africa to re-evaluate their current energy policy as well as the policy for the future. (Anon, 2009d:7.)

The two major environmental taxes presently in use in South Africa are the fuel levy in terms of Customs and Excise Act 91 of 1964 and the electricity levy in terms of Customs and Excise Act 91 of 1964 Amendment of Rules (DAR/53). The bulk of South Africa's environmental tax system stems from these levies, and there is thus a need to investigate the ability of these two taxes to contribute to the decrease in GHG emissions. As pointed out in the analysis in Chapter 9.3 an alternative approach to reduce GHG emissions

should be considered seeing that the mentioned levies do not fulfil the majority of government's principles for Evaluating Environmental Instruments.

The overall objective which is to stabilise or even possibly reduce GHG emissions, might well be achieved by a well-designed carbon tax, but with the current simple electricity and fuel levies, this environmental objective will not be achieved (Anon, 2009d:23). The advantages of a well-designed carbon tax are definitely that it would contribute in achieving the above mentioned environmental objective. The disadvantages are that such a well-designed carbon tax would entail a great deal of monitoring and compliance, and would also be administratively complex and costly. It is thus questionable whether the current electricity and fuel levies could potentially reduce overall consumption of electricity and fuel. Neither of these two levies gives rise to any incentives for organisations to make a change in their behaviours, for example changing their production processes or uses to omit less GHG's. Such changes in production use could be by making use of 'clean fuel', but currently the fuel levy is restricted not considering whether the fuel is 'clean fuel' or not. Likewise for producers of electricity, such as Eskom, could make use of carbon scrubbers in their production process to reduce GHG emissions, but the current electricity levy does not encourage such changes to their existing plants. (Anon, 2009d:23.)

In support of this conclusion, the current carbon tax approach is compared to a cap-and-trade system (refer Chapter 6.2) against the principles laid out by the Government (National Treasury, 2006:69) in a structure for judging market based instruments to back environmental monetary change in South Africa in Chapter 9.3.

### **5.2.2 Transportation**

It is recommended that the original tax proposal in the 2009 budget of ad valorem CO<sub>2</sub> emissions tax on new passenger motor vehicles be converted into a flat rate CO<sub>2</sub> emissions tax. The proposed CO<sub>2</sub> vehicle emissions tax will be implemented as a specific tax, instead of the previously proposed ad valorem tax. New passenger cars will be taxed based on their certified CO<sub>2</sub> emissions at R75 per g/km for each g/km above 120 g/km. This emissions tax will be in addition to the current ad valorem luxury tax on new vehicles. The emissions tax will be extended to commercial vehicles once agreed CO<sub>2</sub> standards for these vehicles are set. (PriceWaterhouseCoopers, 2010:13.)

Commenting on the looming tax levy, the director of the National Association of Automobile Manufacturers of SA (Naamsa) (Klue, 2010), said this tax could send the motor industry, which is gradually emerging from the downturn, back into recession. The big unhappiness by stakeholders is the fact that the fuel sold in South Africa does not comply with the new technological requirements necessary to avoid the green tax.

### **5.3 INCENTIVES**

Currently there are no specific incentives or levies implemented by National Government, to enable carbon administration, or emission reduction schemes. For the Government to implement qualifying schemes for incentives or levies, it has to ensure compliance with regulations, programmes and with other objectives such as improvement, or employment creation, instead of having the intention to receive carbon credits or to reduce emissions. (Anon, 2009d:23.)

In terms of section 12I of the Income Tax Act, 58 of 1962 (*enacted in 2008*) there is a new incentive programme published, which provides for a supplementary capital grant for industrial policy projects, on manufacturing resources obtained. To be eligible for the supplementary capital grant under the point scoring system, one of the qualifying criteria concentrate on features such as making use of new technology resulting in enhanced energy efficiency, pure production technology and improved environmental protection. This section in the Income Tax Act gives an indication that the South African administration is starting to understand the absolute significance of reducing the negative results of climate change, by designing and implementing new tax incentives. (Anon, 2009d:22.)

Currently however in South Africa, as stated above, there are no specifically implemented incentives to contribute to GHG reductions in total, or more specifically, GHG reduction projects. When referring to the current Income Tax Act, there has been no implementation of projects regarding carbon taxes or incentives for individuals.



## 5.4 CONCLUSION

Overall, the verdict is that the present environmental taxes (electricity and fuel levies) are not effective as implemented to deal with the fundamental predicament of GHG emissions since together these levies do not accomplish the bulk of government's principles for evaluating environmental Instruments, both would entail a great deal of monitoring and compliance, and would also be administratively complex and costly. Cap-and-trade is an administrative approach used to control pollution by providing economic incentives for achieving reductions in the emissions of pollutants. This approach was well received internationally and earmarked as the way forward. Cap-and-trade will be discussed in more detail in Chapter 6.

## CHAPTER 6

### CAP-AND-TRADE

#### 6.1 INTRODUCTION

In this chapter one of the most popular GHG emission reduction techniques will be investigated, namely cap-and-trade. The effectiveness and implementation of cap-and-trade will be discussed as well as the advantages and disadvantages of this approach generally referred to as cap-and-trade.

#### 6.2 BACKGROUND TO CAP-AND-TRADE

Cap-and-trade or emissions trading is a market based method which draws on fiscal incentives to accomplish cutback in GHG emissions. This involves the commerce of carbon, which is examined below. Globally it is an increasingly accepted method. (Anon, 2009d:15.)

The cap-and-trade system works as follows. A limit or “cap” is set by the government, or any other central authority, based on the prescribed amount of GHG’s that can “legally” be emitted. These overall caps to reduce GHG emissions, which the national governments agreed to when signing the Kyoto agreement, are then allocated to each industry level and individual company. Thus each company is awarded a certain amount of GHG emissions they are allowed to emit over a certain period of time. If it then so happens that certain companies have not utilised all their allocated amount of GHG emissions, these companies can sell the remaining GHG emissions to other companies. The opposite is then also possible, if a company has utilised all their awarded quantity of GHG emissions, they can buy another company’s remaining quantity of GHG emissions. Thus if an entity have reached their limit of GHG emissions allocated to them, they have one of two options. They can buy an additional GHG allocation from other entities through the carbon market or straight from an emissions reduction development. The latter is then called “carbon credits”. The other option the entity can follow is by assisting them to reduce the amount of GHG they emit per period. A tool implemented by the governments to encourage companies to stay within their allocated GHG emissions target, is to apply

heavy penalties to companies that exceed their assigned allocation of GHG emissions. When trading then with carbon credits, the company that buys credits, has to pay an increased fee to enable them to emit more GHG's, where as the company that sells the carbon credits, makes a profit out of the transaction and thus be awarded for reducing their GHG emissions. (Anon, 2009d:15.)

The cap-and-trade which is currently in use by the European Union's European Trading Scheme (EU ETS) originated out of the Kyoto process. The EU ETS is currently setting the benchmark for all international markets regarding trade with carbon credits as a means to reduce GHG emissions. (Anon, 2009d:15.)

The main goal of the Kyoto Protocol is set by the United Nations to be an international effort in encouraging countries to reduce their carbon emissions. Thus all countries taking part in the Kyoto Protocol, have decided to decrease their GHG emissions target with no less than 5% from the levels of emissions at 1990. The expiration date of the Kyoto Protocol is 2012. The goal of reducing GHG emissions within 5% from 1990 emissions, is assisted by the current trading of carbon on international markets. Thus the implementation of the Kyoto Protocol has pioneered a functioning operating marketplace for carbon, which enables carbon to trade at an international level at set market prices. (Anon, 2009d:15.)

### **6.3 CARBON CREDITS AND KYOTO'S MARKET INSTRUMENTS**

The Kyoto Protocol consists of two compliance groupings namely (Anon, 2009d:15):

- industrialised countries – “Annex I”; and
- developing countries – “non-Annex I”.

The developed countries that are signatories to the Kyoto Protocol, thus fall within the Annex I target of the project, which states that the countries have reached consensus to reduce their GHG emissions with up to 5% below their 1990 levels. If these countries thus can not comply with the 5% reduction, they will have to take part in the carbon trade market and purchase more carbon credits. (Anon, 2009d:15.)

In the second category of the Kyoto Protocol countries, the Non-Annex I developing countries have not agreed to any specific target of reduction in GHG emission levels, even though they also signed the Kyoto Protocol. The reason for there being no specific reduction target for these countries, but still signing the Protocol, is due to the fact that these developing countries were historically not the main contributors to the increasing global GHG emissions. The signing of the Kyoto Protocol by the Non-Annex I countries thus ensured that these countries would not have to face future restrictions on their economic growth, due to restrictions placed on GHG emissions by the Kyoto Protocol. The Non-Annex I countries thus take part in the global initiative to decrease GHG emissions by creating carbon credits through making use of carbon abatement plans and thus they obtain technical and financial means from the Annex I countries. Thus even though the developing countries do not specifically have a set target of GHG emission reduction to meet by 2012, they also take part in the reduction as they develop, to ensure future compliance with targets for the developing countries when they become Annex I countries. (Anon, 2009d:15.)

Absolute parameters for allowable GHG emissions by Annex I countries were set by the Kyoto Protocol as illustrated in the above paragraphs. The Annex I countries then allocate these quantity of allowable GHG emissions to specific industries and companies to ensure compliance with the target. It is thus clear that Kyoto established a market mechanism, which is the emissions trading market. This trading market then contributes to the global emission reduction target.

One of the components to this Kyoto mechanism is the Joint Implementation (JI). The JI is set to regulate the carbon emissions dealing among the Annex I countries. Another part to this mechanism is the Clean Development Mechanism (CDM). The CDM in turn regulates the carbon trading between the Non-Annex 1 (developing) and Annex I (developed) countries. (Anon, 2009d:16.)

Through this CDM process, the developing countries via carbon abatement projects earn or generate carbon credits. In this process, one carbon credit is equal to the right to emit a tonne of carbon dioxide or an equal amount of other GHG's as defined by the CDM process. These carbon credits are like any other commodity in the global financial market, and thus can be traded, held or sold. The implication for South Africa is that it has the

advantage to sell its residual carbon credits to the Annex I countries, which in return assists these countries to reach their set GHG emission targets. The following are a few categories of the carbon abatement projects: waste to energy (methane abatement), renewable energy, fuel switching, cogeneration and energy efficiency. A rigid process of validation, monitoring and verification is applied to any carbon abatement project seeking CDM status. If the carbon abatement project is effectively authorised, these recorded CDM projects can earn “Certified Emission Reductions” (CER) or better known as carbon credits. (Anon, 2009d:16.)

Under the Kyoto mechanism, the market for the carbon credits is referred to as the “compliance” market. There is also another market called the “voluntary” market. (Anon, 2009d:16.)

In the “voluntary” market, carbon credits created by carbon abatement projects, produce Voluntary Emission Reductions (VER’s), which exchange at a discounted price to CER’s. This is due to the fact that the VER carbon credits are based on less rigid requirements which characterise this voluntary market, in comparison with the compliance market. (Anon, 2009d:16.)

## **6.4 FINANCIAL SIDE OF EMISSIONS TRADING**

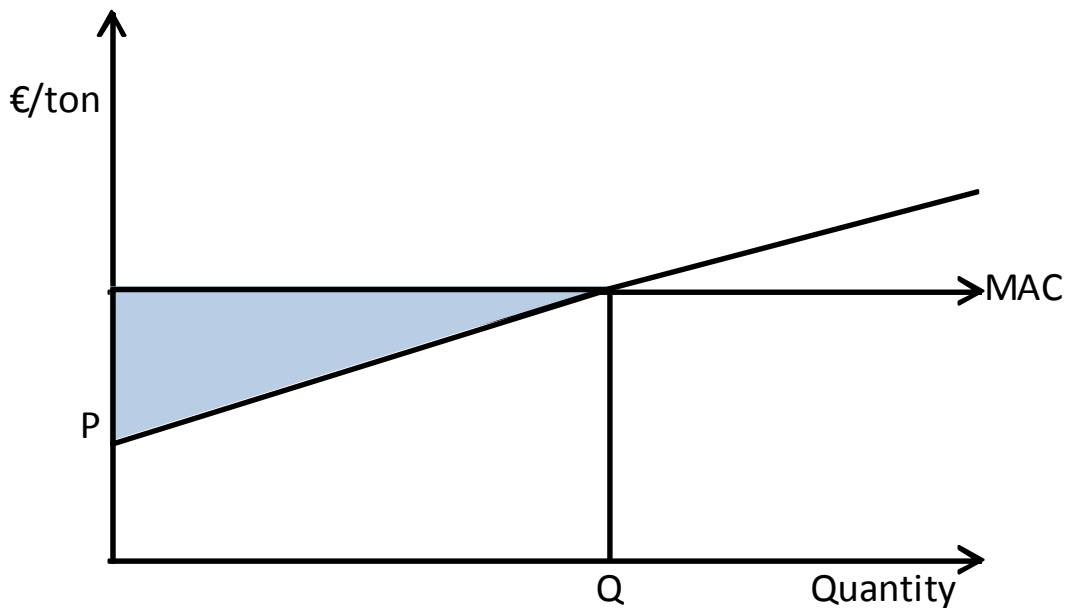
The carbon market is currently valued at approximately US\$36-billion. The drastic increase in value from US\$4.5-billion in February 2005 to the current value of approximately US\$36-billion shows the potential for the carbon market is infinite. (Davis, 2008.)

The present shortage of carbon credits are approximately US\$3.75 billion credits (Davis, 2008). Excluding the USA, this shortage is distributed across global industrialised countries.

There is a financial benefit in trading in carbon credits. It would be financially beneficial to invest in carbon-reducing projects if the current Marginal Abatement Costs (MAC) for a project is a smaller amount than the market value for carbon. Due to reduction in GHG emissions, the company would then obtain carbon credits from the contract, which is one

carbon credit versus one metric ton decrease in GHG emissions. These carbon credits obtained, in return could then be sold at a profitable market related price. The average gain of the company would be no less than the difference between the MAC (indicated by the shaded area in Figure 2 below), and the market price of the carbon credits sold. (Anon, 2009d:17.) This is illustrated in the diagram below:

**Figure 7: MAC and market price relation**



## 6.5 APPLICATION OF THE CAP-AND-TRADE SYSTEM

The carbon credit market's activities are known to be regulated by the Kyoto Protocol's internationally-agreed mechanism. The first phase of the Kyoto Protocol, also called the "first commitment phase", is only applied up to the end of 2012. When the Kyoto Protocol was initially implemented, the future success of the project was uncertain and thus many of the countries which are accountable for a great part of the worldwide GHG emissions did not subscribe to the Kyoto Protocol, for example the USA and Australia. However Australia did eventually join the project. It was expected that the cycle of the next phase of the Kyoto Protocol (second commitment period) would be decided by the end of 2009, and

this contributed to a decline in the concern over a probable discontinuation of the Kyoto Protocol after 2012. (Anon, 2009d:17.)

Between 7 and 18 December 2009 the 2009 United Nations Climate Change Conference, known as the Copenhagen Summit, was held at the Bella Center in Copenhagen, Denmark. The conference was attended by members of the 15th Conference of Parties to the United Nations Framework Convention on Climate Change and the 5th Meeting of the Parties to the Kyoto Protocol. (Anon, 2009l.)

The Copenhagen Accord, judged as a "meaningful agreement", was drafted by the USA, China, India, Brazil and South Africa on 18 December 2009. On the next day a debate on the agreement followed whereby it was not adopted nor unanimously passed. The document acknowledged climate change to be one of today's greatest challenges and that appropriate actions be put in place to ensure temperature increases being kept below 2°C. The document is not legally binding and does not contain any legally binding commitments for reducing CO<sub>2</sub> emissions. (Anon, 2009k.) This agreement does not contain any legally binding obligations for reducing CO<sub>2</sub> emissions and were therefore opposed by several countries and non-governmental organisations. (Anon, 2009l.)

For the cap-and-trade system to be efficiently and effectively implemented, it is of utmost importance to take certain factors into consideration. Below is a short discussion of some of these factors that should be taken into account:

- national carbon emissions caps, should be realistic and show meaningful reductions in GHG emissions. These caps are based on 1990 emission levels and are set by the Kyoto Protocol, after extended negotiations with the countries that are signatories to the Kyoto Protocol;
- the emission allocated to each country is then sub-allocated to industries and companies in the country. This allocation is done by a central authority, which is usually the government of the country. The allocations to the industries and companies combined can thus not exceed the national cap allocated to the country in total by the Kyoto Protocol;

- to ensure the system is functioning as planned, an efficient and effective measurement and monitoring system should be implemented, to make sure that the countries do not exceed the specific cap allocated to them. This monitoring and measurement system should then also ensure that in the case of a country or entity exceeding the cap, they should be penalised accordingly; and
- a good market system is required to set the table for effective international and national carbon trading. (Anon, 2009d:19.)

For the general public and those operators taking part in the system, the discussed cap-and-trade system could contribute to a spectrum of benefits. Some of these benefits for the operators are:

- decreasing energy consumption and lowering emissions is usually a positive attribute for the core business. By recognising various cost savings and enhancing revenue related to the implementation of more efficient methods, could certainly contribute towards realising these benefits;
- carbon credits could be seen as a long-term investment, due to the fact that these carbon credits are currently still relatively inexpensive, but their fair value is certain to increase in the future, due to increased trading in the carbon market and increased demand for carbon credits;
- for operators, a carbon tax might show to be more expensive due to all their GHG emissions being taxed, where as carbon credits could offer a cheaper alternative, due to the fact that the operators only have to pay for GHG emissions exceeding their allocated cap; and
- the allocations of target emissions for individual operators are usually in line with their current emissions, where as the initial emissions were allocated based on historic emissions. (Anon, 2009d:19).

Other general benefits are:

- businesses can now manage and understand their activities much better, due to the fact that emissions are now treated as a market-traded commodity;



- as the price of carbon credits in the cap-and-trade system, is determined by the market, the price is more certain to be deemed fair by parties taking part in the carbon trade market;
- it could be much more simplified for government to enforce a cap-and-trade market, as they would only have to oversee the market and would not have to regulate specific practices of each source of GHG's; and
- a reduction in carbon emissions could certainly be established by the effective and efficient application of a cap-and-trade system (Anon, 2009d:19).

The general disadvantages of a cap-and-trade system include the following:

- it can be quite costly to verify and monitor actual emissions, which is a requirement for an effective cap-and-trade system;
- due to the relative complex nature of the cap-and-trade system, it would require the implementation of legislation. The implementation of such new legislation could take a great deal of time and thus could delay the implementation of the system;
- it is of the utmost importance to ensure that the initial emissions allocations to countries, operators and companies, are carried out in the manner perceived by the affected parties to be fair. If the allocations are not deemed fair, it could lead to disputes. Also, there could be a collapse in the price of carbon if the initial allocations prove to have been done excessively, which results in an excess supply of carbon, lowering the price thereof and
- the quantity of carbon credits in the market is predetermined by the cap-and-trade system, but the price is not. This could lead to excessive volatility in the market which could disrupt the global economy. Also trading with carbon credits as a less well-known financial instrument gives rise to significant risk for the market (Anon, 2009d:19).

## **6.6 CARBON CREDITS IN SOUTH AFRICA**

South Africa is an affiliate of the Kyoto Protocol, but is categorised as a Non-Annex I country. This results that South Africa is thus not bound to any specific target for reduction in GHG emissions. With emissions production totalling approximately 800 million tons per

annum, South Africa is ranked amongst the top twenty countries in terms of total carbon emissions (Anon, 2009d:20).

South Africa has vast opportunities to gain advantage from the Kyoto Project, due to its highly carbon intensive economy. This can be accomplished by cultivating carbon-abatement ventures under the CDM and trading the carbon credits produced by these ventures to entities in Annex I countries that are in need of carbon credits. (Anon, 2009d:20.)

Additional project finance is just one of the benefits of carbon credits. Other benefits include technology and skill transfer, substantial brand enhancement and a diversified revenue stream. It is possible that South Africa could be re-assigned to the developed country group in the Kyoto Protocol after 2012. However, current post-2012 negotiations indicates that there is substantial pressure for the large emitter amongst the developing countries group (India, China, South Africa) to take national action with the goal to reduce emissions. In return for this action taken, the current developed Annex I countries will further decrease their emission levels. In South Africa this goal can be reached by implementing a market based cap-and-trade system and could also place South Africa to a leader in the group of the developing countries. (Anon, 2009d:20.)

There is a steady increase in the consciousness of opportunities concerning a carbon exchange market in South Africa, as large entities are investing in carbon-cutback projects with the aim to achieve higher income from the carbon credits. Thirteen projects in South Africa are presently enrolled with the carbon abatement project, with quite a few other projects in the final stages to also be registered with the carbon abatement project. South Africa's first carbon credit has only recently been realised, being issued in June 2008. (Tucker & Gore, 2008.) The market worth of a carbon credit was roughly estimated at €20 at the end of 2008. In South Africa many of the companies are making use of carbon credits, or likely imminent carbon credits, as a way to get financial investment in expected carbon abatement projects, by trading these carbon credits to developed Annex I countries. It is thus apparent that the opportunities arising in South Africa's highly carbon intensive economy and the increased awareness of the carbon market, indicates that there is a great possibility for potential economic profit through carbon credit dealing in South Africa. (Anon, 2009d:20.)

## 6.7 CONCLUSION

It is thus apparent that a well designed and implemented cap-and-trade system could contribute to significant reductions in GHG emissions. The success of cap-and trade in South Africa will greatly depend on the South African government's willingness to implement and actively support a cap-and-trade system. In the following chapter a more detailed discussion will be done concerning other tax incentives, for reduction of GHG emissions, currently in use by countries other than South Africa.

In the following chapter an investigation of other suggested tax measures that can be implemented with regard to entities like South African industries and mines in order to reduce GHG emissions will be done.

## CHAPTER 7

### OTHER SUGGESTED TAXES AND INCENTIVES FOR ENTITIES

#### 7.1 INTRODUCTION

In this chapter an investigation into alternative tax and other measures that can be applied to entities in order to reduce their GHG emissions will be done. Entities include all non-individuals but specifically refer to power stations and industries in South Africa. In general tax measures refer to carbon tax being implemented in order to reduce the entities' GHG emissions and other incentives refer to reporting requirements enforced by law.

#### 7.2 CARBON TAX

Carbon tax is a measure that first world countries implement in order to reduce GHG. It is generally accepted that a well-designed carbon tax might be of great assistance to stabilize or even decrease emissions. In contrary to this it seems that due to inherent imperfections, the current South African electricity and fuel levies might not achieve the required environmental objectives. Although environmental objectives might be achieved by a well-designed carbon tax, it would be administratively complex and would require substantial monitoring and compliance which will be costly. In short, carbon tax should tax each CO<sub>2</sub> emitter on the amount of CO<sub>2</sub> it produces annually. (Anon, 2009d:9.) In the South African context a well designed carbon tax would be very difficult to implement within the next decade. The challenges posed by Parramon & Gilder( 2009:1):

- determining the rate of the carbon tax to ensure that it is effective in achieving its main objective of reducing GHG emissions. There is, currently, no common position on this issue. The Stern Review on the Economics of Climate Change, 2006, came up with a general, global rate of \$314 per tonne of carbon dioxide equivalent (tCO<sub>2</sub>e), while other studies put the figure closer to \$50/t CO<sub>2</sub>e;
- determining to whom the carbon tax would be levied, be it the various sectors, entities and individuals;
- ensuring that all the priority sectors are subjected to the tax while maintaining the competitiveness of such sectors; and

- determining how the revenue from the carbon tax will be used. The main question is to assess if the revenue should be used for climate change related expenditures or should it be applied to a range of issues not, necessarily, related to climate change.

Even when carbon tax is implemented it is not a given that emitters would change their behaviour because of this tax since this tax would only seem as an additional governmentally imposed financial burden in order to increase government revenue.

Only a minimal reduction in the overall consumption of electricity and fuel is probably brought about by the current fuel and electricity levies because neither encourages organisational behavioural changes i.e. changing production in favour of using less GHG's. As mentioned before, the fuel levy is capped regardless of whether the fuel is "clean fuel" or not, therefore it also does not provide any incentive for the installation of carbon scrubbers on Eskom's existing plants. (Anon, 2009d:9.)

The latter is supported by a mooted cap-and-trade system coupled with a carbon tax approach (refer Chapter 6.6) against principles laid out by the Government (National Treasury, 2006:26).

### **7.3 OTHER INCENTIVES**

The requirement of entities to report in their annual financial statements on their GHG emission for the year as well as their future estimated carbon emissions would disclose all widely held companies' GHG emissions and it would therefore become public knowledge. This could influence company's shareholders opinion of the company's value and this could serve as an incentive for companies to reduce GHG emissions (Anon, 2009m). The extent of the effectiveness of this incentive for companies are however not quantifiable since one cannot point out a single factor as being responsible for the increase or decrease in a company's share price. This measure is therefore more a recording, measuring and disclosure requirement than an incentive to reduce GHG and could not be seen as a GHG emission reduction tool.

## 7.4 CONCLUSION

Both carbon tax and other incentives in the form of reporting requirements do not seem to be an effective GHG emission reduction tool. None of these measures would significantly influence emitters to reduce their GHG emissions to such an extent that the increasing effect that GHG's have on global warming will be reduced. In the following chapter an investigation will be done on the various incentives that the USA and Europe implemented in order to reduce the amount of GHG's that are produced by transportation fuel. In chapter 9 the various types of incentives will be compared against the tax philosophy set by the South African National Treasury in order to reduce GHG.

In chapter 8 a study of the various incentives to reduce transportation GHG emissions used in first world countries will be done.

## CHAPTER 8

### OTHER SUGGESTED TAX INCENTIVES FOR INDIVIDUALS

#### 8.1 INTRODUCTION

In this chapter a study of the tax incentives developed countries implemented to reduce GHG emissions emitted by personal transportation and the level of the initiative's success in first world countries will be discussed. This will be done in order to learn which incentives would be feasible in South Africa by eliminating initiatives that failed in developed countries. This investigation has been done per country and will now be discussed.

#### 8.2 NETHERLANDS

The Dutch government wants to abolish ownership and sales taxes on automobiles and instead levy a fee on every kilometer driven. The Transport Ministry says the move will cut congestion in half and curb carbon dioxide emissions by 10 percent. (Squatriglia, 2009:1.)

Motorists driving a typical sedan would pay 3 Euro cents per kilometer, or about 7 U.S. cents per mile, under the law, which if passed would take effect in 2012. The tax would climb to 6.7 Euro cents (16 U.S. cents) in 2018. (Squatriglia, 2009:1.)

According to a statement by the ministry "[e]ach vehicle will be equipped with a GPS device that tracks how many kilometers are driven and when and where. This data will then be sent to a collection agency that will send out the bill," (Anon, 2009b.)

This tax would vary by the type and weight of the vehicle. Buses, taxis, vehicles owned by the disabled and motorcycles would be exempted (Squatriglia, 2009:1).

The Dutch cabinet approved the legislation, but it must be passed by Parliament before becoming law. Finance Minister Wouter Bos (Anon, 2009c) calls the proposal financially irresponsible. According to Radio Netherlands / Expatia (Anon, 2009c), he fears that the national budget could take a big hit because people might be less inclined to drive.

Advocates of the tax say nearly six in 10 drivers will benefit because the tax burden will be shifted to people who drive the most and at peak times. The price of new cars also would decrease significantly, because taxes comprise about 25 percent of the sticker price. (Anon, 2009c.)

### **8.2.1 Pros and cons for the emission reduction strategy**

Thought must be given to what kind of safeguards is built into the emission reduction strategy system. There is great potential for Big Brother monitoring. Authorities should be able to monitor the distance an individual drives, the weight of the vehicle and its fuel economy. That tells authorities how much gas the vehicle is using and how much GHG emissions are produced by the individual. It can however be argued that if authorities know when and where people are driving it can result in violation of the individual's privacy.

Taxing a fuel efficient car the same per kilometer as a less fuel efficient car makes no sense if the goal is to cut CO<sub>2</sub> output, since the car that is less fuel efficient would produce more GHG but would be taxed at the same rate as all other cars.

Every vehicle already has a mileage counting device (odometer) that could be made electronically accessible at gas pumps and this would also keep the bureaucracy at a minimum.

### **8.3 CANADA**

On 19 March 2007, Jim Flaherty, Finance Minister of Canada's Conservative government, presented his budget (Anon, 2007a). Although it contained the usual measures of restoring the countries fiscal balance and alleviating personal tax, it also included an announcement of a series of incentives to be implemented that could influence greatly the type of cars people in Canada will buy after 2007. More specifically it contained two specific solutions:

a special tax to be levied on high-polluting, large-displacement vehicles;

and rebates on vehicles that are fuel-efficient through the ecoAuto program (the EcoAuto Rebate Program is a Canadian government program administered by Transport Canada to



provide an incentive to people to buy fuel-efficient vehicles, to protect the environment, through rebates). (Anon, 2007a.)

### **8.3.1 A tax on large-displacement vehicles**

It is not yet known what the details of the implementation of such tax on GHG emissions for large displacement vehicles will entail, but it will lead to an increase of government funds with \$220 million over the next two years (Anon, 2007a). However it is clear that the costs will firstly have to be incurred by automakers, which could range from a base Canadian \$1,000 to no less than \$4,000 for fuel-inefficient V8-powered vehicles (Anon, 2007a). In reaction to the aforesaid automakers will increase base prices of their V8-powered models, resulting in consumers paying even more for such a green tax.

The conclusion is therefore that if an individual wants to save money, a smaller car that uses less fuel should be bought.

### **8.3.2 Fuel-efficient vehicle rebates**

The ecoAuto program, which forms an integral part of Transport Canada's eco transport strategy, was launched by federal government with only one purpose in mind, which is to encourage Canadians to buy smaller, more fuel-efficient vehicles to help reduce greenhouse gas emissions. In effect this will lead to a rebate of up to \$2,000 for any person that purchase or lease a highly fuel-efficient vehicle after 20 March 2007. It was estimated that over the next two years, this incentive will lead to government costs of up to \$160 million. Bearing in mind that the Quebec government has recently increased the maximum provincial sales tax amount from Canadian \$1,000 to \$2,000 it further stipulated that this rebate could be refunded on any sale or long-term lease of a new hybrid vehicle up to a maximum of Canadian \$4,000.per transaction, for the period 20 February 2007 to 1 January 2009. (Anon, 2007a.)

## **8.4 CALIFORNIA**

The report "Green Transportation Taxes and Fees: A Survey of Californians" by Weinstein Agrawal, Dill & Nixon (2009) aims to explore and to encourage public debate on a new

concept namely the green transportation taxes and fees. The general idea of the proposed tax and fee is to levy a lower tax on less polluting vehicles, than would be the case for those vehicles that pollute more (Weinstein Agrawal, Dill & Nixon, 2009.) To achieve the following two critical public benefits simultaneously, it was necessary to change the traditional transportation finance system by implementing this new approach to transportation taxes. Firstly to accentuate environmentally friendly transportation to be a driver's first choice of alternate transport and secondly stressing the necessity to raise revenue needed for transportation programs. A random telephone survey of about 1 500 Californians was conducted by the authors in view to test respondents support for green transportation taxes and fees. The following three hypothetical tax and fee options were included in the survey: a proposed flat-rate and a green mileage fee, a flat-rate and a green vehicle registration fee and a "feebate" (a portmanteau of "fee" and "rebate") program under which additional taxes would be levied on purchases of more-polluting vehicles, whilst purchases of less-polluting vehicles would be subject to a rebate. The result of the survey emphasized that the concept of green transportation taxes and fees are viewed very positively by Californians. This response was tested during the survey in the following two ways: by comparing support levels for green versions vs. flat-rate of two taxes versus green versions of two taxes and by testing support for the three hypothetical green transportation tax and fee policies. An analysis of the survey showed an overwhelming support for all three green taxes and fees tested. It also showed that support for the mentioned taxes and fees came from a broad spectrum of the population and were not limited to population subgroups. In conclusion it was found that the green rather than the flat version of the two taxes for vehicle registration fee and feebate, was supported by more people within that subgroup. (Weinstein Agrawal, Dill & Nixon, 2009.)

## **8.5 FRANCE**

French drivers who favour large, gas-guzzling cars will have to pay up to €3,500 (£2,300) more for a new model from next January under a radical green road tax scheme unveiled by the environment ministry. (Henley, 2004:18.)

A new environment bill designed to decrease pollution, over a period of five years, inclusive of air, water and soil pollution, makes provision for incentives of up to €700 to be paid to drivers who opt for cleaner and smaller vehicles. (Henley, 2004:18)

Although this approach of give and take will not increase costs for taxpayers, it will ensure that people reconsider the type of car they buy and require. This scheme makes provision for all new cars sold in France to be divided into five classes, ranging from the least polluting to the most. i.e. cars falling in the middle neutral band or the so-called category C cars such as a mid-sized family car Renault Scenic will be neither liable for incentives or additional taxes. Rebates ranging from €200 to €700 are available for smaller cars that emit less than 140g per kilometre of carbon monoxide, which is the main contributor to GHG, as well as for diesel cars fitted with the latest technology to remove harmful fine particles from their exhaust emissions. On the other hand, for vehicle owners who choose to buy a large vehicle emitting more than 180g of CO<sub>2</sub>, or a diesel-driven vehicle without being fitted with the appropriate emission preventative systems, will be levied a surcharge of €1 500 up to €3 500. It is estimated that around one million out of the two million new cars sold in France each year falls into category C and should therefore not be influenced by the measure. The rebates on the 670,000 smaller, more environment-friendly models will be subsidised by the income derived from the 350,000 big engine cars sold annually. (Henley, 2004:18.)

Bulky 4x4 off-roaders are noted to be amongst the most environmentally harmful vehicles on the market, as they emit up to four times as much CO<sub>2</sub> as a normal car and only get about 12 mpg in urban traffic conditions, thus a controversial decision by Paris town council was taken to try to ban them from the streets of the capital (Henley, 2004:18).

According to a senior Green party councillor in Paris, called Denis Baupin, who tabled the resolution as discussed above "[o]ff-road vehicles are just not suited to towns and you have to wonder why people drive them. They are polluters, they're space-occupiers, and they're dangerous for pedestrians and other road users. They're a caricature of a car." (Henley, 2004:18.)

The powerful V8 Volkswagen Touareg and Toyota Landcruiser off-roaders would both be liable for the maximum €3 500 surcharge, as these cars were cited by the environment ministry of what motorists can expect under the new scheme. A small Peugeot 206 diesel, fitted with a particle filter, would receive a €700 decrease in its showroom price, while a larger saloon car with a 2.5-litre engine would get €1 500 added to its price (Henley, 2004:18.)

French car manufacturers reacted positively on the announcement of the program because the countries' limited production of large luxury models and off-roaders, are unlikely to be as greatly affected as those of the German and Japanese manufacturers.

### **8.5.1 Pros and cons for the emission reduction strategy**

The emission reduction approach to reduce GHG emissions not only gives an incentive to buy a car that emits less GHG but also taxes individuals who opt to purchase cars that emit more GHG's (Henley, 2004:18). The tax or incentive is calculated on the vehicle's GHG emissions figure. The shortcoming with this tax measure is that it does not take into consideration the distance driven by each individual. This shortcoming can be explained by the following example. An individual who drives a low GHG emitting car for vast distances annually produce the same amount of GHG emissions as the individual who drives a high GHG emitting car for short distances annually. Therefore individuals should be taxed on the distances driven as well. (Henley, 2004:18.)

## **8.6 GERMANY**

The Bundestag (the parliament), on recommendations from the German government, settled for a more rigorous approach to the introduction of an ecological tax reform (Studienbüro & Morgen, not dated). This tax reform came into effect on 1 April 1999 and states the increase of mineral oil tax on gas (0.32 Pfennig/kilowatt hour = roughly 0.178 \$/kilowatt hour), fuel (6 Pfennig/litre = roughly 0.125 \$/gallon) and heating oil (4 Pfennig/litre = roughly 0.084 \$/gallon).

To accelerate reform, tax on gasoline and diesel was raised annually to 6 Pfennig per litre for the period 2000 to 2003 (Studienbüro & Morgen, not dated). Whilst ecological tax reform in Germany might have a slight positive effect on the environment, the effects on the economy proved to be doubtful.

Indications to this effect are as follows:

- the environmental goals are not ecologically based or quantifiable;
- permissible environmental goals were not used to determine the tax rates;
- subsidized social security will be given;
- increased subvention volumes thus occurs;
- due to the fact that no taxes were lowered in line with the introduction and/or increase in taxes, this will lead to increased tax volumes;
- due to the fact that those employed must contribute to the social security of salaried employees, the principle of cause is violated; and
- the dilemma arises that the basis for assurable social security financing will become high energy consumption. The reduction of energy consumption (intention of energy taxes) will lead to financial problems in the social security system. (Studienbüro & Morgen, not dated.)

### **8.6.1 Pros and cons for the emission reduction strategy**

In general GHG emitters are taxed on the amount of fuel they use which would directly influence their pockets and might change their behaviour in order to produce less GHG.

There is however no tax incentive to buy a more environmentally friendly car so even these individuals are taxed even though they opt for cars that emit less GHG (Studienbüro & Morgen, not dated).

## **8.7 EUROPEAN UNION MEMBER STATES**

The following information is a guide for European Union's (EU) member states in an attempt to reduce GHG emissions. (Anon, 2005b.)

Guidance on tax incentives and structures on ways to reduce particle matter emissions from diesel cars are frequently given to member EU states and this initiative was triggered by French and German plans (Anon, 2005b).

The aim and scope of this document will be discussed below in order to understand what progress United Nation countries have made till 2005 to implement green tax incentives.

The guidance proposed that the tax incentives be pegged at 5 mg/km of particulate matter emitted by the vehicle. Such a value will only be feasible should the present state of technological development advance to a higher level and diesel cars per example be equipped with particulate matter filters to reduce its harmful emissions.

A reduction of 80% is represented by the 5 mg/km value compared to the mandatory limit of 25 mg/km as of January 2005 under the 'Euro 4' emission standards, as indicated by the Commissioner (Anon, 2005b). This reduction in emissions of diesel motor cars have resulted in a dramatic reduction in pollution created on the European roads since it includes a reduction in pollution by diesel cars as well as trucks (which are mostly powered by diesel engines). The trucks contribute significantly to the amount of pollution produced, because of the quantity of trucks on the roads as well as the large capacity of their engines. (Anon, 2005b.)

As member states will commence with new national tax incentives, it is stated in the guidelines that the limit of the level of "particulate matter's goal" is to escape a fragmentation of the internal market. The said value which should only be seen as a guideline would come into force in 2010. This guideline is published by the Commission prior to the next stage of emission limits. It is possible that the suggested level of 5mg/km particulate matter or even less would become part of legislation as technology progress from the 2007 draft document to 2010 and more efficient ways of lowering emissions are developed. It was said by Verheugen that the EU has "the most ambitious program in the world". The guidance on the implementation of a tax incentive on cleaner diesel cars can also apply to the implementation of a tax incentive on petrol, hybrid or bio fuel cars. (Anon, 2005b.)

## 8.8 CONCLUSION

From the investigation above it can be seen that tax measures aimed at reducing GHG emissions have been implemented in various first world countries. These tax measures have been implemented without too much difficulty since it is not very complex and South Africa can easily also adopt any of these measures.

In the following chapter the most effective tax measures will be discussed by comparing the different tax measures suggested in Chapter 7 and 8 to the principles to judge a new tax measure as set out by the South African National Treasury.

## CHAPTER 9

### COMPARISON BETWEEN DIFFERENT TAXES AND THE TAX PRINCIPLES OF THE SOUTH AFRICAN NATIONAL TREASURY

#### 9.1 INTRODUCTION

In this chapter a comparison according to the principles set out by the South African National Treasury (2006:26) will be done between carbon tax and cap-and-trade for entities. A comparison according to these principles will also be done for the most prominent tax measures used for individuals as identified in chapter 8.2 to 8.7. This will be done in order to determine which GHG emission reduction measures will be less effective and which will be more effective.

#### 9.2 PRINCIPLES SET OUT BY THE SOUTH AFRICAN NATIONAL TREASURY

The South African National Treasury principles that are used are as follows:

- environmentally effectiveness: the aim of the policy intervention is to reduce GHG emissions and other policy aims for the instrument (e.g. revenue) should clearly be secondary;
- tax revenue: if tax revenues are going to be ring-fenced for the purposes of driving environmental programmes (e.g. incentives for cleaner technology), then it is important to consider the revenue implications. If the revenue is not going to be ring-fenced, however, then this is a less important consideration;
- impact on the economy: the longer-term benefits of a cleaner environment need to be traded off against the short-term implications on the economy. Because these taxes impose costs, they will have economic impacts and these need to be considered;
- cost to the organisation: the intention of any intervention is, to some extent, to penalise those that pollute and encourage those that do not. This will entail costs to the polluters, however, that will depress their profits and impact on their business. These impacts need to be considered;



- broad support from industry and the public: the burden for carbon taxes, such as the fuel levy, often falls on the consumer. This will reduce the support for the initiative, which has political implications;
- legislative aspects: some interventions may require substantial legislative changes, and because these can take time, the impact of the intervention can be reduced;
- technical and administrative concerns: some interventions are, by their nature, easier to administer than others; and
- competitiveness effects: the costs to the organisation and the economy may lead to a loss of competitiveness for both the company and the nation. These costs need to be considered (Anon, 2009d:21).

### 9.3 COMPARISON BETWEEN CARBON TAX AND CAP-AND-TRADE FOR ENTITIES

Both overseas and locally, there has been substantial research comparing carbon taxes and cap-and-trade. In Table 2, we assess carbon tax and cap-and-trade against the South African National Treasury principles (2006:26).

**Table 4: Principles of government for assessing environmental instruments – comparing carbon tax to cap-and-trade**

	<b>Carbon tax</b>	<b>Cap-and-trade</b>
Environmental effectiveness	Depends on the nature of the tax. A simple fuel or electricity levy will have limited environmental impact, while a carbon tax will be much more expensive to implement, but will have a much greater impact.	The Kyoto Protocol aims to reduce carbon emissions by the deadline of the project in 2012 with 5% below the 1990 levels (Anon, 2009d:21).
Tax revenue	As the fuel and electricity levies will have limited environmental effectiveness, some argue that they are only revenue generators. It's also believed that large tax revenues can be generated by the carbon tax.	No direct tax revenue – possible other revenues through penalties charged on emissions in excess of available emissions limits.

Impact on the economy	Substantial economic impacts will be created by carbon taxes in the short term. Economic modelling commissioned by DEAT shows that a tax of R600/ton on carbon will cause the end of the CTL industry in total, and similar impacts will be created by smaller taxes (Anon, 2009d:21).	The implementation of a cap-and-trade system could lead to the establishment of a carbon credits trading market. Volatility in the price of carbon may have adverse effects on the economy.
Cost to the firm	In most countries, carbon taxes are levied on all emissions and not only on emissions exceeding a specified level. The effect of this has a negative impact on the economy and increased costs for organisations.	The cost of carbon would be based on market prices. The current price for carbon is approximately €20 (Anon, 2009d:21).
Broad support from industry and the public	Carbon taxes are internationally unpopular, mainly because the greatest part of the impact is taken on by the consumer.	Cap-and-trade has broad international support through the Kyoto process.
Legislative aspects	It is easy to implement carbon taxes through the national budget process.	No legislation is implemented at present, to sustain a cap-and-trade system.
Technical and administrative concerns	Well-designed carbon taxes will be administratively complex to implement.	The cap-and-trade system is technically complex and a lot of administration will be needed to ensure effective implementation thereof.
Competitiveness effects	With carbon taxes of the same size for all countries, no competitiveness will occur. If only SA implements it, then South Africa's competitiveness will be	Initially, emissions limits are expected to be allocated in proportion to historic emissions. If all countries implement it, all countries will

	significantly impacted.	be impacted in the same way, thus avoiding competitiveness.
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## Result

In conclusion it was found that the current environmental taxes (fuel and electricity levy) does not effectively address the GHG emissions problem. However the Cap-and-trade system seems to be by far the most improved approach and is internationally deemed to be the only approach for the future (Anon, 2009d:24).

### 9.4 COMPARISON OF MOST VIABLE TRANSPORT TAX MEASURES

Below a comparison will be made between four types of tax measures implemented in various first world countries. These measures are the most prominent ones as researched in chapter 8. The South African National Treasury principles will be used to evaluate the different tax measures in order to determine the superior approach for South Africa. The four types of tax measures are:

- tax based on the amount of kilometres driven annually by the individual (a means to measure the kilometres also has to be implemented);
- tax based on the emission per kilometre that the individual's car produce – this information would be available from the car manufacturers for:
  - individuals who opt for cars that produce more GHG than the norm will pay an additional amount on the purchase price, thus taxed on the purchase price; and
  - individuals who opt for cars that produce less GHG than the norm will pay less than the purchase price, which will serve as an incentive;
- tax on fuel usage, which basically translates into a tax on fuel or fuel tax – thus the more fuel one uses the more tax one pays; and
- a combination of a tax on emissions per kilometre and a tax on fuel usage. (South African National Treasury,2006:26).

**Table 5: Principles of government for evaluating environmental instruments – a comparison between tax based on km driven, tax based on emission per km, tax on fuel usage and a combination of tax on emission per km and fuel usage**

	<b>Tax based on km driven</b>	<b>Tax based on emission per km</b>	<b>Tax on fuel usage</b>	<b>Combination of tax based on emission per km and tax on fuel usage</b>
Environmental effectiveness	Emissions will be reduced as individuals will try to change behaviour and drive less kilometres in order to pay less tax.	Emissions will be reduced as individuals will opt for a car that emits less GHG as less tax is charged on the purchase price of the car, making it cheaper.	Emissions will be reduced as individuals will try to change behaviour and drive less kilometres or opt for a car that is more fuel efficient in order to pay less tax.	Emissions will be reduced as individuals will try to change behaviour and drive less kilometres, opt for a more fuel efficient car and a car that emits less GHG in order to pay less tax.
Tax revenue	There is a potential for large tax revenues.	There is a potential for large tax revenues where individuals opt for cars that emit more GHG per km, but this revenue must be used to subsidise incentives paid to individuals who opt to buy cars that emit less GHG.	There is a potential for large tax revenues.	There is a potential for large tax revenues where individuals opt for cars that emit more GHG per km, but this revenue must be used to subsidise incentives paid to individuals who opt to buy cars that emit less GHG.
Impact on the economy	Individuals will be taxed and would therefore be in a worse financial position.	Individuals have the choice to either change their behaviour and save money or to pay	Individuals will be taxed and would therefore be in a worse financial	Individuals have the choice to either change their behaviour and save money or to

		tax. Car manufacturers that produce cars that emit large quantities of GHG would lose sales.	position.	pay tax. Car manufacturers that produce cars that emit large quantities of GHG would lose sales.
Cost to the firm	Not applicable.	Not applicable.	Not applicable.	Not applicable.
Broad support from industry and the public	The public prefers a tax measure where there is both a tax for non compliers and an incentive for compliers. The public would therefore not prefer this measure.	The public prefers a tax measure where there is both a tax for non compliers and an incentive for compliers. The public would therefore prefer this measure.	The public prefers a tax measure where there is both a tax for non compliers and an incentive for compliers. The public would therefore not prefer this measure.	The public prefers a tax measure where there is both a tax for non compliers and an incentive for compliers. The public would therefore prefer this measure.
Legislative aspects	This tax measure is easy to implement through the national budget process.	This tax measure is easy to implement through the national budget process.	This tax measure is easy to implement through the national budget process.	This tax measure is easy to implement through the national budget process.
Technical and administrative concerns	A way to measure and keep record of individual's kilometres would be administratively complex.	It would be administratively easy to charge tax or give incentives on all newly purchased cars. All cars that are already on the road or second hand cars will also not be taxed.	It would be administratively easy to charge tax on fuel since this is already being done in South Africa.	It would be administratively easy to charge this tax.
Competitiveness effects	None	None	None	None

Conclusion reached from Chapter 5, 6 and 8.

## **Result**

Overall, the finding is that tax based on kilometres driven is not a viable tax measure to reduce GHG emissions as it is administratively complex and it would not find broad support from the public. Tax based on emission per kilometre is an attractive tax measure except that the tax revenue will be decreased by the tax incentive that will be paid out for qualifying vehicle purchases. Tax on fuel usage alone is not a viable option as it would not find broad support from the public nor will it achieve the desired reduction in GHG emission. For this reason a combination between a tax based on emission per kilometre and a tax on fuel usage is the best alternative. It achieves its goal of GHG emission reduction and it generates tax revenue for the government to fund this tax measure and fight the effect of GHG emissions on other fronts. (Anon, 2009d:24.)

## **9.5 CONCLUSION**

From the findings in this chapter it is evident that cap-and-trade is the preferred method to reduce GHG emissions for power stations and industries. A combination between a tax based on emission per kilometre and a tax on fuel usage is the preferred method to reduce GHG emissions for transport fuel. A summary of findings will be made in the following concluding chapter.

## CHAPTER 10

### OVERALL CONCLUSION

#### 10.1 INTRODUCTION

As GHG emissions rises so does global warming. It is therefore necessary to investigate new ways, including tax measures, to motivate South African corporations and individuals to produce less GHG's. The specific objectives and the consequent results of this study are described in this chapter.

#### 10.2 OBJECTIVES OF THIS STUDY

The objective of this study is to answer the following questions regarding the proposed tax incentive scheme aimed at reducing GHG emissions, namely:

- will a tax or tax incentive influence power stations, industries and individuals in South Africa to be more environmentally friendly and produce less GHG's;
- what type of tax incentive scheme would be more effective for SARS to use in order to achieve the desired results regarding the reduction of GHG emissions;
- to what extent does the tax incentives implemented in Europe and the USA to reduce GHG emissions and to measure the degree of success achieved by these countries; and
- will the expected reduction in pollutants as a result of implementing green tax have a noticeable effect on the overall ecosystem. By answering this question one would be able to determine if the implementation of green tax is a worthwhile exercise or not. This question would be answered by investigating the effect of green tax on the ecosystems of both the USA and Europe. The final question is if it is worthwhile to further research and investigate this type of green tax and does it deliver the required results.

### 10.3 FINDINGS OF THIS STUDY

The finding of this study is that:

- a tax or tax incentive have been implemented by the USA, Canada and European countries and this resulted in a change in behaviour from both individuals and entities in order to produce less GHG's. Therefore one can make the assumption that South African entities and individuals would also change their behaviour to produce less GHG's if a tax or tax incentive is implemented (refer to Chapter 8);
- the most effective behaviour changing incentive for industries and power stations would be to introduce a cap-and-trade system in order to reduce GHG emissions (refer to Chapter 9.3);
- the most effective behaviour changing incentive to reduce transportation emissions would be to implement a combination between a tax on fuel and a tax on buying a new car. With the tax on buying a new car being levied in different tax brackets – as the car's emissions increase the tax percentage also increases and cars below a certain level of emissions should not be taxed, but rather discounted in order to motivate individuals to buy cars in this bracket (refer to Chapter 9.4); and
- a reduction in GHG emissions by the major GHG emitters, namely power stations, industries and transport fuel, will significantly reduce GHG emissions. A reduction in GHG emissions will restrict global warming. It is therefore worthwhile implementing green tax in South Africa and investigating and improving green tax in South Africa in the future (refer to Chapter 2 and 3).

### 10.4 CONCLUSION

From the research in this document it is clear that global warming is increasing due to increased GHG emissions. These emissions are largely produced by power stations, industries and transportation. South Africa emits a large quantity of these GHG emissions when compared to other developing countries (Anon, 2009d:7). Therefore the South African government must introduce measures to reduce the amount of GHG emissions that South Africa produces. The most effective measure to reduce GHG emissions by power stations and industries seems to be a cap-and-trade system. The most effective measure to reduce GHG emissions caused by transportation seems to be a combination



between tax on fuel and a tax on buying a new car. With the tax on buying a new car being levied in different tax brackets – as the car's emissions increase the tax percentage also increases and cars below a certain level of emissions should not be taxed, but rather discounted in order to motivate individuals to buy cars in this bracket. This would be the start of a bright and more environmentally conscious future.

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