A research report submitted to the Faculty of Commerce, Law and Management in partial fulfilment of the requirements for the degree Master of Commerce in the field of Taxation

Carbon Tax implementation in South Africa

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Date:	April 2020

ABSTRACT

In a bid to reduce the impact of global warming and climate change by reducing carbon dioxide and other greenhouse gas (GHG) emissions, governments across the globe are implementing carbon pricing instruments. The two most popular examples of these instruments include a carbon tax and an emissions trading system (ETS).

South Africa recently implemented a carbon tax on 1 June 2019. Considering the volatility of the South African economy and an increasing rate in unemployment and poverty, many stakeholders have argued that a carbon tax should not be implemented in South Africa. On the other hand, other stakeholders have realised the significant threats posed by climate change. They have argued that the effective carbon tax rate in South Africa is too low and should be much higher to raise awareness and effectively reduce carbon emissions, and to assist South Africa in meeting its commitments agreed to in the Paris Agreement.[1] (National Treasury & South African Revenue Service (SARS), 2019)

The aim of this report is to critically evaluate South Africa's implementation of a carbon tax system and the socio-economic challenges that it faces. The approach will be through a comparative analysis of its carbon tax policy measured against The Carbon Tax Guide (Partnership for Market Readiness (PMR), 2017) and carbon tax implemented in some other countries. ETS will be explored as an alternative to carbon tax, and the revenue that can be generated through carbon pricing instruments and the socio-economic impact thereof will be analysed.

Key words: carbon pricing, carbon tax, climate change, emissions trading system, GHG emissions, global comparison, Paris Agreement, socio-economic impact

[1] United Nations Framework Convention on Climate Change (UNFCCC) (n.d.a). 'What is the Paris Agreement?'. Available at: https://unfccc.int/process-and-meetings/the-paris-agreement/what-is-the-paris-agreement [Accessed on: 27 August 2019].
The Paris Agreement refers to the agreement on 12 December 2015 by parties to the UNFCCC. The agreement aims at combatting climate change and encouraging investments towards a sustainable low-carbon future.

DECLARATION

I declare that this research report is my own unaided work. It is submitted in partial fulfilment of the requirements for the degree of Master of Commerce (specialising in Taxation) at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any other degree or examination at any other university.

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April 2020

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TABLE OF ABBREVIATIONS AND ACRONYMS

ACRONYM	MEANING
AFOLU	Agricultural, Forestry and Other Land Use
ATAF	African Tax Administration Forum
AUC	African Union Commission
CAR	Clean Air Rule
CaT	Cap-and-Trade
CCIR	Carbon Competitive Incentive Regulation
CO_2e	Carbon Dioxide equivalents
CPI	Consumer Price Index
CPLC	Carbon Pricing Leadership Coalition
CPM	Carbon Pricing Mechanism
DEA	Department of Environmental Affairs
ERF	Emissions Reduction Fund
ETS	Emissions Trading System
GDP	Gross Domestic Product
GGIRCA	Greenhouse Gas Industrial Reporting and Control Act
GHG	Greenhouse Gas
Gt	Gigaton
GW	Gigawatt
IPCC	Intergovernmental Panel on Climate Change
JSE	Johannesburg Stock Exchange
Mt	Megaton
MW (th)	Megawatts thermal
NCCRP	National Climate Change Response Policy
NDC	Nationally Determined Contribution
NDP	National Development Plan
NSSD	National Strategy on Sustainable Development
OBPS	Output-Based Pricing System
OECD	Organisation for Economic Co-operation and Development
PJ	Petajoules
PMR	Partnership for Market Readiness
PSS	Performance Standards System
SA LEDS	South Africa's Low-Emission Development Strategy
SANEDI	South African National Energy Development Institute
SARS	South African Revenue Service
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VAT	Value-added Tax
WBG	World Bank Group
WHO	World Health Organisation
WMO	World Meteorological Organisation

CHAPTER 1:
INTRODUCTION

Global warming refers to the overall increase in the planet's temperature mainly caused by the burning of fossil fuels. Examples of fossil fuels include coal, oil and natural gas. The burning of these fuels release gasses known as 'greenhouse gasses' such as carbon dioxide, chlorofluorocarbons, water vapour, methane and nitrous oxide. These gases prevent heat from escaping Earth's atmosphere resulting in global warming. (National Geographic Society, 2019)

Carbon dioxide is the most abundant of the GHGs included in the atmosphere. Methane gas is far less concentrated in the atmosphere but its presence is also largely attributable to human activity. Natural methane gas sources include wetlands and erupting volcanoes. The agricultural industry is a major contributor to methane gas. Grazing animals such as cows host microbes in their stomachs to aid in digestion. These microbes emit methane gas. With an ever-growing population and an increasing demand for dairy and beef products, the amount of methane gas being released into the atmosphere is also increasing. (Borunda, 2019)

A serious consequence of global warming is climate change. Climate change refers to changing weather patterns including melting ice sheets and glaciers, rising sea levels and reducing shorelines. Extreme changes to weather conditions as noted above will result in drought and flooding, endangering life on Earth. (National Geographic Society, 2019)

Global warming and the resulting climate change is one of the biggest challenges facing the world. Many countries are realising the magnitude of the problem and the threat it poses. Thus, countries are implementing carbon pricing initiatives. Carbon pricing is an approach to reduce GHG emissions by using mechanisms such as a carbon tax or an emissions trading system to enforce the 'polluter pays' principle.

The 'polluter pays' principle ensures that those responsible for the GHG emissions are held liable and pay the cost for their emissions, and the pollution that they cause to the environment. Carbon pricing introduces an increased financial burden for emitters. In an effort to decrease their costs, emitters are encouraged to reduce their GHG emissions, and invest in low-carbon technologies. The benefits of carbon pricing are therefore significant and include protecting the environment, driving investments towards eco-friendly technology and raising revenue for the fiscus. (Carbon Pricing Leadership Coalition (CPLC), n.d.)

The two most common carbon pricing instruments being implemented around the world are a carbon tax and an Emissions Trading System (ETS). A carbon tax requires the emitter to pay for every ton of carbon pollution emitted. The emitter is encouraged to reduce its emissions and move towards cleaner fuels to pay less tax. Although the price per ton of pollution is fixed, there is limited certainty to the amount of emissions reduced. (CPLC, n.d.)

An ETS is also known as a ‘cap-and-trade’ system. There is a limit (or ‘cap’) on total direct GHG emissions, and a market is set-up where the rights to emit pollutant gasses are traded. This allows emitters flexibility in reaching their emission reduction targets. In contrast to a carbon tax, the amount of emissions reduced is known, whereas the price is not because of market fluctuations. (CPLC, n.d.)

In 2015, 196 Parties joined the Paris Agreement which aims at increasing the global response to global warming and climate change. The goal in terms of the Agreement is to limit the increase in global temperatures to well below 2 degrees Celsius. All parties to the Agreement are required to regularly report on their emissions and implementations and actions to reduce their emissions. They are also required to report on how they are tracking in terms of reaching their ‘nationally determined contributions’ (NDCs).[2]

South Africa is party to the Paris Agreement, and has therefore implemented a carbon tax from 1 June 2019 to reduce its GHG emissions and to ensure that it meets its commitment to the Paris Agreement. The NDC requires South Africa’s GHG emissions to peak between 2020-2025, plateau for a ten-year period from 2025-2035, and decline from 2036 onwards. (National Treasury & SARS, 2019)

The initial carbon tax rate introduced by South Africa is R120/tCO_2e which is approximately US$8/t$CO_2$e.[3] Carbon prices around the world vary considerably. According to the World Bank Group (WBG) the lowest carbon tax rate is levied by Ukraine at US$0.4/t$CO_2$e. The maximum rate of US$127/t$CO_2$e is levied by Sweden which is the fourth country to have introduced carbon tax as early as 1991. (WBG, 2019)

Given the socio-economic environment of South Africa it is understandable why a carbon tax rate was adopted in the lower range of the spectrum. South Africa has not chosen an aggressive approach to carbon tax. This allows companies especially heavy emitters to adopt and transition towards lower carbon options.

Taxes are considered a financial burden to taxpayers and the introduction of new taxes adds to this burden. Therefore, winning the support of the public, by allowing them to see the benefits of introducing a carbon tax to reduce GHG emissions, is vital.

Another important consideration is the utilisation of the revenue generated from the carbon tax. According to the CPLC (2016a) the way in which the revenue is utilised ‘can impact the economic effectiveness of pricing mechanisms, influence environmental outcomes and can help improve the political acceptability of their introduction or increase’. The way in which revenue generated can be used to offset the impacts that it may have on the economy and the public is known as ‘revenue

[2] UNFCCC (n.d.b). ‘Nationally Determined Contributions (NDCs)’. Available at: https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs [Accessed on: 27 August 2019].
NDCs refers to the Parties’ climate actions post-2020 to reach the goals under the Paris Agreement to limit GHG emissions and reduce global warming to well below 2 degrees Celsius.
[3] MBH Media, Inc. (n.d.). ‘South African Rands (ZAR) per US Dollar (USD)’. Available at: https://www.exchange-rates.org/history/ZAR/USD/G/M [Accessed on: 27 August 2019].
Translated at R15/US$ - the average South African Rand per United States Dollar rate as at 27 August 2019.

recycling'. Examples of revenue recycling include the reduction of other taxes such as corporate, value-added and individuals tax (with a focus on low-income households), or the funding of government's debt or deficits. The additional revenue generated may also be used towards research and development and investments in climate friendly technology.

Carattini, Kallbekken & Orlov (2019) reinforces the importance of revenue recycling by stating that the additional costs that low-income households will endure with the introduction of a carbon tax may be alleviated through revenue recycling.

The paragraphs above emphasise the importance of the design of a carbon pricing policy. Measuring the performance of existing carbon taxes and ETSs can assist policy makers in deciding on whether to introduce a carbon pricing policy. More importantly it assists in improving the design of the policy. (Haites, 2018). A comparative analysis of South Africa's implementation of a carbon tax against existing carbon taxes around the world is therefore an integral part of the process and this study.

The main focus of the report is to understand the impact of global warming and climate change, and to determine whether South Africa's implementation of a carbon tax can be effective in reducing its GHG emissions, and contribute towards the global fight against climate change.

1. The Research Problem

South Africa recently introduced a carbon tax on 1 June 2019. Can South Africa's implementation of a carbon tax assist in the global fight against climate change and the reduction of GHG emissions, or will the implementation add more strain to an already fraying economy?

2. The Sub-problems

- What is carbon tax and how does South Africa intend using this carbon pricing instrument to reduce its GHG emissions?
- Is an ETS a more effective tool in reducing GHG emissions, and a better alternative to carbon tax for South Africa?
- How does South Africa's carbon pricing policy compare to the rest of the world?
- Are carbon pricing instruments effective in achieving climate goals or are they just another revenue generating mechanism?
- What are the socio-economic impacts of introducing a carbon pricing instrument?

3. Research Methodology

This research report has been performed using a qualitative approach. The study is based on an extensive literature review, relying on primary sources of information such as domestic legislation, and is supplemented by secondary sources such as journal articles, books and other publications. The report provides insight to the international crisis currently being faced, being global warming and climate change, and South Africa's response to the crisis by implementing a carbon tax policy.

4. Scope and Limitations

This research report is limited to the study of a carbon tax option for South Africa. There are other carbon pricing policies available other than a carbon tax. The two main carbon pricing policies that exist is a carbon tax and an Emissions Trading System or ETS. Other carbon pricing policies include the Greenhouse Gas Industrial Reporting and Control Act (GGIRCA), the Carbon Competitive Incentive Regulation (CCIR), the Output-Based Pricing System (OBPS), and the Performance Standards System (PSS) implemented in Canada, and the Clean Air Rule (CAR) in Washington, United States of America (WBG, 2019). For purposes of this study, only an ETS will be considered as an alternative approach to carbon tax for South Africa, and will form part of this study.

This study includes an analysis of carbon pricing policies implemented in other jurisdictions. Only those countries listed in the Chapter Outline will be included within the scope of this study.

5. Chapter Outline

Chapter 2: Introduction to Carbon Tax

Chapter 2 will examine global warming in further detail, and focus on the basic principles of carbon tax including the advantages and disadvantages of adopting this carbon pricing instrument.

Chapter 3: South Africa's Carbon Tax implementation

This chapter will focus on South Africa's emissions profile and initiatives that have been introduced by South Africa to mitigate its GHG emissions prior to the implementation of carbon tax.

South Africa's approach to carbon tax, including its design and implementation of the tax, will also be analysed. This will include its tax rate, tax base, tax-free allowances and administration of the tax.

Chapter 4: An Emissions Trading System (ETS)

An emissions trading system also known as a 'cap-and-trade' system is a popular alternative to carbon tax. As of 1 April 2019, 28 ETSs have been implemented across national and subnational jurisdictions in comparison to 29 carbon taxes that have been primarily implemented at a national level (WBG, 2019).

This chapter will provide an overview of an ETS and a comparative analysis of an ETS to carbon tax. The rationale for implementing a carbon tax in South Africa rather than an ETS will also be analysed in this chapter.

Chapter 5: Global trend analysis of Carbon Pricing Instruments

The implementation of South Africa's carbon tax has received much criticism including the tax rate being too low. This chapter will provide a comparative analysis of South Africa's implementation of carbon tax to some other countries across the world.

There is an increasing number of jurisdictions that are implementing or planning to implement carbon pricing instruments such as a carbon tax or an ETS. New carbon pricing initiatives are being explored and developed across the world. Using the 'States and Trends of Carbon Pricing 2019' report prepared by the World Bank Group and other recent studies, this chapter will highlight the global trends of carbon pricing instruments such as a carbon tax and an ETS. (WBG, 2019)

For comparative purposes a sample of countries have been selected for this study. These include India, Sweden and Australia. The reasons for selecting these countries are explained in the following paragraphs.

South Africa is categorised as a ‘developing’ country.[4] According to an article published by Forbes the consumption of coal by developing countries is increasing. The 3 countries most dependent on coal, in order of percentage of coal used as a primary energy source are South Africa (70.8%), China (58.2%) and India (55.9%). (Rapier, 2019) In addition to their heavy reliance on coal as a primary source for energy, like South Africa, China and India are also categorised as ‘developing’ countries. Due to these similarities, and the fact that South Africa and India are all part of BRICS,India was selected for this study.

Sweden has been selected because of its experience in carbon tax and successful implementation thereof. Sweden implemented its carbon tax policy as early as 1991 and is one of the lowest carbon dioxide emitters within the European Union. Its success in implementing a carbon tax policy is evidenced by its ability to effectively reduce its GHG emissions over the years while contributing to the economic growth of the country. (Hammar & Åkerfeldt, 2011)

Australia implemented a carbon pricing scheme effective 1 July 2012. The country faced resistance of the tax from opposing parties and the public. The implementation of the tax failed and was repealed in 2014. (Irigoyen, 2017) Instead of reintroducing the tax Australia established an Emissions Reduction Fund, also known as the ‘Climate Solutions Fund’ (Timperley, 2019b). The Climate Solutions Fund aims at offering financial incentives to companies to increase their energy efficiency (Schiermeier, 2014). Key learnings can be learnt from Australia’s unsuccessful attempt at introducing a carbon tax, and has therefore been selected as a case study.

Chapter 6: Understanding the Socio-Economic Impact

An important part in the design and implementation of a carbon pricing instrument is to assess the socio-economic impact and mitigating ways to reduce the impact. Low- and moderate-income households are highly affected by the introduction of a carbon tax. However, a well-designed carbon tax policy can generate sufficient revenue to alleviate some of the increased pressures that they may face. (Stone, 2015)

This chapter examines the socio-economic impact of introducing a carbon tax instrument and what the impact will be for South Africa.

Chapter 7: Revenue Generated by Carbon Pricing Instruments

Carbon taxes requires emitters to pay for the costs of investing in greener technology to mitigate their emissions. Furthermore, a tax is levied on their remaining emissions providing a source of revenue to

[4] Investopedia (2019). ‘Top 25 Developed and Developing Countries’. Available at: https://www.investopedia.com/updates/top-developing-countries/ [Accessed on: 14 October 2019]. There are several factors that determine whether a country is categorised as ‘developing’ or ‘developed’. Factors include the country’s gross domestic product (GDP) per capita (the country’s GDP divided by its population), the social and economic development levels, levels of debt and level of industrialisation.

the government (PMR, 2017). An important consideration in designing a carbon tax policy is to determine the use of the revenue that is going to be generated.

This chapter will provide an overview of the revenues generated by carbon taxes and ETSs and how they are being used in some countries across the world. This chapter also identifies ways in which revenues generated from carbon pricing instruments can be used effectively, and explores the concept of revenue recycling.

Chapter 8: Conclusion

This chapter is the concluding chapter which will summarise the findings of the research. Any limitations of this research and areas requiring further research that have been identified will be highlighted in this chapter.

CHAPTER 2:
INTRODUCTION TO CARBON TAX

2.1 Global Warming and Climate Change

The main reason for the introduction of a carbon pricing instrument such as a carbon tax, is due to the crisis that the world is currently facing, which is global warming and climate change.

Numerous studies by scientists have verified that the extreme changes in weather patterns and the occurrence of natural disasters currently being experienced around the world, is attributable to climate change, caused by global warming.[5]

Compared to other planets, Earth is protected by a thin layer of gases, namely the atmosphere. These gases can absorb infrared radiation thereby preventing some of the solar energy from escaping into the outer space. Without these gases present in the atmosphere, Earth would be extremely cold. GHGs are therefore naturally present in the atmosphere and is essential for maintaining moderate temperatures on Earth, thus making the conditions liveable and preventing excessively cold weather conditions that can be experienced on some other planets. (Shahzad, 2015)

As the global population has increased over time so did the demand for food and energy, resulting in a significant increase in the concentration of GHGs on Earth. This substantial increase is attributable to human activity and can be referred to as human-induced GHG emissions. (Shahzad, 2015).

The over-concentration of GHGs in the atmosphere is resulting in an increase in the absorption of infrared radiation. This energy is radiated back to Earth, thereby warming the planet and increasing the overall temperatures. This is referred to as global warming. (Shahzad, 2015)

The world's average surface temperature is estimated to have increased by 0.6 degrees Celsius during the twentieth century. Approximately two-thirds of this increase is said to have occurred since 1975. (WHO, WMO & UNEP, 2013)

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[5] World Health Organisation (WHO), World Meteorological Organisation (WMO) & United Nations Environment Programme (UNEP). 2003. Climate Change and Human Health – Risks and Responses Summary, World Health Organisation: Geneva, Switzerland.
The terms 'weather' and 'climate' can be distinguished as follows:
'weather' refers to the continuous change in the condition of the atmosphere which is measured over a short timeframe of hours to weeks.
'climate' refers to the average condition of the lower atmosphere and characteristics of the land or water that is measured over several years.

Countries across the world including South Africa are already seeing an increase in overall temperatures and significant changes in weather patterns. Winters in South Africa are becoming warmer and heatwaves more extreme. Whilst some places in the country are experiencing drought, others are experiencing persistent rainfall and flooding.

Other natural disasters such as forest fires, earthquakes, tsunamis, tornadoes and hurricanes are also occurring more frequently in other parts of the world.

The increase in temperature is causing polar ice caps to melt. Besides increasing temperatures of the land and sea surface, humidity and sea levels are also increasing. Elements that are decreasing because of global warming include glaciers, snow cover and sea ice. (Sivaramanan, 2015)
The major sources of the GHG emissions per sector is summarised as follows:

1. Energy – natural gas leakage and the combustion of fossil fuels and biomass.
2. Forestry – deforestation, harvesting and the burning of trees.
3. Agricultural – paddy fields, animal farming and the use of fertilisers.
4. Waste management – the burning of sanitary landfills and biomass decay.
5. Industrial – cement and petrochemical production, and metal smelting.

The excessive use of fossil fuels in the energy sector such as coal, gas and oil are identified as one of the largest contributors to global warming. The burning of these fuels emits harmful gases into the atmosphere. Furthermore, these fuels will be depleted at some point since they are non-renewable energy sources and there is a limited supply thereof. Nations are therefore encouraged to transition towards low carbon intensive sources of energy, and to rather use renewable energy sources such as wind, hydro, solar, bio mass and geothermal energy. (Shahzad, 2015)

Transitioning towards renewable energy sources that are environmentally friendly will require a significant amount of capital. Many developed countries have already adopted renewable energy sources and can obtain large amounts of energy from these sources. However, such a transition for a developing country such as South Africa, that is still heavily reliant on coal as a primary source of energy, is not easy. It is an extremely costly project that can take several years to be completed. Developed countries are therefore encouraged to assist developing countries with their efforts to reduce GHG emissions by adopting renewable energy sources. (Shahzad, 2015)

Besides the changes in weather patterns and the frequent occurrence of natural disasters, climate change will also influence the functioning of ecosystems, and have a significant impact on human health. Although the increase in the global average temperatures has the benefit of resulting in milder winters, therefore reducing the mortality rate caused by the harsh winter seasons, the adverse impact on human health is far more detrimental. (WHO, WMO & UNEP, 2013)

These extreme weather conditions increase the risk of sun strokes and diseases such as skin cancer, malaria and cholera. The agricultural sector is also at risk of being severely affected, impacting the availability of food. It is therefore evident that global warming not only has an environmental impact but also a significant social impact, affecting all living things on Earth. (WHO, WMO & UNEP, 2013)

There are several mitigation strategies that can assist with the reduction of GHGs. (Sivaramanan, 2015) Examples of these include:

1. Providing incentives for reducing energy consumption and GHG emissions.
2. Introducing taxes that will discourage excessive energy consumption.
3. Increasing the use of renewable energy sources.
4. Investing in energy efficient technology.
5. Encouraging the use of public transport, and promoting the use of electric cars.
6. Encouraging the recycling of materials, and appropriate disposal of waste.
7. Reforestation and the restoration of wetlands.
8. Managing the use of fertilisers that produce nitrous oxide.

Due to the significance and severe impact of global warming being experienced across the globe especially over the last few years, carbon pricing instruments have gained much popularity as a mitigation strategy to reduce GHG emissions that contribute to global warming.

Carbon pricing instruments ensure that the ‘polluter pays’ and is penalised for causing damage to the environment, for releasing harmful gases into the atmosphere that contribute to global warming. Furthermore, carbon pricing instruments encourages investment in low-carbon technologies therefore reducing GHG emissions.

Carbon pricing can be implemented by using one of two instruments, namely, a carbon tax or an emissions trading system (also referred to as a cap-and-trade system) (Haites, 2018). The principles of an emissions trading system as an alternative to carbon tax will be discussed in Chapter 4.

Carbon tax, as a carbon pricing option, will form the basis of this study.

2.2 What is Carbon Tax?

Carbon tax is based on the ‘Polluter Pays Principle’. This means that, ‘Those responsible for harming the environment must pay the costs of remedying pollution and environmental degradation and supporting any consequent adaptive response that may be required’. (National Treasury, 2018)

A carbon tax is as an environmental tax that directly levies a charge on emissions (Kaineg, 2013). The primary purpose of the tax is to reduce the emission of harmful gases into the atmosphere, thereby slowing the rate of global warming (PricewaterhouseCoopers (PwC), 2011). Carbon tax is regarded as a ‘Pigouvian’ tax or a tax on vice, meaning a tax levied on activities that have negative externalities, in this case global warming (CPLC, 2016a).

Carbon pricing is identified as the most effective regulatory approach to reduce GHG emissions. Placing a price on carbon incentivises emitters to introduce emission reduction alternatives, that will reduce their cost of emissions which would have been increased through carbon pricing. (Haites, 2018) By introducing a cost on carbon emissions such as a carbon tax, emitters are encouraged to transform their businesses and invest in innovative, less carbon-intensive technologies, that will assist their business in saving costs and maximising profits.

According to the World Bank Group (2019), only 20 percent of global GHG emissions are covered by carbon pricing. Although the coverage is currently low, carbon pricing is still regarded as the most effective way to reduce GHG emissions, and to encourage a transition towards a low carbon-intensive environment. Jurisdictions are therefore encouraged to strengthen their carbon pricing policies to sufficiently reduce GHG emissions and reduce the harmful effects of climate change.

National Treasury, through its carbon pricing policy and legislation, will decide on emission sources that will be subject to the tax, and determine the carbon tax rate that will be levied per unit of emissions. Carbon tax is not limited to carbon dioxide emissions only. Other GHGs that are harmful to the environment can also be included within the scope of a carbon tax. GHGs other than carbon dioxide that are included within the scope of the tax, such as methane and nitrous oxide, are converted using formulae and expressed as tonnes of carbon dioxide equivalents (CO_2e). In doing so, the coverage of the tax is increased and will not be limited to carbon dioxide alone. Some emissions may be excluded from the scope because they are very costly or difficult to measure, or the extent of the emissions is insignificant. (Haites, 2018)

Another form of taxing emissions is at the point of purchase. For example, the taxing of fuels such as petrol and diesel at the point of purchase, by charging a levy upfront based on the carbon content of the fuel, instead of when the products are consumed. (Kaineg, 2013) The carbon content of these fuels can be easily determined thus allowing for the emissions to be taxed when it enters the economy, instead of at the point of combustion. By taxing these sources upfront, the number of entities that are covered by the tax is decreased thus reducing the administrative burden of managing the compliance of the tax for government. (Haites, 2018)

The primary goal for introducing a carbon tax is to reduce the jurisdiction’s GHG emissions. GHG emissions are directly linked to energy obtained from the burning of fossil fuels. Therefore, the introduction of a carbon tax increases the cost of this energy and should discourage users from consuming excessive amounts of energy. Introducing a carbon tax to regions where the primary source of energy is coal, which is a high emitter of carbon, may have an adverse impact on low-income households. This can be mitigated and managed through the effective use of revenue generated by the carbon tax. Carbon pricing policies need to be structured in a manner that achieves a balance of meeting environmental targets and international commitments, whilst minimising the adverse impact on the economy, businesses and the people. (Kaineg, 2013) The design of a carbon pricing policy is therefore critical. A detailed understanding of the jurisdiction's emissions profile, its economy and the socio-economic impact of implementing the policy is required.

2.3 FASTER Principles for Successful Carbon Pricing

The FASTER Principles for Successful Carbon Pricing was developed jointly by the Organisation for Economic Co-operation and Development (OECD) and the World Bank Group (WBG). The principles are based on the experiences learnt from different jurisdictions with carbon taxes and ETSs. (PMR, 2017) These principles can be used as a good guidance tool for developing a well-designed carbon pricing policy.

The FASTER Principles for Successful Carbon Pricing are as follows:

Principle for Successful Carbon Pricing	**Description**
Fairness	Successful carbon pricing policies reflect the 'polluter pays' principle, contributes the distributing costs and benefits equitably, and avoids disproportionate burdens on vulnerable groups;
Alignment of Policies and Objectives	Successful carbon pricing policies are part of a suite of measures that facilitate competition and openness, ensure equal opportunities for low-carbon alternatives, and interact with a broader set of climate and non-climate policies;
Stability and Predictability	Successful carbon pricing policies are part of a stable policy framework that gives a consistent, credible and strong investment signal, the intensity of which should increase over time;
Transparency	Successful carbon pricing policies are clear in design and implementation;
Efficiency and Cost-effectiveness	Successful carbon pricing improves economic efficiency and reduces the costs of emission reduction;
Reliability and Environmental Integrity	Successful carbon pricing schemes result in a measurable reduction in environmentally harmful behaviour.

Figure 1: FASTER Principles for Successful Carbon Pricing
Source: OECD & WBG (2015)

2.4 Advantages and disadvantages of a Carbon Tax

There are both advantages and disadvantages of implementing a carbon tax.

Carbon tax is favoured by some economists since they regard the tax as being effective because of the cost that it places on the negative environmental consequences caused by emitters, who would have otherwise not been held accountable for the full social cost of their actions (PwC, 2011).

PwC (2011) lists the following advantages of a carbon tax:

- Carbon tax encourages the reduction of emissions by placing a price on carbon;
- It encourages investment in low-carbon technologies;
- The tax is easy to implement and can therefore be implemented quickly;
- It is economically efficient since it is transparent and offers wide coverage;
- The costs of a carbon tax are predictable and can therefore be estimated, assisting businesses and consumers to plan accordingly;
- The tax can be implemented across different economies, therefore international efforts on reducing GHG emission can be aligned;
- Carbon tax is an additional source of revenue for government that can be used to mitigate the socio-economic impact of introducing the tax or to assist in budget deficits, whilst providing the benefit of reducing the country's GHG emissions and achieving global commitments.

Kaineg (2013) describes the disadvantages of introducing a carbon tax:

- There is no guarantee of achieving the goals set for reducing GHG emissions;
- The increase in costs created by the introduction of the tax may have an adverse impact on low-income households, and may negatively impact the economy;
- The introduction of an additional tax may be resisted by taxpayers and can therefore lead to a tax revolt;
- The tax does not allow for any revenue to be generated from over-compliance in achieving target goals.

Overall, the advantages of implementing a carbon tax outweigh the disadvantages. However, each country's requirements and circumstances are different. Therefore, the pros and cons of implementing a carbon tax for each jurisdiction must be weighed accordingly when deciding to adopt this tax, and should be carefully considered when designing a carbon pricing policy.

CHAPTER 3:
SOUTH AFRICA'S CARBON TAX IMPLEMENTATION

3.1 Understanding South Africa's emissions profile

South Africa is ranked the 14th largest emitter of GHGs in the world (McSweeney & Timperley, 2018). During the period 2000 to 2012 South Africa's total emissions increased by just over 19 percent, from approximately 434 Mt CO_2e to 518 Mt CO_2e. South Africa's GHG emissions account for 1.1 percent of global GHG emissions, whereas its GDP contribution relative to global GDP is only 0.6 percent. (Department of Environmental Affairs (DEA), 2018)

During the period 2000 to 2012, the waste, transport and energy sectors contributed the most to the increase in South Africa's GHG emissions. The waste sector increased by 78 percent, transport sector by 32 percent and energy sector by 28 percent. There were no significant changes to the percentage of emissions by the industrial sector, whereas the agricultural, forestry and other land use (AFOLU) sector decreased by 32 percent during this period. (DEA, 2018)

Figure 2 depicts the GHG emissions per sector according to the National Greenhouse Gas Emission Inventory measured in 2012. The energy sector accounted for 67.8 percent of total GHG emissions, followed by the industrial sector which accounted for 12.8 percent, and the transport sector that contributed 9.2 percent of South Africa's total GHG emissions.

In total, the top 3 sectors per Figure 2 accounted for 89.8 percent of South Africa's total GHG emissions.

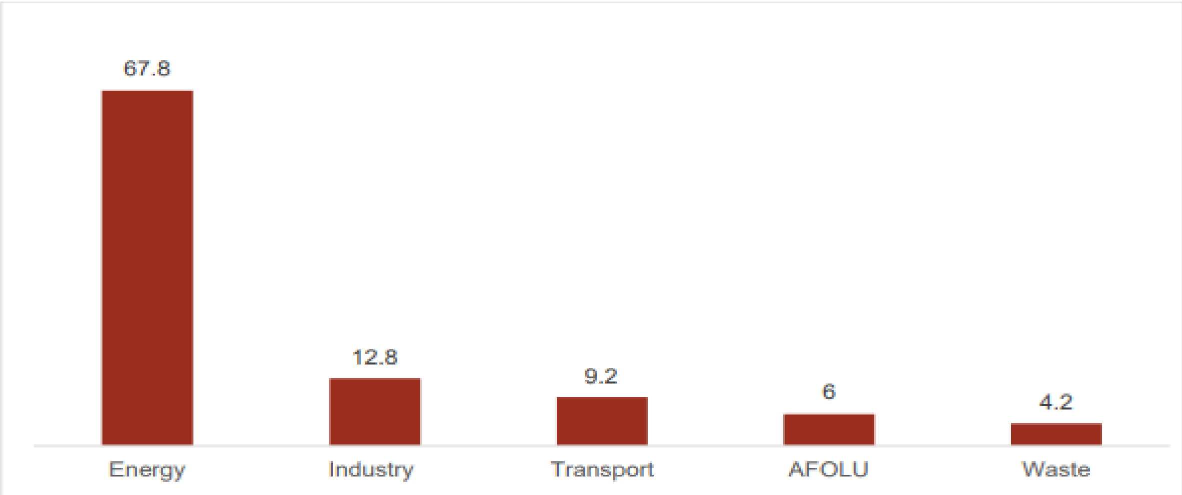

Figure 2: Percentage of South Africa's GHG emissions per key sector in 2012
Source: DEA (2018)

The Carbon Disclosure Project

South Africa is a participant in the Carbon Disclosure Project. The Carbon Disclosure Project is an international project that allows companies to voluntarily participate by submitting reports annually based on their emissions profile. Many of the top Johannesburg Stock Exchange (JSE) listed companies participated in South Africa's first Carbon Disclosure Project (2010). The data obtained from this project plays a vital role in providing a baseline measurement for GHG emissions and can assist in the measuring, reporting and verification process administered by the Department of Environmental Affairs. (National Treasury, 2010)

South Africa's Carbon Disclosure Project Report (2010) categorises the estimated firm-disclosed carbon emissions by 'Scope 1' and 'Scope 2' emissions. 'Scope 1' and 'Scope 2' emissions are defined by National Treasury as follows:

- Scope 1 emissions are direct GHG emissions from sources owned or controlled by the company. For example, emissions from combustion in owned or controlled boilers, furnaces and vehicles, as well as emissions from chemical production in owned or controlled process equipment.
- Scope 2 emissions, on the other hand, are indirect GHG emissions from purchased electricity used by the company. These emissions physically occur at the facility where electricity is generated.

Per South Africa's Carbon Disclosure Report (2010) the total estimated scope 1 emissions amounted to 352,535,130 tCO_2e and scope 2 emissions 89,693,641 tCO_2e.

The Report evidences that South Africa's GHG emissions are dominated by a few large entities, namely:

- Eskom, a non-listed JSE company responsible for South Africa's coal-generated electricity,
- Few JSE listed companies from the industrial and mining sectors namely, Sasol, BHP Billiton, ArcelorMittal SA, Anglo American, Pretoria Portland Cement Company, and
- Sappi and Mondi from the AFOLU sector.

In total, these companies accounted for 341,641,898 tCO_2e or 97 percent of total scope 1 emissions, and 55,968,289 tCO_2e or 62 percent of total scope 2 emissions.

Figures 3 and 4 depict South Africa's firm-disclosed estimates of scope 1 and scope 2 GHG emissions based on the findings from the Carbon Disclosure Project Report (2010).

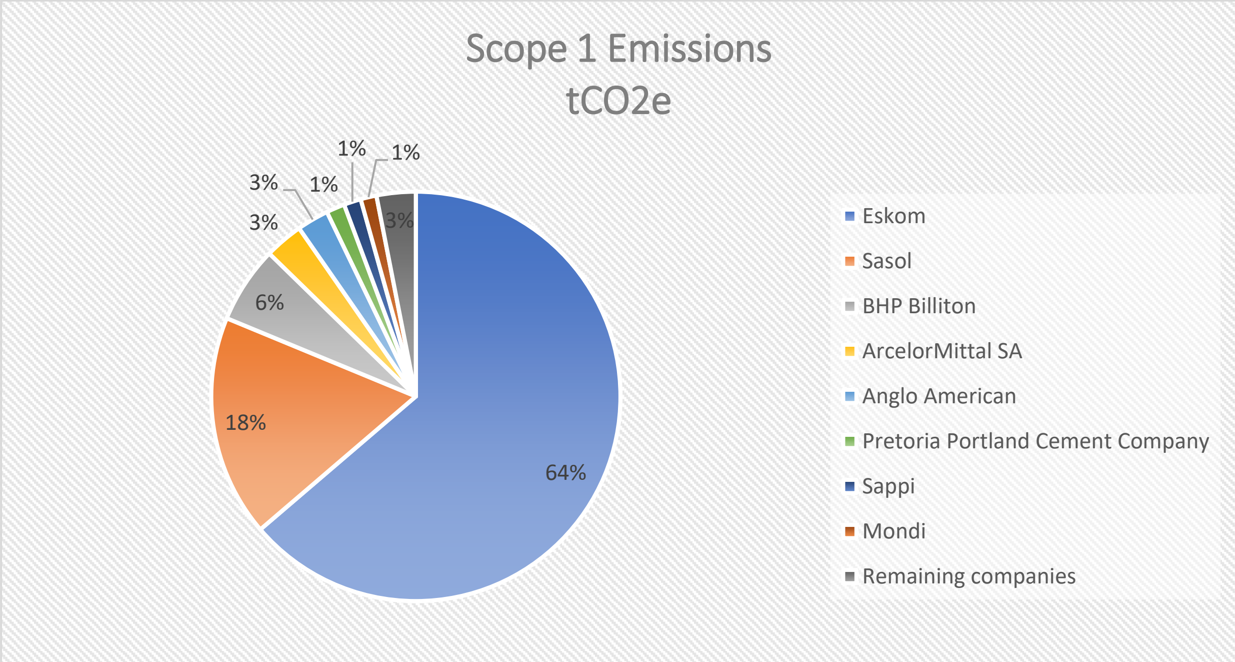

Figure 3: Firm-disclosed Scope 1 GHG emissions estimates per South Africa's Carbon Disclosure Project Report (2010)

Source: National Treasury (2010)

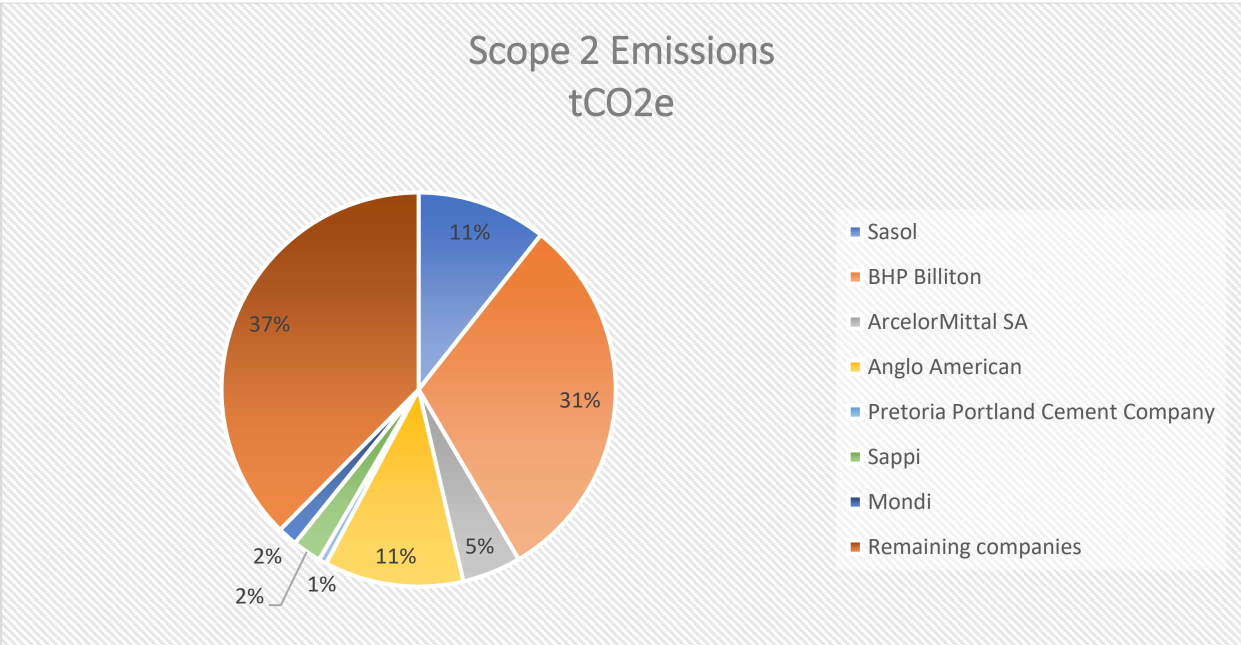

Figure 4: Firm-disclosed Scope 2 GHG emissions estimates per South Africa's Carbon Disclosure Project Report (2010)

Source: National Treasury (2010)

Overview of the energy sector

Figure 5 depicts the profile of South Africa's sources of energy as at 2014, and the amount of energy supplied by the various sources during the period 1990 – 2014 measured in petajoules (PJ).[6] As at 2014, 70 percent of South Africa's energy was being sourced from coal, making it South Africa's primary source of energy. Renewable energy sources were almost zero and did not improve much since 1990. (Climate Transparency, 2017) Figure 5 evidences South Africa's heavy reliance on fossil fuels, such as coal, oil and gas, for its energy.

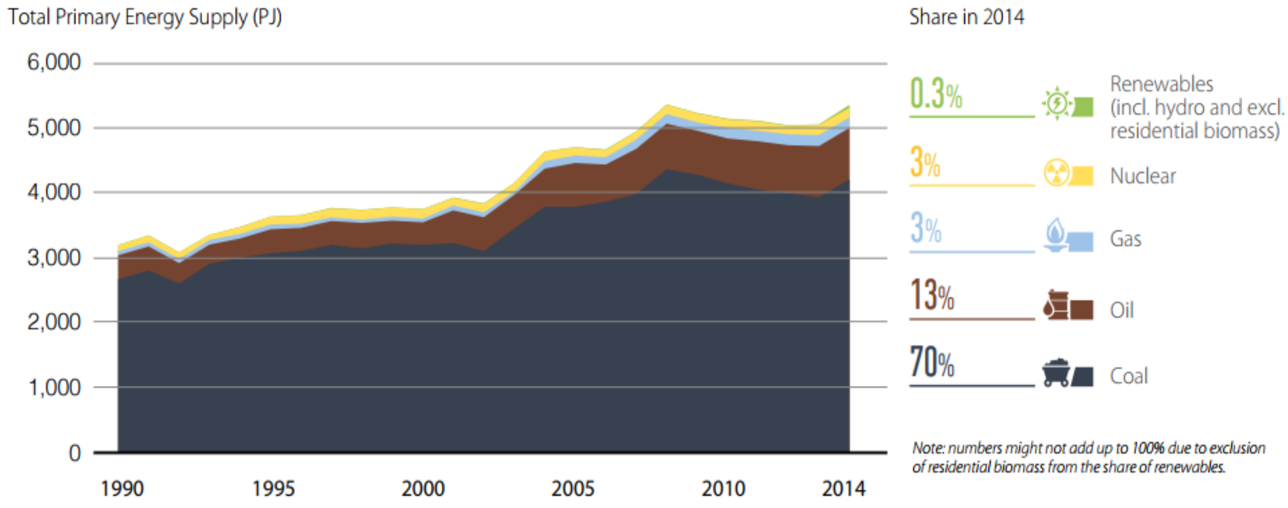

Figure 5: Profile of South Africa's source of energy

Source: Climate Transparency (2017)

South Africa is ranked 83rd out of 129 in terms of the Energy Sustainability Index developed by the World Energy Council. The low performance in environmental sustainability is due to South Africa's heavy reliance on coal and its high emission rates. (DEA, 2018)

Although South Africa's renewable energy sources are relatively small, it has grown from 0.3 percent to 5.2 percent over the last decade. Studies indicate that there are several opportunities for South Africa to further develop its renewable energy resources. Examples of these include, wind power that can be generated along South Africa's coastline, biomass from large wood and sugar plantations which are abundant in South Africa, and solar power afforded by South Africa's favourable weather conditions. As discussed in Chapter 2, climate change does however bring about extreme weather conditions which can then have an impact on the renewable energy resources. Therefore, it is essential to ensure that

[6] Australian Government, Department of the Environment and Energy (n.d.). 'One petajoule (PJ) explained'. Available at: https://www.energy.gov.au/sites/default/files/2016-australian-energy-statistics-info3.pdf [Accessed on: 24 November 2019].
The joule is the standard unit of energy which is the equivalent of one watt of power radiated for one second. One petajoule is 10^{15} joules or 278 gigawatt hours.

the systems and infrastructures developed to generate renewable energy can withstand these conditions. (DEA, 2018)

Overview of the industrial sector

South Africa is one of Africa's most developed countries and has the second largest economy in the continent after Nigeria. It is rich in minerals and is ranked the 5th largest mining sector in the world. (McSweeney & Timperley, 2018) The country is a major producer of coal, gold, platinum, diamonds, iron ore, manganese and chrome. Besides stainless steel, South Africa also produces a large variety of non-ferrous metals such as aluminium, copper, brass, lead and zinc. (DEA, 2018)

Per Figure 2, the industrial sector accounts for 12.8 percent of total GHG emissions in South Africa. The metals and manufacturing industries contributed approximately 90 percent of these emissions during the period 2000 and 2012 as per Figure 6. Although their emissions are high, these sectors have an important role in the contribution to South Africa's economy. The mining industry having contributed approximately 8 percent to South Africa's GDP in 2017. (DEA, 2018)

Unfortunately, the industrial sector is highly energy-intensive accounting for the largest portion of South Africa's total energy demand and consumption, making it the second largest contributor of GHG emissions in South Africa. However, these sectors provide a substantial contribution to South Africa's economy and creates employment for many people, and therefore has significant bearing on the socio-economic development of the country. (DEA, 2018)

South Africa has the largest chemical industry in Africa that is mainly driven by the synthetic coal and natural gas-based liquid fuels industries. Although the chemical industry contributed approximately 5 percent to South Africa's GDP in 2017, its emissions are substantially lower, accounting for only 2 percent of the total industrial emissions per Figure 6. (DEA, 2018)

The industrial sector, especially the minerals, manufacturing and construction sectors within the sector, is highly vulnerable to the risks associated with climate change. The availability of water, a resource that is impacted by climate change, is essential in all these industries as it is used in their primary production processes. Whilst some places may experience water shortages due to drought, other places may experience excessive rainfall which can lead to flash floods resulting in substantial erosion and degradation of mining surface areas. (DEA, 2018)

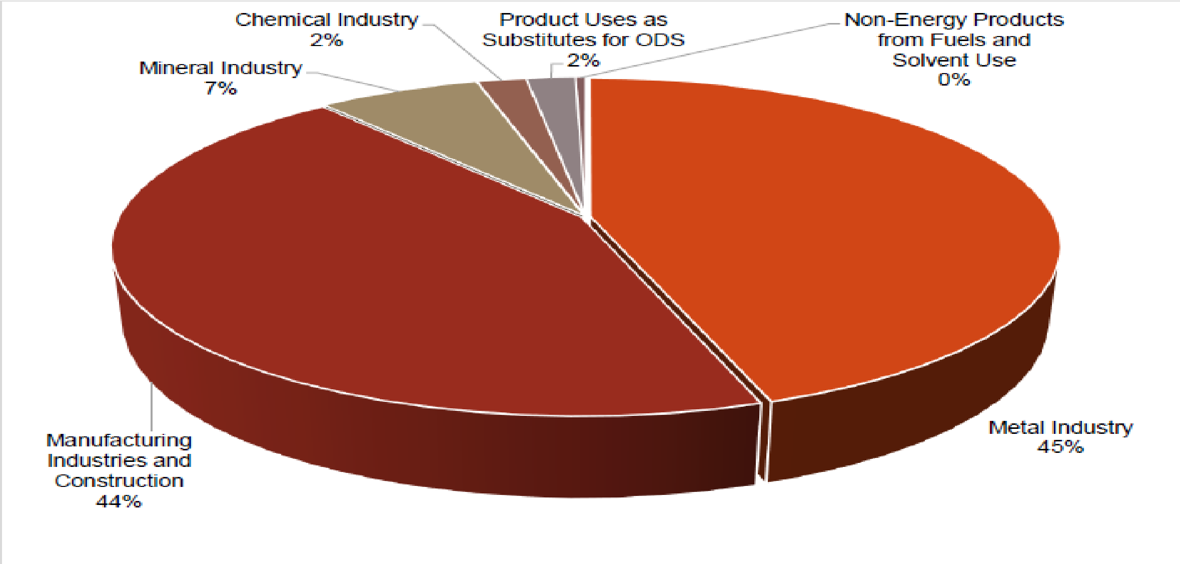

Figure 6: Percentage of South Africa's GHG emissions in the industry sector between 2000 to 2012

Source: DEA (2018)

Overview of the Agricultural, Forestry and Other Land Use (AFOLU) sector

The AFOLU sector contributes only a small portion to South Africa's economy. However, the significance of the industry lies in the employment and skills development opportunities that it creates especially in the rural areas. Approximately 6 percent of South Africa's total GHG emissions is emitted by the AFOLU industry per Figure 2. Enteric fermentation[7] from livestock is responsible for 42 percent of these emissions, while 28 percent is accounted for by nitrous oxide emissions caused by fertiliser, manure and animal urea. The remaining emissions are caused by the burning of grasslands and forestry, liming and urea application. South Africa's forest land sequesters approximately 32,882 Gt CO_2e thus reducing the country's total emissions by approximately 5 percent. (DEA, 2018)

The AFOLU and waste industries are the main contributors to South Africa's methane and nitrous oxide gas emissions.

[7] Conneely, D., Gibbs, M. J., Johnson, D., Lasse, K. R. & Ulyatt, J. (n.d.). 'Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories: CH4 Emissions from Enteric Fermentation'. Available at: https://www.ipcc-nggip.iges.or.jp/public/gp/bgp/4_1_CH4_Enteric_Fermentation.pdf [Accessed on: 06 April 2020].
Enteric fermentation is a digestive process by which the feed consumed by animals are fermented by microbes resident in the animal's digestive system. Methane gas is emitted as a by-product through this digestive process.

Overview of the waste sector

The waste sector is a major concern for South Africa and other countries across the world. The growing challenge of waste disposal and management thereof is due to an increasing population, economy and rate of urbanisation. South Africa generated approximately 109 Mt of waste in 2017 per the Draft South African State of Waste Report, of which only approximately 11 percent was recycled. The remaining waste was disposed at landfills. (DEA, 2018)

Although the waste sector accounts for only 4 percent of South Africa's total emissions per Figure 2, the sector's emissions increased by 78 percent during the period 2000 - 2012, the highest increase compared to the other sectors. Landfill methane emissions account for approximately 84 percent of the waste sector's total GHG emissions per Figure 7. The remaining 16 percent is attributable to waste water treatment works. (DEA, 2018)

Many landfills in the country are close to or have already reached their capacity, resulting in an increasing scarcity in the availability of landfills. Furthermore, the increased cost of building new landfills, the rapid rate of urbanisation and the social unacceptability of disposing waste using landfills, has slowed down the development of new landfill sites. Alternative measures for disposing waste are therefore required and are being investigated. (DEA, 2018)

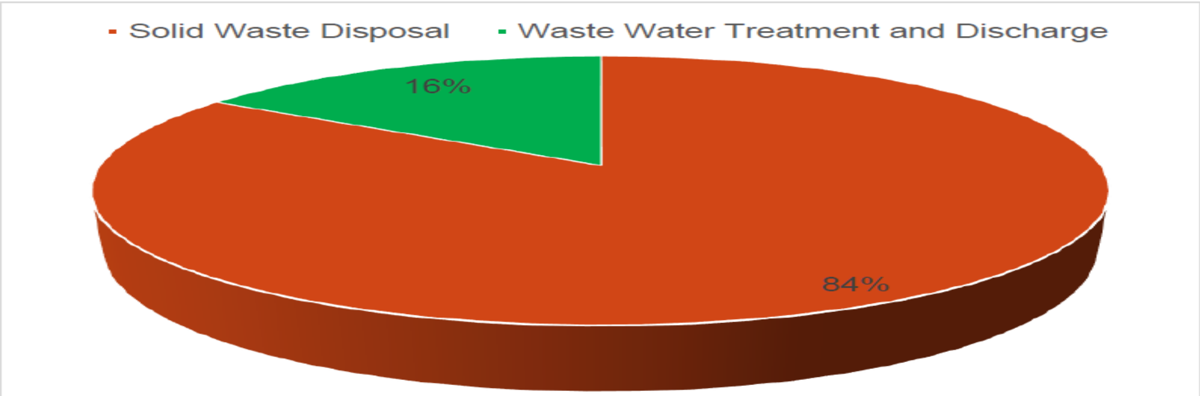

Figure 7: Average percentage of GHG emissions in the waste sector between 2000 to 2012

Source: DEA (2018)

3.2 Initiatives undertaken by South Africa prior to the implementation of a Carbon Tax

Prior to the implementation of carbon tax, South Africa introduced a number of tax incentives to encourage investments in low-carbon technologies and reduce its GHG emissions. Over the years, South Africa has also introduced several environmental levies to dissuade pollution and improve the environmental condition of the country.

Tax policies and mechanisms are often used by government to influence the behaviour of individuals. With the objective of promoting the protection of our planet, South Africa has committed itself to several environmental obligations and international pledges which has led to an increase in tax incentives and environmental levies to meet these commitments. (Cliffe Dekker Hofmeyr (CDH), 2019)

South Africa's Low-Emission Development Strategy (SA LEDS) 2050

South Africa acknowledges the significance of global warming and the risks associated with climate change. In an effort to mitigate these risks, the DEA has undertaken a study to understand the emissions for each of the significant sectors, and ways to mitigate the emissions by these sectors as the country strives towards a low-carbon emissions environment.

The SA LEDS 2050 aims at directing the country towards a low-carbon environment whilst improving the socio-economic circumstances of the country. The SA LEDS 2050 vision is, 'Putting South Africa on a low-carbon growth path while making a fair contribution to the global effort to limit the average temperature increase'. (DEA, 2018)

The SA LEDS 2050 outlines South Africa's research, technology and developmental needs required to transition towards a low-carbon emissions development. International support in terms of financing, transfer of technology and skills is required for South Africa to meet its climate change and developmental goals. To promote a low carbon development culture, South Africa has pledged to continue educating its people, and creating public awareness and participation in addressing climate change. (DEA, 2018)

Below is a list of some of South Africa's national and international commitments as listed in the SA LEDS 2050:

- UNFCCC – to prevent concentrations of GHG in the atmosphere at a level that would result in dangerous anthropogenic interference with the climate system and urge countries to respond in accordance with their common but differentiated responsibilities and respective capabilities;
- Paris Agreement – to limit the global average temperature increase above pre-industrial levels to well below 2°C, and to pursue efforts to limit the increase to 1.5°C and the communication by Countries, by 2020, their mid-century LEDS to the global community;
- NDC – to confirm the peak, plateau and decline GHG emissions trajectory range whereby South Africa's emissions by 2025 and 2030 will be in a range between 398 and 614 Mt CO_2equivalent;
- National Development Plan (NDP) – to eliminate poverty and reduce inequality by 2030, recognising that South Africa is not only a contributor to GHG emissions, but also particularly vulnerable to the effects of climate change specifically when it concerns the poor, women and children;
- National Climate Change Response Policy (NCCRP) – to make a fair contribution to avoiding dangerous anthropogenic interference with the climate system, within a timeframe that enables economic, social and environmental development to proceed in a sustainable manner;

- National Strategy on Sustainable Development (NSSD) – to formulate a sustainability vision for the country in which South Africa aspires to be a sustainable, economically prosperous and self-reliant nation state that safeguards its democracy by meeting the fundamental human needs of its people.

The SA LEDS 2050 that manages South Africa's goal towards a low-carbon emissions environment, is one of the many initiatives undertaken by South Africa to combat global warming and the impact of climate change. The list of obligations above emphasises South Africa's commitment to addressing the risks posed by global warming and climate change, emphasising the point that South Africa is serious about addressing the causes and harmful effects of global warming, and its commitment to reducing its GHG emissions.

To address these risks South Africa introduced the following tax incentives and environmental levies to drive the behaviour of its people and encourage them towards a cleaner, more sustainable environment.

Tax incentives and environmental levies

South Africa is ranked 18th in terms of generating the highest environmentally related tax revenue amongst 34 Organisation for Economic Co-operation and Development (OECD) and five partner economies. The average contribution of environmentally related tax revenues to GDP measured in 2014 amongst these 39 countries was 2 percent. In comparison, revenue generated from environmentally related taxes contributed 2.14 percent to South Africa's GDP. Taxes on energy contributed 93 percent of this revenue, compared to an average of 70 percent amongst the 39 comparative countries. It was further noted that transport fuels were taxed at a higher rate compared to fuels used for heating, processing and the generation of electricity. (CDH, 2019)

According to a further research done by the OECD, the African Tax Administration Forum (ATAF) and the African Union Commission (AUC), South Africa ranked 2nd in terms of the highest environmentally related tax revenue generated amongst the selected African countries per Figure 8. In 2017, environmentally related tax revenues contributed 2.7 percent to South Africa's GDP compared to 2.14 percent measured in 2014. During the last 10 years, South Africa introduced the incandescent light bulb levy (2009/10), the electricity levy (2009/10), the CO_2 tax on vehicle emissions (2010/11) and the tyre levy (2016/17). Revenues generated from these taxes accounted for 0.2 percent of the 2.7 percent measured for 2017. (OECD, ATAF & AUC, 2019)

Most of the environmentally related revenue generated by the selected African countries per Figure 8 was from energy products, such as diesel and gasoline that accounted for approximately two-thirds of this revenue. Most of the remaining revenue was generated through motor vehicle and transport taxes. Per Figure 8, approximately 90% of South Africa's environmentally related revenue related to taxes on energy, followed by transport, and a negligible amount attributable to pollution. (OECD, ATAF & AUC, 2019)

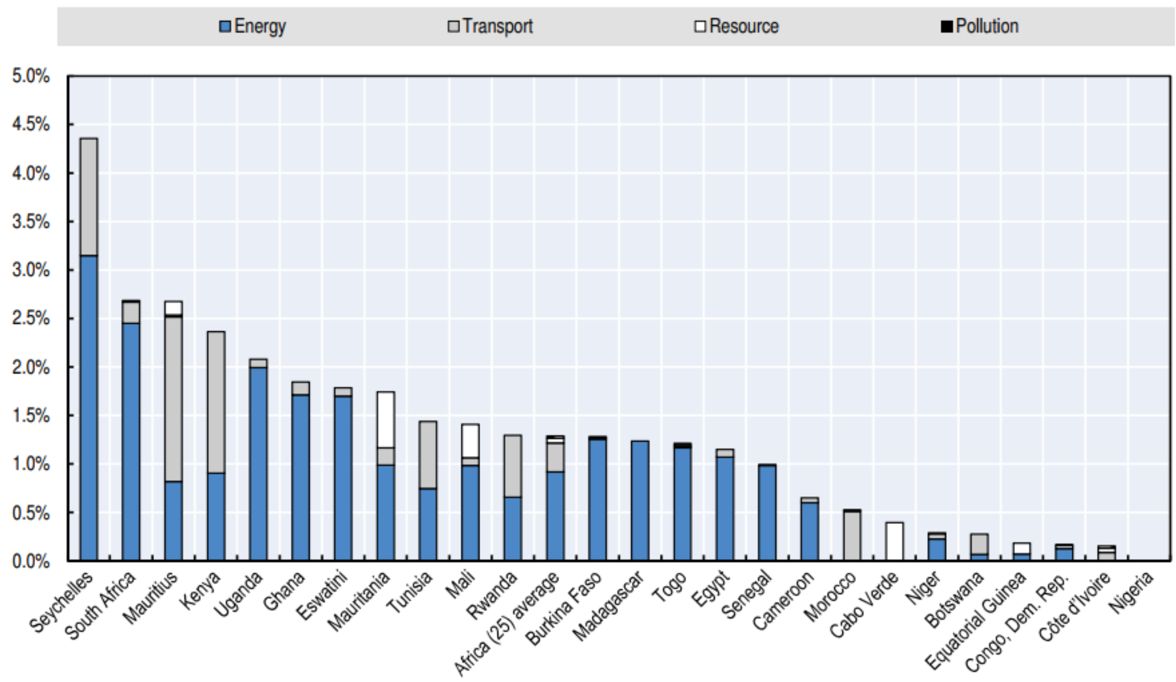

Figure 8: Environmentally related tax revenue generated by selected African countries, 2017

Source: OECD, ATAF & AUC (2019)

Figure 9 summarises some of the key environmental tax incentives introduced by South Africa in terms of the Income Tax Act, 58 of 1962 (the Income Tax Act).

TAX INCENTIVE	***DESCRIPTION***
Section 12B Allowance on renewable energy assets	Section 12B provides an attractive tax allowance for taxpayers investing in renewable energy assets used to generate electricity from: • wind power, • solar energy, • hydropower producing no more than 30 megawatts of electricity, and • biomass comprising organic wastes, landfill gas or plant materials. Plant, machinery, implements, utensils and articles (referred to as 'qualifying assets') used in the production of renewable energy in the course of the taxpayer's trade, will qualify for an accelerated tax allowance in the year of assessment that the asset is brought into use for the first time by the taxpayer. Machinery used in the taxpayer's trade to generate electricity from photovoltaic solar energy not exceeding one megawatt, will be allowed a deduction of 100% in the first year. All other qualifying assets will be allowed an accelerated allowance of 50% in the first year, 30% in the second year and 20% in the third year. Section 12B also includes the deduction of improvements to qualifying assets that are not classified as repairs. Taxpayers also enjoy the benefit under section 12B of claiming the allowance in full even if the asset is brought into use during the year of assessment, and is only used for part of that year. This means that an apportionment of the allowance is not required. Effectively, section 12B allows the taxpayer to claim the allowance on renewable energy assets over a much shorter period of one to three years even though its useful life may be much longer.

TAX INCENTIVE	*DESCRIPTION*
Section 12L Energy efficiency savings deduction	Section 12L was introduced to give taxpayers an incentive to reduce their energy consumption, and to encourage investment in newer technologies that are environmentally friendly. A deduction can be claimed for all forms of energy efficiency savings that have resulted from activities performed in the production of income. By improving energy efficiency, the demand for energy such as electricity is reduced thus reducing CO_2 emissions. The process of claiming the energy efficiency deduction is highly regulated. To claim the deduction, taxpayers must be registered with the South African National Energy Development Institute (SANEDI), and be in possession of an energy usage and savings certificate issued by a prescribed institution, board or body. A deduction of 95 cents per kilowatt hour or kilowatt hour equivalent of energy efficiency savings can be claimed as a tax deduction from the taxpayer's taxable income, provided that the taxpayer is in possession of the regulatory certificate.
Section 12U Deduction for roads and fences used in respect of the production of renewable energy	Section 12U provides taxpayers with a deduction for some supporting capital infrastructure costs, such as for roads and fences, actually incurred by the taxpayer relating to renewable energy projects. Although the costs incurred for the construction or improvement of a qualifying road or fence are capital in nature, section 12U allows for the full amount to be deducted during the year that it is incurred. Large-scale renewable energy projects such as wind farms and solar farms are capital intensive, requiring a large amount of capital expenditure upfront. This allowance makes investments in these projects more attractive by allowing an upfront deduction for the capital expenditure incurred.
Section 37B Allowance in respect of environmental expenditure	Section 37B provides a deduction for general capital environmental expenditure and post-trade environmental expenses such as decommissioning and restoration, usually a legal precondition for operations. New and unused environmental treatment and recycling assets will be given an allowance of 40% in the first year, followed by 20% per annum over the next 3 years. New and unused assets acquired for environmental waste disposal purposes will receive an allowance of 5% per annum.
Sections 37C/ 37D Deductions for environmental and land conservation	Section 37C - Land conservation and maintenance expenses actually incurred in terms of a biodiversity or protected area agreement, will be allowed a deduction in terms of section 37C. Contravention of these agreements will result in a recoupment of the deductions allowed, limited to deductions allowed within 5 years prior to contravention. Section 37D provides an allowance in respect of acquisition costs and improvements effected to 'declared land'. 'Declared land' refers to land declared under the National Environmental Management: Protected Areas Act, 57 of 2003 as a national park or nature reserve.

Figure 9: Key environmental tax incentives introduced by South Africa

Source: CDH (2019), and Koekemoer et al. (2019)

In addition to the environmental tax incentives listed above, South Africa also introduced many environmental levies prior to the carbon tax implementation. The objective of these levies is to assist in curbing the negative impact certain products have on the environment.

Environmental levies are legislated by the Customs and Excise Act, 91 of 1964.

The rates mentioned in Figure 10 are applicable to the 2020/ 2021 years.

ENVIRONMENTAL LEVY PRODUCTS	***DESCRIPTION***
Plastic bags	An environmental levy on plastic bags was introduced to discourage the use thereof. The rate of environmental levy on plastic bags manufactured in or imported into South Africa is 25 cents per bag (SARS, 2020a). Manufacturers are required to submit a quarterly return with payment to SARS.
Tyres	An environmental levy on tyres will be applied to new, used or re-treaded tyres manufactured in or imported into South Africa. The levy is calculated on the nett mass of the tyre. The current environmental levy charged on tyres is R2.30 per kilogramme net (SARS, 2017). Manufacturers are required to submit a quarterly return with payment to SARS.
Motor vehicle CO_2 emission	An environmental levy of R120 per g/km CO_2 emissions exceeding 95g/km and R160 per g/km CO^2 emissions exceeding 175g/km on carbon dioxide emissions of motor vehicles manufactured in or imported to South Africa (SARS, 2020b). The purpose of the levy is to encourage South Africa's vehicles to become more energy efficient and environmentally friendly. Manufacturers are required to submit a quarterly return with payment to SARS. South Africa also levies a fuel levy depending on the type of fuel, examples include petrol and kerosene.
Electricity generation	An environmental levy will be applied on electricity generated in South Africa from non-renewable energy sources (fossil fuels) and hazardous nuclear sources. The levy is payable by producers of energy from these sources, and is levied at 3.5 cents per kilowatt hour (SARS, 2012). Manufacturers are required to submit a monthly return with payment to SARS.
Electric filament lamps	Electric filament lamps refer to non-energy saving light bulbs. Manufacturers or importers of these products in/ to South Africa are required to pay a levy of R10 per lamp (SARS, 2020c).

Figure 10: Key environmental levies introduced by South Africa
Source: SARS Environmental Levy Products (2019)

<u>*Assessing the effectiveness of tax incentives in encouraging energy efficiency*</u>

Tax incentives and disincentives (such as levies) are used by countries all over the world to address environmental challenges, reduce CO_2 emissions and encourage energy efficiency. There are differences in opinion regarding the effectiveness of environmental tax incentives used to address environmental challenges and change the behaviour of citizens. Some researchers are of the opinion, that if applied correctly, these incentives can be useful in addressing environmental challenges such as pollution and GHG emissions. Studies have also shown that in some instances such as the case in the Netherlands, environmental tax incentives can promote energy efficiency; and research and development of technologies that reduce emissions such as renewable energy. (Dippenaar, 2018)

Environmental tax incentives are rather popular and are used in both developed and developing countries. There are some researchers who believe that implementing environmental taxes in developing countries such as South Africa is a concern as it may affect the country's economy and global competitiveness. However, measures can be taken to reduce this impact. In the long term, these taxes will provide the benefit of improving the circumstances of societies and reducing the impact of global warming. (Dippenaar, 2018)

One of the reasons for implementing several environmental tax incentives and levies instead of applying one instrument, is due to environmental issues stemming from various factors that need to be accommodated. The effectiveness and efficiency of the incentives and levies are enhanced when implemented together. To significantly increase the effectiveness of the incentives, key categories of emitters such as the energy sector should be targeted, and given an economic incentive to reduce their emissions. (Dippenaar, 2018)

Research has found that from a global perspective, non-tax incentives play a far more important role in the decision-making process for investment purposes compared to tax-related incentives. Although not as significant, tax incentives are still considered in the process. (Dippenaar, 2018)

A study was performed to determine the role of environmental tax incentives in the decision-making of South African businesses when investing in energy efficiency and renewable energy projects. A sample of companies were selected from South Africa's JSE Top 40 Index, companies who would have most likely invested in energy efficiency and renewable energy projects. According to the study, the main factor that drives South African businesses in respect of investment in energy efficiency and renewable energy projects, is the conservation of energy. Reducing its energy consumption will reduce the strain on the supply of electricity, is a cost saving for the business, and helps reduce the carbon footprint of the business. Similar to the global view, tax incentives do play a role in the decision-making process for investments, however it is non-tax factors that drive the decision for investments. (Dippenaar, 2018)

The role played by tax incentives still however, increase the attractiveness of the investment.

Another key finding from the study is that businesses feel that the compliance requirements for the energy efficiency allowance of section 12L and other energy efficiency and renewable energy allowances, are burdensome, and that government should reduce the requirements to make the allowances more attractive. This will encourage businesses to consider the allowance when investing in these types of projects, and will change their environmental behaviour. (Dippenaar, 2018)

National Treasury is intending to reform the existing environmental taxes and levies so that their coverage may be extended and their price signals strengthened. Government is also considering the introduction of other taxes that will address air pollution and climate change, encourage appropriate water consumption, decrease waste and encourage developments in waste management. (CDH, 2019)

3.3 Background to South Africa's Carbon Tax implementation

Climate change is a global crisis that requires initiative from all countries. In 1997, South Africa, along with some other countries, joined the UNFCCC to contribute towards the global cause of addressing the challenges caused by climate change. In 2002, South Africa endorsed the Kyoto Protocol to further strengthen its international response to climate change. (DEA, 2018)

South Africa then became a party to the Paris Agreement in December 2015, together with 194 other countries (DEA, 2018). The Paris Agreement is the first international agreement that commits all signatory countries to joint efforts against climate change. The Agreement obliges parties to undertake efforts to reduce their GHG emissions and meet their targets set out in their NDCs. (PMR, 2017)

South Africa's NDC requires that the country's GHG emissions 'peak in 2020 to 2025, plateau for a ten-year period from 2025 to 2035 and decline from 2036 onwards'. Carbon pricing policies such as carbon tax are being utilised globally to assist in the reduction of GHG emissions and to meet the required NDC targets. (National Treasury & SARS, 2019) Signatories to the Paris Agreement are required to communicate their NDCs to the UNFCCC every 5 years (DEA, 2018).

South Africa's National Treasury proposed that a carbon tax be implemented. The reason provided for the implementation of the tax was that climate change and the effects thereof are caused by GHG emissions, and the cost of these harmful emissions are not being paid for by emitters. These emissions impose an external cost to society, referred to as an 'externality' in economics. The costs being referred to here, is the pollution and the harmful effects of climate change caused by GHGs. These costs have not been factored into the prices of goods and services, and is regarded as a market failure, which can be corrected through pricing instruments such as carbon tax. By imposing a carbon tax, the cost of climate change will be reflected in the price of good and services, thereby correcting the market failure. The result of implementing the carbon tax is that emitters are held accountable for the negative impact which they cause to the environment. (Lloyd, 2011)

Implementing a carbon tax in South Africa was not an easy process. The implementation was first proposed in 2013 with an initial start date of January 2015. There was initial resistance to the tax being implemented, which led to numerous consultation and discussion sessions prior to its implementation. This resulted in the tax being delayed three times before it was finally implemented on 1 June 2019, making South Africa the first African country to introduce carbon tax. (WBG, 2019)

3.4 The Carbon Tax Act, 15 of 2019

South Africa's carbon tax is governed by the Carbon Tax Act, 15 of 2019 (the Carbon Tax Act) which came into effect from 01 June 2019. South Africa has followed a two-phased approach in the implementation of its carbon tax. The first phase of the Carbon Tax Act will be from 01 June 2019 to 31 December 2022, and the second phase from 2023 to 2030. The reason for the two-phased approach is to allow for the review of the effectiveness of the tax in reducing South Africa's GHG emissions in line with the country's NDC commitments. After the initial period of implementation of approximately 3 years, the impact of the tax will be reviewed and any changes to the carbon tax rates, tax-free allowances and tax coverage will be made prior to the implementation of the second phase of the Carbon Tax Act. The first phase of the Carbon Tax Act will only apply to scope 1 emissions which are direct GHG emissions from sources owned or controlled by the company, and will not have an impact on the price of electricity (National Treasury, 2019)

Section 2, the charging section of the Carbon Tax Act, imposes a carbon tax to be 'levied and collected for the benefit of the National Revenue Fund'. Section 3 stipulates that a person will be liable for the tax 'if that person conducts an activity in the Republic resulting in greenhouse gas emissions above the threshold determined by matching the activity listed in the column "Activity/ Sector" in Schedule 2 with the number in the corresponding line of the column "Threshold" of that table'. Therefore, any person that conducts an activity and emits GHGs above the threshold stipulated in Schedule 2, will be liable for carbon tax.

There are four sectors listed in Schedule 2, namely:

- the Energy sector,
- the Industrial processes and product use sector,
- the Agriculture, Forestry and other land use (AFOLU) sector, and
- the Waste sector.

The main thresholds per Schedule 2 relating to each of these sectors are as follows:

- 10 megawatts thermal or MW(th) – indicates that GHG emissions are required to be reported to the DEA where the total installed thermal capacity is equal to or exceeds 10MW(th) net heat input, and that these emissions are subject to carbon tax that is payable to SARS.
- None – indicates that the GHG emissions and activity data are required to be reported to the DEA regardless of the size of the GHG emissions and the scale of operation of the activity, and that these emissions are subject to carbon tax that is payable to SARS.
- N/A – indicates that no reporting of GHG emissions in respect of such activities is required, and that there is no liability for carbon tax. (National Treasury, 2018)

Tax Base

The 'Tax Base' refers to the GHG emissions that will be subjected to the tax.

The 'Tax Base' in terms of section 4(1) of the Carbon Tax Act states:

> The carbon tax must be levied in respect of the sum of the greenhouse gas emissions of a taxpayer in respect of a tax period expressed as the carbon dioxide equivalent of those greenhouse gas emissions resulting from fuel combustion and industrial processes, and fugitive emissions in accordance with the emission factors determined in accordance with a reporting methodology approved by the Department of Environmental Affairs.

The carbon tax applies to GHG emissions from all direct stationary and non-stationary sources, and the emissions can be categorised as follows:

- Fuel combustion emissions – includes emissions from fuel combustion activities,
- Fugitive emissions – refers to emissions that are mainly released from the extraction, production, processing and distribution of fossil fuels, including leaks from industrial plants and pipelines, and
- Industrial process emissions – includes emission of GHGs released from the consumption of carbonates, the use of fuels as feedstocks or carbon reductants, and emission of synthetic gases. (National Treasury, 2018)

The Intergovernmental Panel on Climate Change (IPCC) was 'established for the purposes of providing internationally co-ordinated scientific assessments of the magnitude, timing and potential environmental and socio-economic impact of climate change' (the Carbon Tax Act, 2019). South Africa's carbon tax addresses GHG emissions in accordance with the IPCC guidelines and offers a wide coverage of the tax by including all GHGs within the scope of the tax, namely, carbon dioxide, methane, nitrous oxide, perfluorocarbons, hydrofluorocarbons and sulphur hexafluoride. These gases are converted using emission factors and are expressed as carbon dioxide equivalents. The emission factors quantify the GHG emissions associated with a specific activity and can be found in Schedule 1 of the Carbon Tax Act, Table 1 for Fuel Combustion Emissions, Table 2 for Fugitive Emissions and Table 3 for Industrial Processes and Product Use Emissions. (National Treasury, 2018)

There are reporting requirements for taxpayers to account for their GHG emissions to both the DEA and SARS. It is advised that consistency is applied when submitting this information, and that companies use the same methodology when reporting on their emissions to both parties. (National Treasury, 2018)

The carbon tax applies to all sectors and activities except the AFOLU and waste sectors which are exempt from carbon tax during phase 1 of implementation. This is due to the complexities in measuring the emissions from these sectors. Furthermore, the carbon tax component will be included in the fuel tax regime in respect of GHG emissions from stationary and mobile sources using liquid fuels such as petrol and diesel. (National Treasury, 2018) The tax is therefore levied upfront rather than at the point of combustion, since the carbon content of these fuels can be easily determined (Kaineg, 2013). By taxing these sources upfront, the administrative burden for government to manage the compliance of the tax is therefore reduced (Haites, 2018).

In summary, the tax base is required to determine the company's carbon tax liability, and is the total of all GHG emissions expressed as the CO_2e of all scope 1 GHG emissions resulting from fuel combustion, industrial processes and fugitive emissions, excluding emissions from the AFOLU and waste sectors.

Tax Rate and Tax Liability

The initial carbon tax rate imposed by section 5 of the Carbon Tax Act is R120 per ton of carbon dioxide equivalent (tCO_2e) of the GHGs emitted by a taxpayer. This rate will increase annually by the rate of consumer price inflation plus two percent for the preceding tax period until 31 December 2022. Thereafter, the carbon tax rate is expected to increase annually only by the consumer price inflation rate. The intention for the design of the carbon tax rate was to provide certainty to taxpayers and to provide firms with a long-term price signal. Also, a modest carbon tax rate was determined to assist taxpayers with a smooth transition towards a low-carbon environment (National Treasury, 2018)

Section 6 of the Carbon Tax Act details the calculation of the amount of tax payable in accordance with the prescribed formula. In summary, the carbon tax liability is calculated as the tax base reduced by the tax-free allowances, multiplied by the carbon tax rate (National Treasury, 2018).

Tax-free Allowances

The Carbon Tax Act affords taxpayers with several tax-free allowances during phase 1 of the implementation of the tax, that reduces the headline carbon tax rate of R120 per tCO_2e to a much lower effective tax rate ranging from R6 to R48 per tCO_2e equivalent. The reason for allowing these tax-free allowances was to factor any potential adverse impacts on international competitiveness, and to provide current significant emitters sufficient time and resources to transition towards cleaner technologies by investing in energy efficient technologies and renewable energy sources. (National Treasury, 2018)

Part II of the Carbon Tax Act includes the provisions for the various tax-free allowances that are available to taxpayers. Reference can be made to Schedule 2 of the Carbon Tax Act to determine the percentages applicable.

The following tax-free allowances are available to taxpayers in terms of the Carbon Tax Act:

- Section 7 - A basic tax-free allowance of 60 percent for emissions from fuel combustion, except for transportation activities which qualifies for an allowance of 75 percent.
- Section 8 - A basic tax-free allowance of 70 percent for industrial process emissions.
- Section 9 - An additional allowance of 10 percent is provided to entities that generate fugitive emissions.
- Section 10 - Entities that are trade exposed and may be adversely impacted by international competitiveness due to the carbon tax, may be provided with an additional tax-free allowance of up to 10 percent. The percentage of allowance to the taxpayer is determined based on the

trade intensity of a product for a particular sector. The trade intensity is measured as the sum of the value of imports and exports divided by production.

- Section 11 - A performance allowance of up to 5 percent will be awarded to entities that voluntarily take actions to reduce their GHG emissions by implementing GHG mitigation measures. Entities that are below the agreed GHG emissions intensity benchmark will be provided with an additional allowance.
- Section 12 - Entities that participate in the carbon budget process developed by the DEA and voluntarily declare their emissions, will be awarded an additional 5 percent tax-free allowance referred to as a carbon budget system allowance.
- Section 13 - Carbon offsets used by firms to reduce their carbon tax liability will be provided with an offset allowance of up to 10 percent for fuel combustion emissions, and 5 percent for process and fugitive emissions.
- Section 14 - The maximum tax-free allowance is limited to 95 percent depending on the sector and activity. (National Treasury 2018)

Carbon Tax Administration

Entities are liable to make a carbon tax payment for each tax period. In terms of section 16 of the Carbon Tax Act, the initial tax period will be from 01 June 2019 to 31 December 2019. Subsequent tax periods will commence on 01 January each year until 31 December of that year. Section 17 of the Carbon Tax Act requires taxpayers to submit levy accounts and payments on an annual basis. The provisions relating to the administrative procedures for the collection of the carbon tax revenues by SARS, is contained in the Customs and Excise Act, 91 of 1964.

Adjustments relating to the design of the carbon tax will be reviewed approximately three years after implementation. The economic circumstances and progress made to reduce GHG emissions in line with NDC commitments will be considered during the review process. (National Treasury, 2018)

CHAPTER 4:
AN EMISSIONS TRADING SYSTEM (ETS)

4.1 What is an Emissions Trading System?

The two most popular market-based instruments used for placing a price on carbon and reducing GHG emissions are carbon taxes and Emission Trading Systems or Schemes (ETS) also referred to as cap-and-trade systems (National Treasury, 2010).

An ETS works by allocating allowances to a defined set of GHG emitters who are required to hold sufficient allowances to cover their emissions at the end of a compliance period. The allowances may be set for a particular country, sector or type of GHG. Should the entity not hold sufficient allowances to cover its emissions at the end of the compliance period, the entity will be penalised. (Burchell, du Toit & Tyler 2011: p.26)

There are three main methods used for allocating allowances under an ETS. The first method is referred to as 'grandfathering', a system whereby allowances are allocated based on historical emissions. A base year is chosen and allowances are allocated as a percentage of the chosen year's emissions. Grandfathering requires a high level of data for the regulator and is therefore administratively burdensome. It can be used initially to gain acceptance of a scheme; however, it should be replaced by an auctioning system not long after implementation. Allowance auctioning is the second method used for allocating allowances. Allowances are auctioned by the regulator and emitters bid for the allowances that they think they will require. The third method is to benchmark emissions against a sector best practice, and issue allowances against this best practice level. Allowance auctioning provides a net transfer of income from emitters to the regulator, whereas the grandfathering and benchmarking methods create wealth within the participants. (Burchell, du Toit & Tyler 2011: p.29)

The allowances that are allocated to the emitters are lower than the emission levels, therefore forcing emitters to either reduce their GHG emissions in line with their allocated allowance, or purchase additional allowances to cover the shortfall resulting from excessive emissions and avoid any penalties. Cost is regarded as the determining factor in driving the behaviour of emitters. If the cost for implementing GHG mitigating strategies to reduce its emissions is cost-efficient, then the emitter will incur these costs to reduce its emissions and to avoid penalties. In the case of where the cost is too high, the emitter will look at purchasing allowances from emitters, whose costs for implementing mitigating strategies are more cost-efficient, to cover the surplus of its emissions. (Burchell, du Toit & Tyler 2011: p.26)

An ETS is regarded as a 'hybrid instrument' since it has a regulatory component that provides certainty over emission reductions by quantifying the emissions that are permissible, and an economic aspect by establishing a market in which these allowances are traded between emitters. In this way emitters are encouraged to reduce their emissions or pay the price. The intention of an ETS is also to stimulate investment in carbon mitigating technologies, since emitters are incentivised to reduce their emissions and generate revenue by selling their surplus allowance. (Burchell, du Toit & Tyler 2011: p.26)

There is a third carbon pricing alternative referred to as an output-based pricing or a hybrid policy since it includes characteristics of both a carbon tax and an ETS. In terms of this policy, emitters are provided with emission intensity caps, and are permitted to purchase emission reduction credits to cover their excess emissions, similar to an ETS. Emitters can also choose to make a payment instead, of $15/ tCO_2e into a technology fund, similar to a carbon tax. This policy was implemented in Alberta, Canada and was applicable to large industrial emitters only, and a carbon tax was used for the smaller emitters. (Wood, 2018: p.3)

The hybrid policy is not included in the scope of this report and will therefore not be studied in further detail.

4.2 *Differences between a Carbon Tax and an ETS*

Carbon taxes and ETSs are commonly used around the world. However, both these instruments have advantages and disadvantages, and one may be more suitable for a particular country or economy than the other. Whilst carbon taxes aim at reducing GHG emissions by placing a direct price on emissions, ETSs seek to limit the quantity of GHG emissions allowed, and determine the carbon price through trade in allowances (National Treasury, 2010). This brings about a key difference between a carbon tax and an ETS - a carbon tax provides certainty over price, whereas an ETS provides certainty over the reduction in GHG emissions.

Figure 11 outlines the key differences between a carbon tax and an ETS.

	Carbon Tax	**ETS**
Price of carbon – certainty and efficiency gains	The price is fixed for a specified period, and the pricing policy caters for inflation. Possible efficiencies due to greater flexibility over the period in which to achieve emission reductions.	Uncertainty and volatility in price, that is dependent on initial and subsequent allowances granted. Possible inefficiencies due to the specified period to achieve emission reductions.
Environmental effectiveness – emission reductions	Uncertainty regarding achievable emission reductions.	Certainty over emission reductions due to the pre-determined emission caps or allowances.

	Carbon Tax	**ETS**
Coverage	May be applied to the whole economy, with possible exemptions for sensitive industries or sectors.	Usually applied to high emitters.
Administration and compliance	Easy to administer. Can make use of existing administrative systems, therefore reducing compliance costs.	New systems are required to effectively implement the scheme. Complexities around permit allocations and high transaction costs.
Visibility of tax	Calculation of the tax is explicit.	Pricing and costs cannot be easily determined.
Design	The tax base, tax rate, payment and collection of the tax, and mitigating measures need to be determined.	The scheme coverage, point of obligation and level of cap or allowances needs to determined.

Figure 11: Comparison of a Carbon Tax to an ETS
Source: National Treasury (2010)

Wood (2018: p.3) also studied the advantages and disadvantages of the different carbon pricing instruments, including carbon taxes and ETSs. There were seven comparative aspects that were considered for the study, namely, cost-effectiveness, price certainty, incentives for innovation, salience or visibility, capacity to generate revenue, impacts on competitiveness and emissions leakage, and administrative requirements.

Based on Wood's (2018: p.5) findings, both carbon taxes and ETSs are considered to be cost-effective, allowing emitters of GHGs to decide the extent of which they can reduce their emissions and the cost that they are willing to pay. Under the carbon tax, an emitter will reduce its emissions until it becomes more expensive to reduce its emissions than to pay the tax. Similarly, with an ETS, an emitter will purchase allowances from the market if the cost to reduce its emissions is exceeded by the cost to purchase allowances from the market. In both instances, the wider the coverage of the carbon pricing policy, the more cost-effective the policy becomes.

The advantages that were identified by Wood (2018: p.7, 10 - 12) of a carbon tax included certainty over the carbon price, lower administration costs and the ability for the tax to raise substantial amounts of revenue for government. A major advantage of the ETS compared to carbon tax is that, allowances can be allocated in a way that reduces the negative impacts to competitiveness, and reduces potential emissions leakage. Emissions leakage is caused by emitters relocating their businesses from one jurisdiction to another, to escape the carbon pricing burden. In this way, the emissions for the jurisdiction with a carbon pricing is reduced, and the emissions of another jurisdiction is increased.

Wood (2018: p.9) also agreed that the carbon tax provided more salience or visibility than the ETS. Some studies suggest that the salience of carbon tax has led to higher reductions in emissions. However, there is some debate on whether being more or less transparent is preferred. The carbon pricing of an ETS is less transparent since the carbon price is included in the market price. On the other hand, the high visibility of the carbon tax may lead to resistance from emitters and political parties when carbon prices need to be increased to achieve emission reduction targets.

Wood (2018: p.12 - 13) concluded that there are two main factors that need to be considered when deciding which carbon pricing policy is a better option for a particular jurisdiction. The economy of the country and its emissions profile must be considered when deciding which policy to implement. If there is a low risk for emissions leakage, then it is better for that jurisdiction to adopt a carbon tax. Whereas, if there is a large part of the economy that is carbon-intensive and trade exposed, then an ETS would be a more suitable carbon pricing policy option for that jurisdiction.

4.3 Assessing the suitability of an ETS for South Africa

Lessons learned from carbon pricing policies

According to the article written by Haites (2018), both carbon taxes and ETSs are gaining popularity across the globe, with an increasing use of ETSs rather than carbon taxes being noted. Both carbon taxes and ETSs have resulted in a decline in GHG emissions. With regards to carbon tax, it is likely that other mitigating policies (that have been implemented with the tax) have contributed more to the decline in emissions than the carbon tax itself. Whereas with an ETS, is it unclear to what extent other mitigating policies have contributed to the decline in emissions.

Many European countries have implemented both a carbon tax and an ETS that target different emission sources. There are studies that suggest that it may be more effective to use a combination of carbon pricing instruments rather than choosing the better alternative. However, the use of a combination of these instruments increases the compliance costs and creates complexities. Further research is required to identify the 'composition of effective policy portfolios' to reduce GHG emissions. (Haites, 2018)

According to Haites (2018), the design of ETSs are being developed based on experiences whereas carbon taxes have had almost no change to its design over the years. This is evidenced by a more stable pricing environment being provided for by ETSs by specifying reductions in emission caps for periods of three to eight years in its regulations. Whereas, carbon tax rates are usually specified for a three to five-year period, with little indication of what the future tax rates will be.

It is important to bear in mind that the above findings are mainly based on European experiences that are far more developed than South Africa. Therefore, although an ETS might seem as a better alternative, it might not be the better option for South Africa.

Implementation of an ETS in South Africa

The design of an ETS is critical for the success of the instrument. For the instrument to be most cost-effective, a substantial amount of information and certainty is required, necessitating extensive planning and research for the design and management of the instrument. The greater the level of uncertainty and gaps in information, the more complex the design of the ETS becomes, to prevent abuse of the instrument in the market. If sufficient information and certainty is available, an ETS can work well in the energy sector for South Africa. There are however limitations for the ETS to work in the transportation sector, suggesting that alternative mechanisms such as a carbon tax can be used for this sector, which will mean that a hybrid policy needs to be implemented. It is important to note that obtaining sufficient data and certainty is a difficult and lengthy process, especially for a developing country like South Africa which has a shortage of resources in the public sector. (Burchell, du Toit & Tyler 2011: p.28 - 39)

There is a strong argument that in the situation where there is insufficient information and high levels of uncertainty, a carbon tax instrument is more efficient than an ETS (Burchell, du Toit & Tyler 2011: p.28 - 39).

National Treasury, in its Discussion Paper, '*Reducing Greenhouse Gas Emissions: The Carbon Tax Option'* (2010), provided reasons for why an ETS will not be a suitable option for South Africa:

- The administrative complexity of a cap-and-trade system.
- The uncertain environmental outcomes of some current regional emissions trading systems.
- The windfall gains experienced by some stakeholders.
- The uncertain economic costs to business.
- The controversy associated with setting specific targets.

National Treasury (2010) reasoned that for a developing country such as South Africa to implement an ETS, an adequate policy and infrastructure will need to be developed, to ensure transparency in the market, and for the measuring, reporting and verification of emissions. South Africa is not equipped to develop such a policy and infrastructure within the short timeframe, therefore implementing an ETS was not considered suitable in the short term. National Treasury also highlighted the advantage of efficiency gains under the carbon tax policy, and its ability to generate an additional source of revenue for government which can be used to reduce other taxes. Although the carbon tax doesn't provide certainty over the quantity of emissions reduced, National Treasury argued that behavioural changes can be achieved by setting the rate at an appropriate level, and then adjusting the rate over time to achieve the desired rate that will send a strong price signal to consumers and producers to reduce emissions.

Based on the comparison provided by National Treasury (2010), and the studies completed by Haites (2018), Wood (2018), and Burchell, du Toit & Tyler (2011), a carbon tax seems to be a more suitable alternative than an ETS for South Africa, that is still a developing country. Although ETSs are proven to also assist in reducing GHG emissions, they are difficult to implement, maintain and administer. The less technical design requirements, low administrative burden costs and fewer compliance requirements of a carbon tax are therefore more suitable for South Africa. Carbon taxes also offer wider coverage, and provides greater certainty over price which is crucial for South Africa's unstable economy. Furthermore, carbon taxes create an additional source of revenue for government that can be utilised in many ways, and will be discussed in Chapter 7.

The risk of emissions leakage due to a carbon tax implementation is sufficiently minimised by South Africa's implementation of tax relief measures such as tax-free allowances, that result in a low effective tax rate and allows taxpayers the opportunity to transition towards a low-carbon environment. Studies also suggest that the use of other mitigating policies in combination with a carbon tax, yields a higher reduction in emissions. South Africa provides taxpayers with several tax deductions relating to energy efficiencies as discussed in Chapter 3, that can be utilised to ease the burden of the carbon tax and can assist in reducing GHG emissions.

CHAPTER 5:
GLOBAL TREND ANALYSIS OF CARBON PRICING INSTRUMENTS

The design of a carbon pricing policy is the most critical aspect of implementation since it will determine whether the policy is effective or not. During the design process, it is important to study the policies of other jurisdictions and their performance. This will act as a guiding tool since it will provide key insight to the design of different polices. From this process, we understand ways in which to design a policy that is most effective. We also learn about things that we should avoid, that could result in the failure of the policy that is implemented.

5.1 Is South Africa's Carbon Tax rate too low?

As of 01 April 2019, 57 carbon pricing initiatives had been implemented or were to be implemented, consisting of 28 ETSs and 29 carbon taxes, implemented at national and subnational levels (Figure 12). These implementations are expected to cover 11 $GtCO_2e$ or approximately 20 percent of GHG emissions. (WBG, 2019)

Carbon prices vary significantly across the globe, from less than US$1/$tCO_2e$ in countries such as Mexico, Poland and Ukraine to US$127/$tCO_2e$ in Sweden. Not many countries increased the carbon tax rate in 2019, except for Portugal, whose carbon tax rate nearly doubled from US$8.5/$tCO_2e$ to US$14.31/$tCO_2e$ due to its rate being linked to the European Union Allowance, and Iceland, whose carbon tax rate increased by 10 percent. Due to social protests, carbon tax rate increases were halted in France. On the other hand, the price of many ETSs increased due to the strengthened trust and increased stringency of the policy. (WBG, 2019)

According to the WBG (2019) report, the carbon prices of most jurisdictions are below the level required to meet the commitments as per the Paris Agreement. Per Figure 13, the recommended carbon price should be in the range of at least US$40 - 80/$tCO_2e$ by 2020, and US$50 - 100/$tCO_2e$ by 2030 to achieve the temperature goals set out in the Paris Agreement. Less than 5 percent of carbon price initiatives is line with the recommended prices. The WBG (2019) reiterates the point that the effectiveness of carbon pricing in reducing GHG emissions is dependent on the policy environment, and that having a suite of complementary policies will assist in achieving the temperature goals of the Paris Agreement. (WBG, 2019)

In respect of carbon pricing revenue, more than US$44 billion was raised in 2018 through carbon pricing policies, an increase of approximately US$11 billion from the previous year (WBG, 2019). The effective ways in utilising revenues generated from carbon pricing, and the concept of 'revenue recycling' will be discussed in Chapter 7.

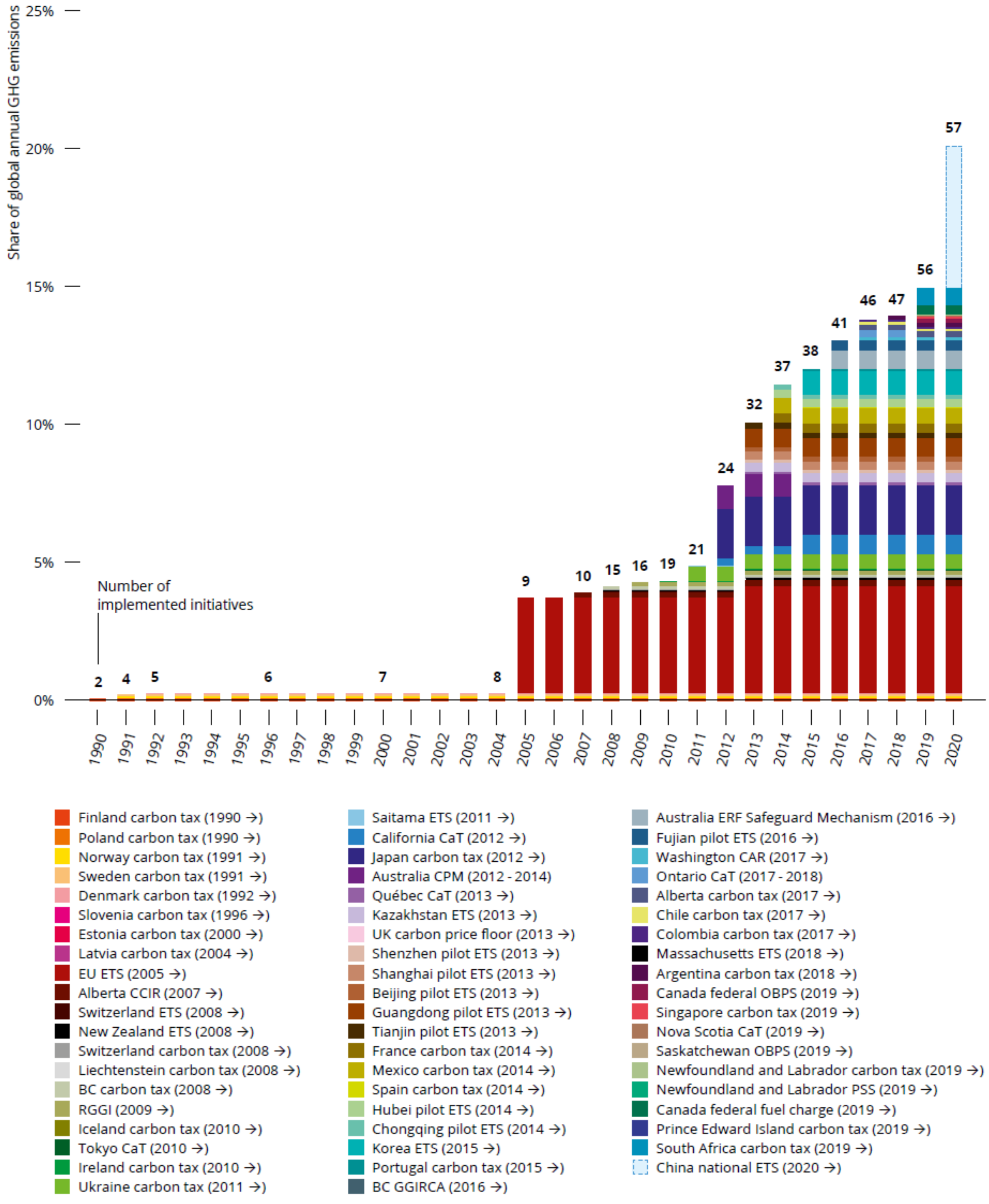

Figure 12: Regional, national and subnational carbon pricing initiatives: share of global emissions
Source: WBG (2019)

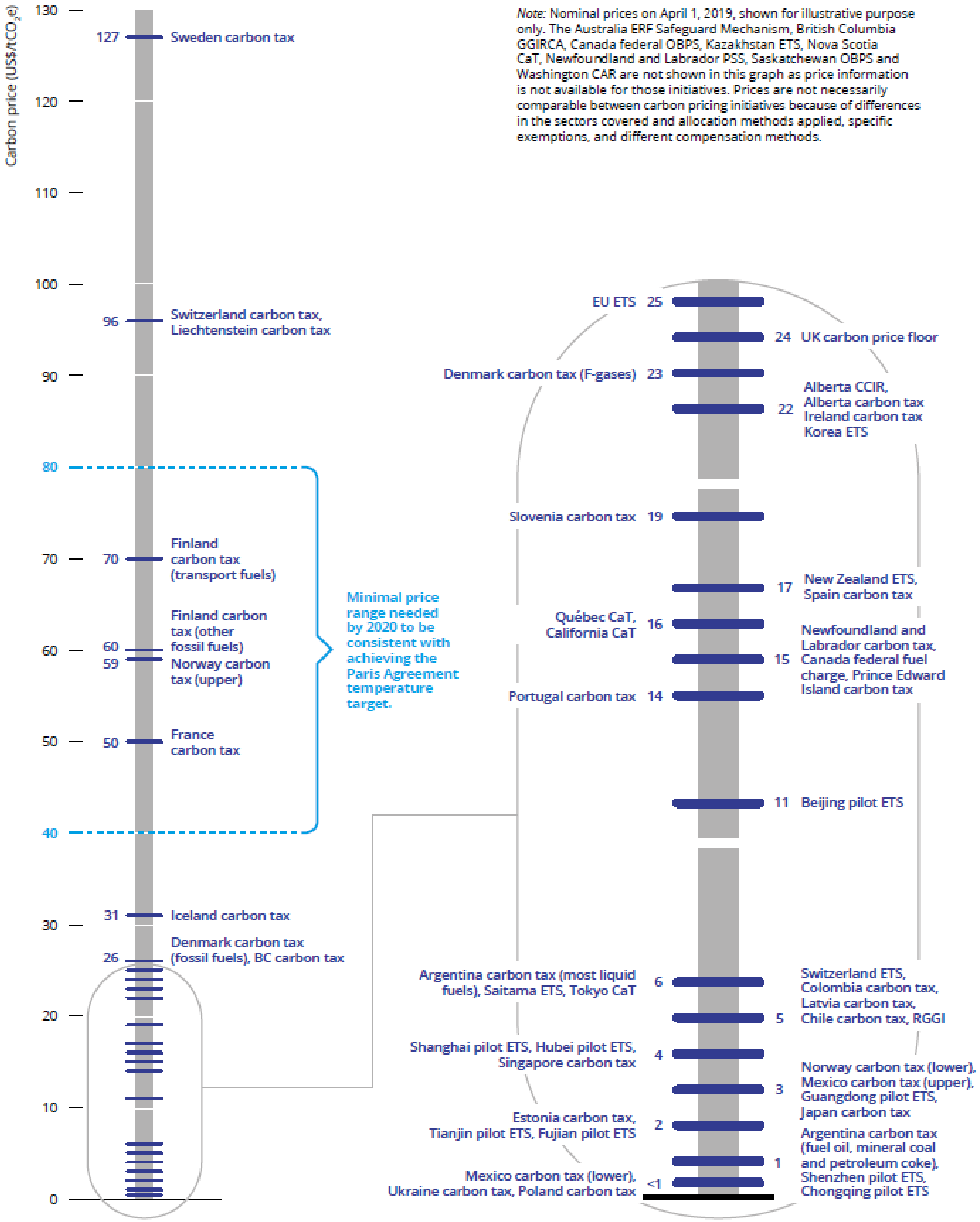

Figure 13: Prices in carbon pricing initiatives implemented worldwide

Source: WBG (2019)

One of the major concerns regarding South Africa's carbon tax implementation is that the carbon tax rate is too low. Stakeholders are concerned that by implementing such a low rate, the magnitude of the risks is not effectively communicated, and that the tax will fail to promote the change in behaviour required to reduce the level of GHGs emitted. National Treasury argued that the reason for the low carbon tax rate, is to provide the relevant industries with the time and flexibility required to make structural changes in their businesses to transition to a low carbon environment. (National Treasury & SARS, 2019)

South Africa's initial carbon tax rate was implemented at R120/tCO_2e, or US$8/t$CO_2$e. However, due to tax-free allowances, the effective carbon tax rate is significantly lower, and ranges between R6 to R48 per tCO_2e, or US$0.4 – 3.2/t$CO_2$e. The suggested rate in the WBG (2019) report to effectively reduce emissions to achieve the set targets, ranges between US$40 - 80/t$CO_2$e by 2020.[8] South Africa's carbon tax rate is expected to increase by the inflation rate plus 2 percent for the first 3 years, and thereafter inflation only.

The above rates indicate that South Africa's carbon tax rate is far from the suggested range. National Treasury is expected to review the performance of the carbon tax, and make further carbon tax rate adjustments after the initial phase of implementation. If a similarly low pattern in the rate continues, it is unlikely that South Africa will achieve the necessary targets.

The Carbon Tax Guide suggests that it is not uncommon for jurisdictions to start at a much lower carbon tax rate, and increase the rate gradually over time. However, for the tax to remain effective, the correct balance must be determined. Per the Carbon Tax Guide (PMR, 2017) the following key considerations are provided when determining a suitable carbon tax rate:

- While existing carbon taxes vary widely across jurisdictions, the vast majority have begun at a relatively low level and gradually increased over time. This approach allows liable entities – and the economy as a whole – to adjust to the tax, and provides time to invest in mitigation strategies.
- At the same time, setting the rate low initially, without having a trajectory or mechanism in place for raising it in the short to medium term, creates the risk of the low rate being locked in, thereby severely limiting the environmental effectiveness of the tax.
- In choosing the right approach to adjusting the tax rate over time, policy makers must balance the need to provide stability and predictability to investors with the desire to retain some flexibility to be able to take into account changing circumstances.

British Columbia and Sweden have followed a similar approach in their implementation of a carbon tax, by starting at a low rate and progressively increasing it over time. Experiences such as in these jurisdictions suggest that the progressive introduction of carbon taxes allows firms and households to adapt to the higher energy prices, increasing the political and social support for the tax. Phased taxes

[8] MBH Media, Inc. (n.d.). 'South African Rands (ZAR) per US Dollar (USD)'. Available at: https://www.exchange-rates.org/history/ZAR/USD/G/M [Accessed on: 27 August 2019].
Translated at R15/US$ - the average South African Rand per United States Dollar rate as at 27 August 2019.

can increase investment in 'long-lived, low-carbon infrastructure', allowing firms the time to introduce new technologies that are environmentally friendly. In the case of British Columbia, the initial carbon tax rate was low, however, the legislation permitted annual tax increases which allowed government to increase the carbon tax rate with little political resistance. This meant that the province could move to more stringent prices with little opposition because the increases were clear and anticipated. Furthermore, the expectation of progressively increasing prices provided an incentive to invest in cleaner technologies. (OECD & WBG, 2015)

Figure 14 depicts the development of Sweden's carbon tax rate over time.

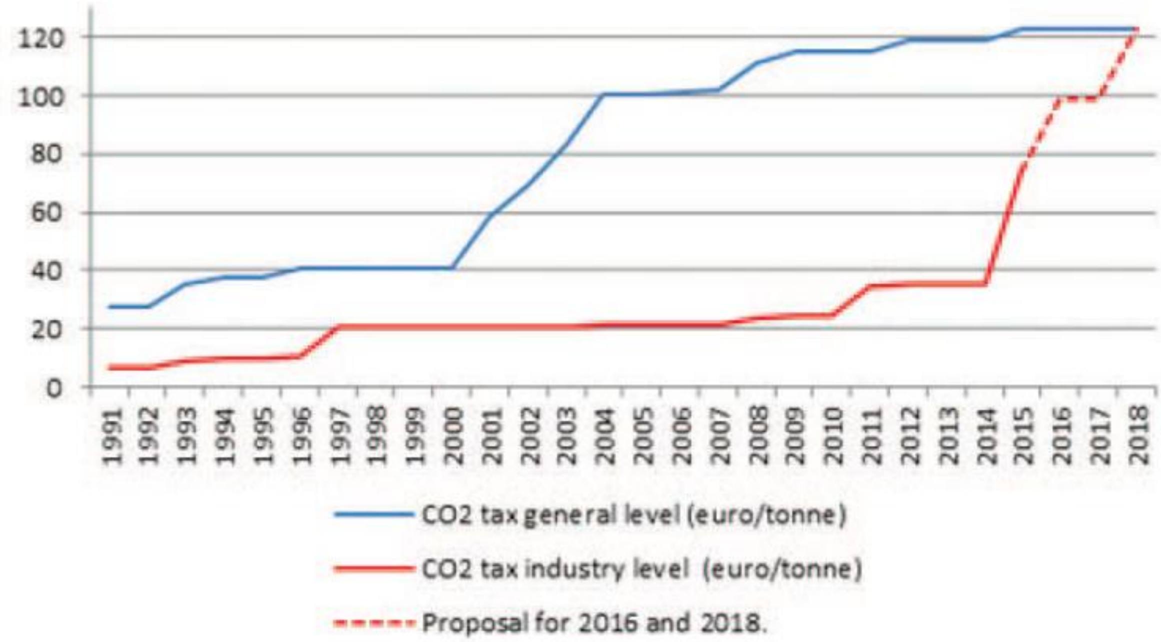

Figure 14: Development of Sweden's carbon tax rate over time
Source: OECD & WBG (2015)

A study by Dorband et al. (2018) also suggests that introducing carbon prices at very low levels and increasing the price over time is more feasible than starting with very high prices. Higher carbon prices will have stronger implications for behavioural changes and investments in cleaner technologies, but will require a more sophisticated approach.

Stakeholders are correct in arguing that South Africa's carbon tax rate is relatively low when compared to other jurisdictions and the recommended carbon tax range. However, it is not uncommon for a jurisdiction to initially implement the tax at a much lower rate, and then gradually increase the rate over time. Also, given South Africa's volatile economy and high levels of poverty, it is understandable that the tax was introduced at a low rate to assist businesses with the transition, and assist households with the burden of higher costs. However, to ensure that the tax remains effective in reducing emissions, that it stimulates behavioural changes and promotes investments in new technologies, the rate should be revised in subsequent years to better reflect the true cost of emissions.

5.2 How some countries are addressing global warming and climate change

<u>Sweden's success with a carbon tax implementation</u>

Per Figure 12, Finland and Poland were the first countries to have implemented a carbon tax, as early as 1990. Norway and Sweden followed with a carbon tax implementation in 1991. One of the most notable attributes of Sweden's carbon tax implementation is its high success rate in reducing GHG emissions, without negatively impacting the economic growth of the country.

Sweden introduced a carbon tax in 1991 on all major fossil fuels at a rate equivalent to €27/tCO_2e. The introduction of a carbon tax led to the energy tax rates being reduced by 50 percent. The carbon tax rate was gradually increased over time. The gradual increase in the carbon tax rate allowed households and businesses the time to adapt, and improved the political acceptability of the tax. To avoid the increase in the overall level of taxation, the increase in energy and carbon tax rates was combined with a reduction of other taxes. This was done to avoid any unwanted distributional effects and to stimulate job growth. (Criqui, Jaccard & Sterner, 2019)

Initially, trade-exposed sectors were taxed at a much lower rate than households or were temporarily exempt from the tax, to allow these businesses time to adjust and to prevent 'carbon leakage' (discussed in Chapter 6). Given that these businesses have had sufficient time to adapt, the lower tax rates have been abolished and the exemptions removed. The only major exemption to Sweden's carbon tax are those industries that fall within the ambit of the European Union's ETS. Sweden was obliged to remove the carbon tax from these industries since it conflicts with the European Union's principle against double taxation. (Criqui *et al.* 2019)

Prior to the implementation of a carbon tax, Sweden's primary energy source was oil, a non-renewable energy source. In the 1970s, Sweden launched a nuclear program with 12 reactors. Eight of these reactors are still being utilised today, and contribute 35 – 40 percent of Sweden's electricity production. Over the years, Sweden has also invested in biomass energy, which now provides 12 million tonnes of oil equivalent. Hydro-energy production has remained stable over the years, and wind-solar energy has seen some development since 2012. The introduction of carbon tax incentivised the transition towards renewable energy sources, reducing the consumption of oil from 61 percent to only 28 percent in 2017. The significant decrease in oil consumption explains the decrease in emissions noted in Figure 15. (Criqui *et al.* 2019)

During the period 1990 – 2010, Sweden experienced an 8 percent reduction in its GHG emissions, while at the same time increasing its economy by 51 percent (Criqui *et al.* 2019). Figure 15 evidences that this trend continued after 2010, emission levels continued to drop, and the growth in economy was sustained.

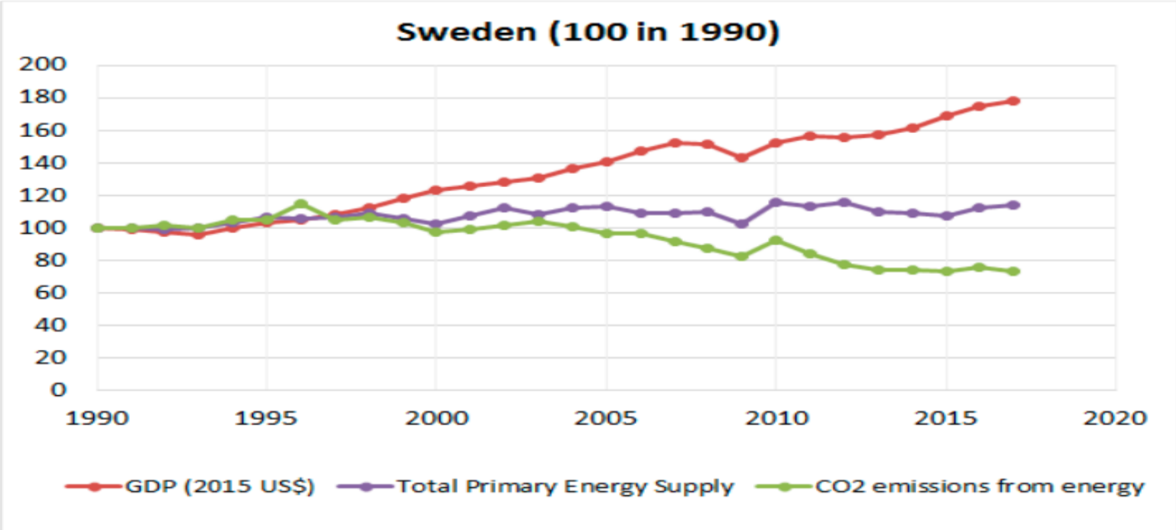

Figure 15: GDP and energy-related CO_2 emissions
Source: Criqui, Jaccard & Sterner (2019)

Sweden does not earmark carbon tax revenues for a specific purpose, instead it is allocated to the general budget and its use is determined in the annual budget process. Over the years, the use of biofuels has increased, reducing the consumption of oil as an energy source. Due to the effectiveness of the tax, the tax base has eroded over time resulting in lower carbon tax revenues being generated today. (Criqui *et al.* 2019)

Success factors from Sweden's carbon tax implementation noted in the article by Criqui et al. (2019):

- 'One striking aspect that emerges is that confidence in government and in its ability to manage fiscal revenues in a transparent, just, and effective way is key for the acceptability of environmental policies based on taxation'.

  One of the key success factors identified in Sweden's implementation of the carbon tax is said to be the high confidence in its political system, which increases the acceptability of the tax. Social inequalities, and the lack of confidence in the government can lead to strong opposition to the tax, and is therefore crucial to address when introducing new taxes.

- Carbon taxes should not be applied in isolation. The combination of a carbon tax with other policies can lead to a successful implementation of the carbon tax.

  Prior to the implementation of the carbon tax, Sweden had already introduced other policies and measures to reduce its emissions such as the energy tax, and the nuclear energy investment. These mechanisms continued even after the carbon tax was implemented.

- It is important to identify the impact of a carbon tax on households and businesses, and to mitigate the risks that are identified.

  Sweden applied lower carbon tax rates or exempted certain trade-exposed sectors from the tax, to allow these businesses time to adjust. It is important to note that these allowances were temporary and have now been removed. Sweden's carbon tax rates are now similar for most sectors of the economy.

- Effective utilisation of carbon tax revenues will enhance the confidence in government, and increase the acceptability of the tax.

  Sweden's experience evidences that direct revenue recycling does not need to be a precondition for acceptability of the tax. Its approach to utilising carbon tax revenues was to not earmark carbon tax revenues for a specific purpose, instead it was used for general government expenditure and was allocated in the annual budget process.

India – a pioneer for renewable-energy production

India is the world's second largest consumer of coal, and is ranked the third largest emitter of GHGs. Its GHG emissions measured in 2015 amounted to 3 571 mtCO_2e. Emissions have increased three-fold since 1970. India's major sources of emissions include coal power plants, rice paddies and cattle. The melting of the Himalayan glaciers and the monsoon weather, makes India highly vulnerable to climate change. (Timperley, 2019a)

Figure 16 evidences India's high reliability on non-renewable energy sources such as coal and oil. Its reliance on coal as a primary source of energy has increased exponentially since 1990. In 2017, 76 percent of India's electricity was being generated from coal (Timperley, 2019a). In recent years, India has experienced growth in energy from renewable energy sources such as hydro, wind, solar and geothermal sources.

India has shown its commitment to moving away from fossil fuel sources of energy and moving towards renewable energy sources by ratifying the Paris Agreement. India has submitted a pledge for a 33 - 35% reduction in its GHG emissions per unit of economic output by 2030, compared to 2005 levels. India's climate pledge, or NDC, is in line with the goal set out in the Paris Agreement, of limiting the increase in global temperatures to well below 2 degrees Celsius. (Timperley, 2019a)

Although India does not explicitly have a carbon tax or ETS in place to reduce its GHG emissions, it does have other carbon pricing policies to promote energy efficiency and growth in renewable energy.

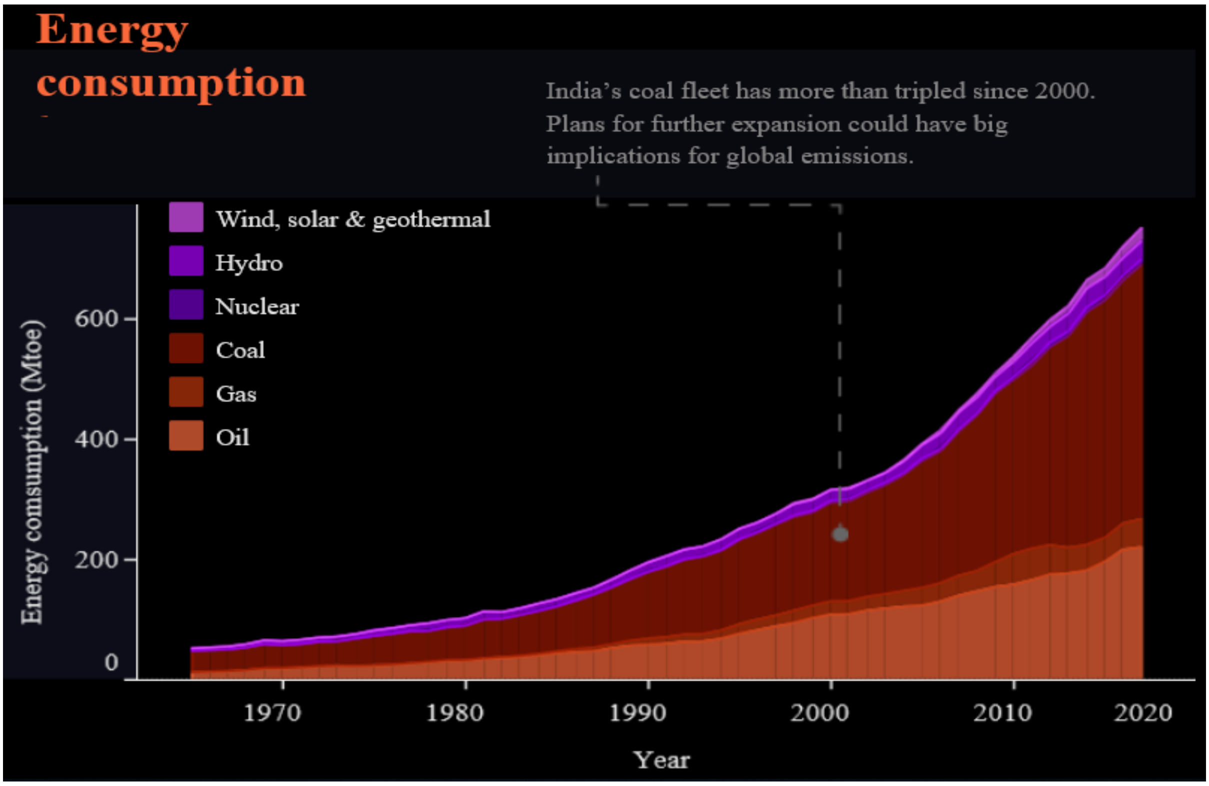

Figure 16: India's energy consumption by source

Source: Timperley (2019a)

According to a survey conducted in 2014 – 2015, India's economic and energy policy is moving from a carbon-subsidising regime to a carbon-taxation regime. The following are some of the initiatives undertaken by India to promote energy efficiency and to encourage investment in renewable energy projects:

- The National Clean Environment Cess, a tax that places a price on carbon, was introduced in 2010. The National Clean Environment Cess levies a tax on power producers that purchase or import coal for energy production. The tax is levied at approximately US$6 per ton of coal purchased or imported by power producers, and has increased eightfold since being introduced in 2010.

- Carbon pricing on petroleum products. In 2015, the carbon price for petrol and diesel was $140 and $64 per metric ton of CO_2, respectively.

- 'Perform Achieve and Trade' is a regulatory measure that aims to promote energy efficiency. This measure requires energy-intensive industries to reduce their energy consumption. The company will be penalised for failing to comply with the regulation.

- 'Renewable Purchase Obligation' imposes an obligation on some entities to either buy electricity generated from green sources, or to purchase renewable energy certificates from the market. This initiative aims at growing renewable-energy production, and is targeted at electricity distribution companies, and large consumers of electricity.

- Many companies in India have also adopted internal carbon pricing. An internal carbon price is defined as, 'a value that companies set in order to internalise the economic cost of GHG emissions associated with their business activities.' The main driver cited for adopting an internal carbon price is to manage the company's risk exposure, and protect the company against future regulations and associated costs. (Adhia & Gajjar, 2018)

To transition towards a low-carbon environment, India has committed to generating at least 40 percent of its electricity from renewable or nuclear energy sources by 2030. It also aims at growing more trees that can absorb carbon emissions, and assist in reducing the country's emissions by 2 500 - 3 000 mtCO_2e by 2030. India's pledge is heavily reliant on climate finance, technology finance and capacity building, and is expected to require at least $2.5 trillion up to 2030, from domestic and international funding. (Timperley, 2019a)

Since 2005, India's CO2 emissions have doubled due to the rapid expansion of coal use in the country, mainly used for electricity generation. However, in the first eight months of 2019, emissions only increased by 2 percent, the lowest increase noted since 2001. This was due to a surge in electricity generated from renewable energy sources, reducing the amount of coal-generated electricity. Wind, solar and hydro energy contributed 70 percent of the increase in electricity demand for 2019. India has a current target of 175 GW capacity from renewable energy sources by 2022, and a further target of 450 GW in future. Its current capacity from wind, solar and biomass is approximately 74 GW. (Myllyvirta, 2019)

According to an article by Sinha (2020), India has one of the world's largest clean-energy expansion programmes, and is among the top 5 clean-energy producers in the world. Its renewable energy sector has grown exponentially in the last 5 years, at an annual growth rate of 17.5 percent between 2014 and 2019, and from a 6 to a 10 percent share in total energy mix.

India's growth in the renewable energy sector is funded by both domestic and foreign sources. Several steps have been taken to encourage foreign investment, including, its commitment to promoting green-technologies and declaring an aggressive target of 450 GW from renewable energy sources. This is backed up by 'strengthening macroeconomic fundamentals, ensuring policy stability and introducing several fiscal incentives', including tax incentives to invest in green technologies. India's renewable market is huge and well diversified in terms of the location of its projects. This assists in lowering investors' perception of risk, and further encourages investment. (Sinha, 2020)

India is similar to South Africa in that, it is also a developing country, it is heavily reliant on coal as a primary source of energy, and that the energy sector contributes a large percentage of its emissions.

To curb its emissions, India did not explicitly implement a carbon tax or ETS, but have instead introduced other carbon pricing policies, and policies to encourage investment in renewable energy. Many businesses are also realising the risks of climate change, and have taken a proactive approach by adopting an internal carbon price for their business. Moving away from fossil-based energy production to renewable energy sources, is key to achieving emission reductions. India is capitalising on this, and is using domestic and foreign sources of capital to develop its renewable energy sources, to reduce its emissions and achieve its climate goals.

Why carbon tax was repealed in Australia

In 2015, Australia was ranked the 15^{th} largest GHG emitter in the world. The country is highly vulnerable to climate change, including extreme heat, drought and bushfires, conditions that the country is already experiencing today. (Timperley, 2019b)

Australia is the world's second largest exporter of coal. In 2017, 61 percent of Australia's electricity was coal-generated, contributing one-third of the country's GHG emissions. Over the past decade, Australia's energy from renewable sources such as wind and solar, has grown rapidly, contributing 10 percent of Australia's electricity in 2017. Hydropower contributed approximately 5 percent towards Australia's energy profile, bringing the total renewable energy source to 15 percent. (Timperley, 2019b)

In July 2012, Australia introduced a carbon tax. There were also proposals to convert the tax to a more flexible ETS by mid-2015. However, by July 2014, the carbon tax, together with any proposals for an ETS, were repealed. The repeal of the carbon tax was considered a major setback for Australia achieving its climate goals. A climate economist commented, 'An economically sensible policy framework is being discarded and there is nothing adequate to replace it.' (Schiermeier, 2014)

The tax was levied at approximately Aus\$24/tCO_2e, led to a 5 percent reduction in emissions from the power sector, and generated Aus\$6.6 billion (US\$6.2 billion) in carbon tax revenue. However, critics argued that the tax resulted in increased costs of electricity for consumers, and that by abolishing the tax, the cost of living could be reduced by approximately Aus\$550 per household per year. (Schiermeier, 2014)

Climate change is a major political issue for Australia, that has led to several of the changes of prime ministers in recent years (Timperley, 2019b). Similarly, the abolishment of the carbon tax was used as a key commitment in Prime Minister Tony Abbott's election campaign. Tony Abbott described the tax as a 'useless, destructive tax', and abolished the tax upon gaining victory in his election campaign. (Schiermeier, 2014)

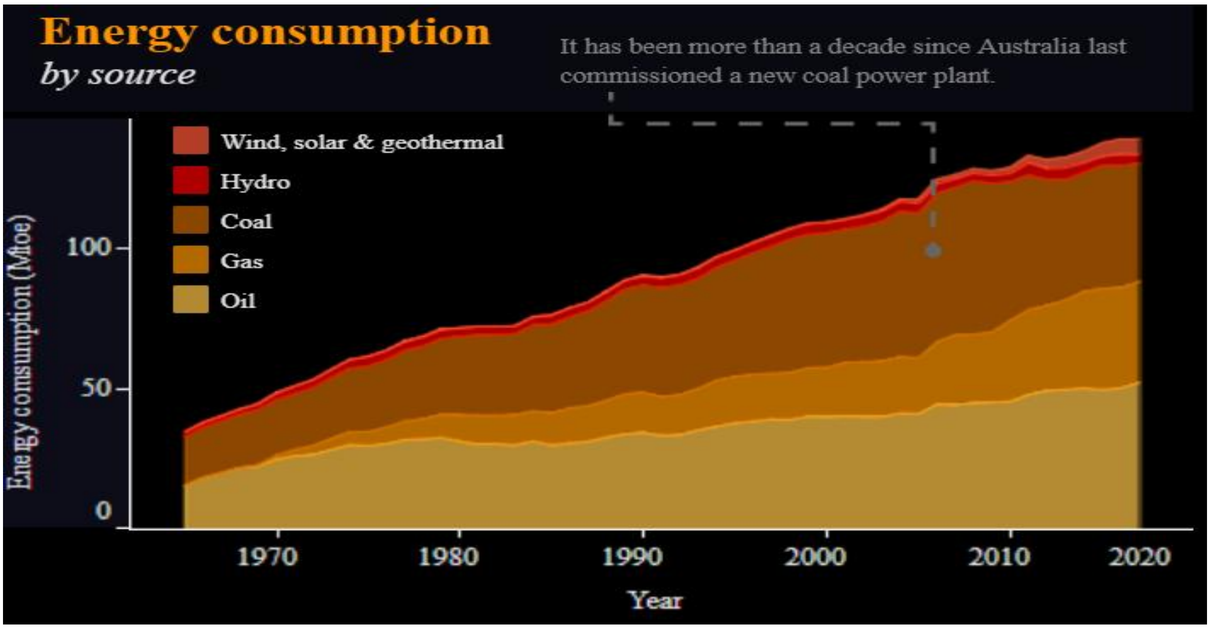

Figure 17: Australia's energy consumption by source
Source: Timperley (2019b)

In 2015, Australia submitted its climate pledge, a commitment to reduce its emissions by 26 – 28 percent by 2030 compared to 2005 levels. The main policy being used by Australia to achieve its climate goal, is its Emissions Reduction Fund, now known as the 'Climate Solutions Fund', and a scheme to generate 23 percent of its electricity from renewable energy sources by 2020. (Timperley, 2019b) The Climate Solutions Fund aims at offering financial incentives to companies to increase their energy efficiency (Schiermeier, 2014).

The Climate Solutions Fund is failing to significantly contribute to reducing Australia's emissions. There have been fewer emissions abatements contracted, and funding for certain projects have been discontinued for failing to meet abatements. (Climate Action Tracker, 2019) The policy is also regarded as being more costly, and less effective than an ETS (Schiermeier, 2014).

Based on Australia's current trajectory, it is off track on its pledge to reduce emissions by 26-28 percent by 2030 compared to 2005 levels. Australia's climate policies are considered inadequate and will not achieve the climate goals of the Paris Agreement. According to Climate Action Tracker, Australia's pledge is also insufficient for achieving the target of limiting the increase in global temperatures to well below 2 degrees Celsius. (Timperley, 2019b)

Australia's carbon tax implementation highlights:

- the significance of achieving political acceptability for the tax,
- understanding the unintended, distributional impact that the tax can have on the public, and
- identifying ways to mitigate the negative consequences of the tax.

One of the key contributors for the successful implementation of a carbon tax, or any other carbon pricing policy, is gaining public acceptance for the tax. Political acceptance is also important so that it is not used in electoral campaigns to sway voters, and ensures that the tax survives during changes in leadership.

CHAPTER 6:

UNDERSTANDING THE SOCIO-ECONOMIC IMPACT

The previous chapters indicated that carbon pricing is one of the most effective tools that can be used to assist jurisdictions in reducing their GHG emissions. By setting the correct price signal for emitting GHGs, emitters are encouraged to transition from a carbon-intensive environment to a low-carbon environment (CPLC, 2016b). However, the implementation of a carbon pricing instrument such as a carbon tax may have an adverse impact on a jurisdiction's economy and social welfare. This chapter aims at understanding the possible socio-economic impacts that can result through the implementation of a carbon tax.

6.1 The impact on economic growth

As mentioned above, one of the advantages of implementing a carbon tax is that it encourages the transition towards newer technologies that are less carbon intensive, in that way reducing GHG emissions. Newer technologies usually mean enhancements to productivity, that can lead to competitive advantages and economic gains for the business. The disadvantage of implementing a carbon tax is that it may have a negative impact on the competitiveness of the business or industry, which can lead to carbon leakage. (CPLC, 2016b)

Businesses that are energy-intensive and trade exposed are particularly at risk of being impacted by competitiveness issues. This is due to limitations that exist in reducing their GHG emissions owing to the nature of their products, and the processes used to manufacture these products. (CPLC, 2016b)

Although many jurisdictions are realising the value of implementing a carbon pricing instrument as evidenced by the increasing number of carbon pricing instruments that are being implemented across the globe, there are still a number of jurisdictions that exist without a carbon pricing instrument. This means that businesses operating in jurisdictions that have implemented a carbon pricing instrument are subjected to higher costs and lower profits compared to jurisdictions that do not have a carbon pricing instrument in place. To escape the additional cost, businesses may be tempted to relocate their operations to jurisdictions with less stringent, or no carbon pricing instrument in place. The transfer of emissions from one jurisdiction to another is referred to as carbon leakage. (CPLC, 2016b)

According to the article by CPLC (2016b), there is not much evidence that supports the occurrence of carbon leakage. However, the risk still exists, and necessary precautions must be taken to mitigate the risk from occurring. It is important to carefully consider the impact on competitiveness and the risk of carbon leakage when designing a carbon pricing policy. Defects in the design of the policy can negatively impact the efficiency of the policy in reducing GHG emissions.

CPLC (2016b) also confirmed that carbon pricing policies implemented in jurisdictions such as California, British Columbia and Quebec, did not have a negative impact on economic growth, nor did it result in carbon leakage. Similarly, Norway, Sweden, Switzerland and France that have implemented carbon tax, did not experience an adverse impact on their economic growth. In fact, Sweden, which has the highest carbon price in the world, has witnessed increases in its industrial sector and GDP, whilst also realising reductions in its GHG emissions.

CPLC (2016b) suggests that there are a few possibilities that could have contributed to the low occurrence of carbon leakage:

- Businesses rank other factors such as quality of institutions, availability of capital and skills, governance and tax regimes, higher than they rank carbon pricing and have therefore not moved jurisdictions.
- Businesses have reduced their GHG emissions leading to lower production costs, in that way minimising the risk of carbon leakage.
- Carbon price levels are too low or still new to be factored in decision-making.
- Sufficient mitigating initiatives have been factored in the carbon pricing policy to reduce the risk of carbon leakage.

The risk of carbon leakage is said to also decrease as more jurisdictions choose to implement a carbon pricing policy. The more common carbon pricing policies become, the lesser opportunities there are available for businesses to move their operations. Other initiatives that can be useful in reducing the risk of carbon leakage and the negative impact on competitiveness include, offering incentives to specific industries to reduce their emissions, and dedicating revenues to assist businesses with their transition towards a low-carbon environment. (CPLC, 2016b)

In addition to the various energy-related allowances offered by South Africa to its businesses, the Carbon Tax Act also provides tax-free allowances up to 95 percent during phase 1 of its implementation. This reduces the carbon tax rate of R120/tCO_2e, to an effective carbon tax rate ranging between R6 to R48/tCO_2e.

The goal of implementing a carbon tax is to achieve a reduction in GHG emissions. Permitting such high tax-free allowances can assist businesses in transforming their operations to a low-carbon environment. However, it can also result in not sending a strong enough message on carbon pricing that will motivate emitters to reduce their emissions, thereby undermining the effectiveness of the tax (CPLC, 2016b).

Another factor to consider when implementing a carbon pricing policy, is the impact on the employment rate of the country. As the demand for fossil fuels such as coal decreases, so too will the demand for labour in these industries. This will impact the workers and communities especially in rural areas in which these industries operate. Carbon revenues can also be used in this instance to assist workers and communities with this transition. (CPLC, 2016b)

6.2 The impact on low-income households

A research analysis conducted in the United States of America found that the burden of a carbon tax on the lowest income group is approximately four times higher than the burden-to-income ratio for the highest income group. A major concern for introducing a carbon pricing instrument in South Africa, where a large portion of the population are in the low-income category, is the adverse impact that it can have on the poor, and the inequalities that it can lead to, which can ultimately result in public resistance to the tax. In South Africa, there are often violent protests by the poor and low-income communities, stemming from the implementation of policies that are regressive. (Fakoya, 2013)

The design of a carbon pricing policy is critical. A study by Dorband et al. (2018) suggests that carbon pricing might be more socially and politically acceptable in poorer countries. There is also evidence that suggests that the policy becomes more acceptable to the general public if it is designed to protect low-income households from the adverse impacts that they may be exposed to.

Carbon pricing will result in increases in the prices of energy and energy-related products, eroding the purchasing power of household income. Low- and moderate-income households are impacted the most since a large portion of their income is spent on energy-related expenses. They also have little to no investments or savings, and are therefore unable to afford the energy-efficient appliances that higher income households can, to reduce their energy consumption. This disproportionate burden on low-income households makes the carbon tax a regressive tax. The impact of the carbon tax on low-income households depends on the household's carbon footprint. (Stone, 2015)

The regressive nature of the carbon tax and the negative impact it will have on low-income households, is consistent with the analysis done by Fakoya (2013), that evidenced a strong relationship between increases in the Consumer Price Index (CPI) and the prices of energy-related products.

Effective allocation of carbon tax revenues can reduce the burden on low-income households. Carbon tax is seen as the most cost-effective way to reduce emissions for the economy as a whole, since it generates sufficient revenue that can be used to negate the regressive effect on low-income households. (Stone, 2015)

As mentioned above, the extra burden on low-income households makes the tax regressive, and is an adverse consequence of the tax. However, there is an upside to implementing a carbon tax since it can have a positive effect on the welfare of the poor and the condition of the environment (Marquard & Winkler, 2011).

Low-income households rely on fuels such as paraffin, wood and coal as their primary source of energy. Being exposed to such fuels can negatively impact one's health and is also a safety hazard, having a negative impact on the welfare of the people and the environment. The use of these fuels can be discouraged by imposing a carbon tax on these fuels and making their cost inefficient. (Marquard & Winkler, 2011)

However, introducing a carbon tax also increases the cost of electricity, therefore making it less affordable. An example of how the use of electricity can be encouraged in low-income households is through an 'accelerated electrification programme'. The programme is targeted at low-income households, providing them with direct access to electricity, thus replacing the need for fuels such as paraffin and coal as a primary source of energy. In addition to the programme, an incentive called 'free basic electricity' can also be provided to these households to assist with the affordability of electricity. (Marquard & Winkler, 2011)

The use of electricity can also be encouraged by offering lower electricity tariffs or rebates to low-income households. It is important not to extend this benefit to higher-income households that utilise more electricity relative to low-income households. By not providing this incentive to higher-income households, they will be incentivised to reduce their costs by decreasing their energy use, which will enhance the effectiveness of the tax. (Marquard & Winkler, 2011)

The article by Marquard & Winkler (2011) refers to the 'van Heerden study' which found that utilising carbon tax revenues to reduce the cost of foods can be effective in achieving GHG emission reductions, economic growth and can alleviate poverty. They refer to this as a 'triple dividend'.

The studies above confirm that the implementation of a carbon tax can have a socio-economic impact. The regressive nature of the tax places a heavy burden on low-income households that do not have the necessary means to overcome the harsh impact of the tax, being the increase in the cost of living. However, implementing the tax and subsidising low-income households can lessen this burden and encourage the use of electricity, thus improving the standard of living for the poor, and contributing towards a cleaner environment.

It is advised that special attention is paid to the needs of low-income households to prevent violent protests and a tax revolt from happening.

There are many jurisdictions that implemented a carbon pricing policy and did not experience any negative impact on their economic growth. Nevertheless, the risks do exist and necessary steps should be taken to avoid the risks from occurring. The adverse impact on both the economy and society can be successfully managed through a well-designed carbon tax policy, that measures these risks and implements effective mitigating actions to reduce these risks. One of the key mitigating factors to reduce the impact on the economy and low-income households, is the effective utilisation of carbon tax revenues which will be discussed in Chapter 7.

Fakoya (2013) supports the importance of using carbon tax revenues efficiently. The misuse of carbon tax revenues will contribute significantly to the ineffectiveness of a carbon pricing policy.

> Carbon tax revenues could be used to promote growth through promoting productive government spending, funding basic research, funding essential infrastructure, and investments in human capital. However, the failure to re-channel realised carbon tax revenues efficiently would render the objective of the policy and its output inconsistent and damaging to the overall economy.

6.3 Understanding the potential impact for South Africa

As mentioned in the previous section, the majority of South Africa's population are in the low-income category. South Africa also has a history of violent protests by the poor and low-income communities. Introducing a carbon tax can worsen their circumstances, leading to further protests and a tax revolt. Therefore, understanding the potential socio-economic impact that a carbon tax can have for South Africa, and gaining public support for the policy, are critical aspects to consider when designing a policy.

To develop an understanding of the potential impact of a carbon tax on macroeconomic aggregates such as GDP, employment, consumption and exports for South Africa, a modelling analysis was performed, and a report commissioned by the Partnership for Market Readiness (PMR). The study was based on the carbon tax design specified in the National Treasury's 2013 paper. Different approaches to the way in which revenue will be recycled and the speed at which the tax-free allowances will be phased out, were used as variables for this study (PMR, 2016)

The study was based on an anticipated start date of 2016 for the tax, and the year 2035 was selected as the focus period. The assumptions used for the study included:

- A tax rate of R120/tCO_2e to be levied on scope 1 emissions,
- The tax rate was set to increase by 10 percent per annum over the first five years,
- Similar tax-free allowances were provided to emitters as mentioned in Chapter 3,
- The AFOLU and waste management sectors were exempt from the tax in phase 1 of implementation, and
- Revenues were to be used to support the shift towards a low-carbon environment, impact on low-income households and sectors negatively impacted by energy price increases.
  (PMR, 2016)

From the assumptions, it is evident that the design of the policy used for the study is closely aligned to the policy that was implemented by South Africa on 01 June 2019, which was discussed in Chapter 3. A key difference when compared to the Carbon Tax Act is the percentage at which the carbon tax rate will increase. The assumptions consider a 10 percent increase over 5 years, whereas the Act legislates an increase of the inflationary rate plus 2 percent for the first three years, followed by inflation thereafter.

Also, bear in mind that the study assumes that the start date for the tax is in 2016, which differs from the actual implementation date being mid-2019. The focus period for the report was 2035. The percentages quoted below for the year 2035 may differ slightly due to the different implementation date. However, the principles remain the same, and the impact observed on the macroeconomic aggregates would not be significantly impacted due to the delay.

Key findings from the PMR Report (2016) are summarised below.

Emission reductions and renewable energy sources:

A carbon tax will assist South Africa in significantly reducing its GHG emissions. The study evidenced that emissions can be reduced by approximately 13 to 14.5 percent by 2025, and 26 to 33 percent by 2035. Although the carbon tax will contribute significantly to South Africa reaching its goal to reducing its emissions, it would still need to be complemented by other policies or a higher carbon tax rate, that will incentivise emitters to reduce their emissions, for South Africa to meet its target.

The output from renewable energy sources including nuclear, wind, hydro and solar, is expected to increase by more than 200 percent than without a carbon tax. These energy sources will be more cost competitive with a carbon tax. Coal generation is expected to be much less cost competitive, and is expected to be 46 percent lower in 2035, than without a carbon tax.

Macroeconomic aggregates and the impact on the different sectors:

Introducing a carbon tax will not significantly impact the growth of South Africa's economy. The annual average growth rate of the economy is expected to reduce by 0.05 to 0.15 percent, in comparison to not having implemented a carbon tax policy. This means that, if the economy is growing at a rate of 3.5 percent per year, it will be reduced to 3.3 to 3.4 percent per year, which means that the growth rate in 2035 will be between 1 and 3 percent lower than if the carbon tax was not introduced.

The study also evidenced a small impact on macroeconomic aggregates such as employment, consumption and real wages. It is expected that the annual growth rate in household consumption will reduce by 0.23 percent, employment rate by 0.07 percent and the growth rate in real wages by 0.2 percent.

Importantly, the modelling suggests that concerns over competitiveness impacts due to the introduction of carbon taxes are overstated. In fact, exports could potentially be 3.5 percent higher in 2035 due to a carbon tax. Certain sectors were materially impacted by the carbon tax, which resulted in a decline in exports especially the coke oven, iron and steel industries. However, there were also several industries that benefitted from the introduction of a carbon tax. The transport equipment, electrical machinery, and textiles and footwear sectors showed an annual growth rate of exports of approximately 7 percent. This means that in 2035, their exports would be 30 to 40 percent higher than without the carbon tax implementation. Besides the carbon tax, revenue recycling would also be a contributing factor to the growth rate of exports.

Many sectors will remain largely unaffected by the introduction of a carbon tax, indicating that the cost of carbon is a relatively small cost driver for many sectors, and that revenue recycling can benefit these sectors. The concept of revenue recycling is discussed in Chapter 7.

According to the study, including the AFOLU and waste management sectors within the scope of the carbon tax, will have a negligible impact on the overall reduction of emissions, and the GDP of the country.

Tax-free allowances:

Tax-free allowances result in a lower effective carbon tax rate, that can influence the behaviour of emitters. The modelling suggests that by not phasing out the tax-free allowances in the early stages of the tax, the impact on the macroeconomy would be even smaller. However, the effective carbon tax rate will remain low, and would be substantially less effective in reducing GHG emissions.

The study shows that by maintaining the tax-free thresholds until 2035, emission reductions would reduce significantly from 33 percent to 26 percent. If the tax-free allowances are gradually phased out after the initial implementation, emission reductions can be much higher.

Summary:

The magnitude of emission reductions realised and the impact on macroeconomic aggregates such as the GDP, employment rate and competitiveness, is largely dependent on the carbon pricing policy and the design of the revenue recycling schemes. As per the PMR (2016) report, the impact on South Africa’s economy through the introduction of a carbon tax is very minimal, and can be effectively managed through a well-designed carbon pricing policy and the proper utilisation of carbon tax revenues. (PMR, 2016)

Besides the macroeconomic aggregates discussed above, understanding the impact on society is also crucial when implementing a carbon pricing policy. Carattini, Carvalho & Fankhauser (2018) emphasise the importance of gaining public acceptance for the tax, and regard it as an essential contributor to effectively reducing GHG emissions. Although carbon taxes are explicitly aimed at reducing the harmful effects on the environment, voters are instinctively against the introduction of new taxes, and will be concerned about the effectiveness of the tax and the impact on low-income households. Developing a well-designed carbon pricing policy that is clearly communicated to the public, can make the policy more acceptable and can reduce the risk of public resistance to the tax.

CHAPTER 7:
REVENUE GENERATED BY CARBON PRICING INSTRUMENTS

One of the advantages that was identified in Chapter 2, of implementing a carbon tax as a carbon pricing instrument, is the additional source of revenue that it creates for government. This Chapter aims at identifying the effective uses of carbon pricing revenues, compare carbon revenues generated from carbon taxes versus ETSs, and identify how these revenues are being utilised in some countries.

7.1 Efficient ways of utilising Carbon Tax Revenues

There are several factors that a jurisdiction needs to consider in determining the appropriate uses for its carbon tax revenue. These include: 'potential economic and environmental gains, efficiency, interaction of spending with the carbon price itself, potential cost of distortions created by a revenue spending policy, and how progress toward objectives can be monitored and verified'. Often, a combination of uses is used to achieve the best outcome, and to appease different stakeholders. (CPLC, 2016a)

Reducing the impact of a carbon tax on low-income households and the economy

Although a carbon tax creates an incentive to reduce GHG emissions, it also introduces new burdens to the public at large and the economy. Low-income households are particularly vulnerable since a large portion of their income is used for energy, such as electricity and fuels used for transport and heating, the cost of which are increased by the introduction of a carbon tax. To reduce the burden on and protect low-income households, carbon tax revenues can be used to provide a rebate to qualifying recipients. (Marron & Morris, 2016)

Using carbon tax revenues to reduce the rate of regressive taxes such as value-added tax (VAT), a goods and services tax, will also reduce the burden on low-income households (Marron & Morris, 2016). Van Aswegen (2018) explains the difference between a 'regressive tax' and a 'progressive tax':

> A 'regressive tax' is a tax imposed in such a manner that its effect is more adverse on lower income groups than higher income groups. This is in contrast with a 'progressive tax', which imposes tax at a higher rate on high-income earners, and a lower rate on low-income earners. South African income tax is an example of a progressive tax, because higher income earners pay income tax at a higher rate. VAT is generally cited as a perfect example of a regressive tax, because all people pay the same rate, even though not everyone is equally able to afford taxes.

Marron & Morris (2016) state, 'Adding even a well-designed carbon tax on top of the existing tax system will increase the overall economic burden of the tax system'. They therefore suggest revenue recycling as a mechanism to reduce the burden on the economy and encourage economic growth.

Revenue recycling can be achieved through the reduction of other distortionary taxes such as income and corporate tax. Distortionary taxes have negative side effects on economic activity and influence personal and business decisions regarding saving, investing and spending. Carbon tax revenues can be used to reduce these taxes to improve economic growth and employment rates. (CPLC, 2016a; Marron & Morris, 2016). However, reducing tax rates will benefit the higher income groups more than the lower income groups, and is therefore considered to be a 'regressive' approach, whereas a rebate in the form of a dividend would instead be a 'progressive' approach (Marron & Morris, 2016).

PMR (2016) reported on the findings of an analysis performed to understand the impact of different revenue recycling scenarios on the economy and the effectiveness in emission reductions. The results of the study indicated that, dedicating carbon tax revenues narrowly to energy efficiency related projects only can yield higher emission reductions, but lower the growth rate of the economy. Alternatively, the wider the use for carbon tax revenues, the better the revenue recycling scheme is for the economy.

To promote economic growth, revenues can also be used for investment in infrastructure, education, research and development, and providing transitional support to coal workers and other affected industries and communities that will be displaced due to the changes brought about by carbon tax. (Marron & Morris, 2016)

Using carbon tax revenues to further reduce GHG emissions

Implementing a carbon tax will not eliminate GHG emissions in its entirety. Some emitters will continue to emit GHGs due to certain exemptions from the tax, or because paying the cost of the carbon tax is more cost-efficient to the emitter than reducing its emissions. Therefore, using some of the carbon tax revenue to further reduce GHG emissions will enhance the benefits of the tax, and can assist in achieving climate goals. In doing so, support for the carbon tax from stakeholders and the public who prioritise climate concerns, will be gained. (Marron & Morris, 2016)

Marron & Morris (2016) mention two types of emission reduction initiatives, namely, 'belt and suspenders' policies that aim to achieve the same behavioural changes as the tax, and 'filling the gap' policies that intend to achieve behavioural changes missed by the tax. 'Belt and suspender' policies include subsidies and tax allowances that incentivise the transition towards carbon friendly technology, which the carbon tax itself seeks to encourage. Marron & Morris (2016) advise that the use of the tax revenues in this manner may reduce emissions more than the tax alone would, however the shortfall of using this type of policy is that the cost of providing the subsidy or tax allowance may exceed the benefit provided. On the other hand, 'filling the gap' policies target emission sources that are not covered by the tax due to certain complexities. In this case the carbon tax revenue is used to incentivise sectors not covered by the tax by offering them subsidies or tax allowances to improve their processes, which may result in additional reduction of emissions.

Although carbon tax revenues can be used to incentivise emission reductions and may lead to achieving higher reductions in emissions, it is advised that any gaps identified in the process should rather be fixed through regulatory measures, especially in the case of ‘belt and suspender’ policies, than to earmark a fixed percentage of the revenue for a specific spending purpose. (Marron & Morris, 2016)

Funding other public priorities

Revenues generated through carbon taxes can be used for general public funding or reducing government debt, instead of being utilised specifically for climate change initiatives. Public finance experts and budgeting officials endorse this by recommending that all revenue sources be treated alike so that they can be assessed appropriately. (Marron & Morris, 2016)

Revenue included in general public funding is allocated based on public priorities that require funding, and includes priorities in areas such as health, education, infrastructure and defence. Allocating revenue to the general public fund promotes efficiency and flexibility, and allows for shifts in allocation as budgetary needs change over time. (CPLC, 2016a)

The public are often curious about how revenue generated from a new tax is intended to be utilised as there is concern that the tax is merely introduced to increase the ‘size and scope of government’. As discussed, each of the possible uses come with its own challenges, therefore it is important for government to evaluate both policy goals and political realities, in order to achieve the best outcome. Also, bear in mind that different stakeholders have different views. For example, the environmentalist will want revenue to be invested in other GHG emission initiatives, budgeting officials will want to reduce government deficits, tax reformers will want reductions in taxes, and analysts will want revenues to be used to offset the difficulties experienced by low-income households. (Marron & Morris, 2016) By engaging with the different stakeholders, governments can identify the more important priorities for which the revenue needs to be utilised, and the challenges that they pose (CPLC, 2016a).

Advice from the Marron & Morris (2016) can be summarised as follows:

- Using carbon tax revenues to reduce tax rates and assist low-income households and displaced coal workers and their communities is recommended since it will reduce opposition to the tax.
- Using carbon tax revenues for other GHG emission reductions should be exercised cautiously. Spend on ‘filling the gap’ policies rather than ‘belt and suspender’ policies.
- Tight earmarking is not recommended since it can result in overspending, inefficiency in deploying resources and concerns over funds being used for ‘pet projects’.
- Utilise carbon tax revenues in a manner that will provide ongoing support for the tax.

A periodic review for the use of carbon tax revenues is recommended. Priorities and needs change over time, therefore the allocation of revenues should change accordingly (CPLC, 2016a).

7.2 *Revenues generated from Carbon Taxes versus ETSs*

ETSs have contributed approximately $6.57 billion globally in government revenues in 2013. Approximately 70 percent of these revenues are being used towards supporting renewable energy and energy efficiency projects, and only about 9 percent was returned to taxpayers or individuals. (Carl & Fedor, 2016)

Global cap-and-trade system revenues.

Cap and trade systems	**Annual revenue (millions)**	**Per capita revenues**	**Share of GDP**	**Green spending**	**General funds**	**Revenue recycling**
European Union Emissions Trading System, Phase III	$4640	$9	0.03%	80%	20%	0%
California AB 32 Cap and Trade System	$1034	$27	0.05%	45%	4%	55%
Regional Greenhouse Gas Initiative (United States)	$447	$8	0.01%	49%	32%	12%
Chinese Provincial Emission Trading Scheme Pilots	$250	$2	0.02%	10%	90%	0%
Quebec Cap and Trade System for Emission Allowances	$100	$13	0.03%	100%	0%	0%
Alberta Greenhouse Gas Reduction Program	$92	$22	0.03%	90%	10%	0%
Switzerland Emission Trading System	$9	$1	0.00%	0%	100%	0%
Combined globally:	*$6572*	*$8*	*0.02%*	*70%*	*21%*	*9%*

Most revenue figures are for 2013 or FY 2013/14. Exceptions due to data availability are: Switzerland ETS (2014). Data sources for each system are cited in the text and include author estimates where necessary. Shares may not add up to 100% as categories are not comprehensive and annual revenue budgeting may not match annual revenue inflows.

Figure 18: Global ETS revenues, 2013

Source: Carl & Fedor (2016)

In comparison, carbon taxes raised approximately $21.7 billion in revenues globally in 2013, contributing approximately three times more revenues than ETSs. The uses for carbon tax revenues differ significantly to the use of revenues generated from ETSs. Most of the revenue generated from ETSs was used for energy related projects, whereas only 15 percent of carbon tax revenues was used for this purpose. A large portion of carbon tax revenues, approximately 44 percent, was used to reduce other taxes or provide rebates to taxpayers, and approximately 28 percent of carbon tax revenues contributed towards the general budget for government spending. (Carl & Fedor, 2016)

Per the Carbon Tax Guide, using a revenue generating instrument such as a carbon tax is generally more efficient than an instrument that does not generate revenue. The reason for this is that the latter also brings about 'negative tax interaction effects' such as, higher energy prices, loss of jobs and deceased investment levels, without having the advantage of the 'revenue recycling effect' that is provided by the carbon tax instrument. The 'revenue recycling effect' in this case refers to the use of carbon tax revenues to reduce other distortionary taxes. (PMR, 2017)

Global carbon tax system revenues.

Carbon tax systems	Annual revenue (millions)	Per capita revenues	Share of GDP	Green spending	General funds	Revenue recycling
Australia carbon pricing mechanism (canceled)	$8790	$391	0.60%	15%	1%	53%
Sweden carbon dioxide tax	$3680	$381	0.67%	0%	50%	50%
Norway carbon dioxide tax	$1580	$307	0.31%	30%	40%	30%
United Kingdom carbon price floor	$1530	$24	0.05%	0%	85%	0%
British Columbia carbon tax shift	$1100	$239	0.49%	0%	0%	102%
Denmark carbon dioxide tax act	$1000	$177	0.29%	8%	47%	45%
Switzerland carbon dioxide levy	$875	$107	0.13%	33%	0%	67%
Mexico special tax on production and services	$870	$7	0.06%	0%	100%	0%
Finland carbon dioxide tax	$800	$146	0.29%	0%	50%	50%
Ireland natural gas carbon tax, mineral oil tax, and solid fuel carbon tax	$510	$111	0.03%	13%	88%	0%
Japan tax for climate change mitigation	$490	$4	0.01%	100%	0%	0%
France domestic consumption tax on energy products (carbon dioxide)	$452	$7	0.02%	100%	0%	0%
Iceland carbon tax on carbon of fossil origin	$30	$92	0.22%	0%	100%	0%
Combined globally:	*$21,707*	*$49*	*0.13%*	*15%*	*28%*	*44%*

Most revenue figures are for 2013 or FY 2013/14. Exceptions due to data availability are: Denmark (2010), Mexico (2014), France (2014 partial year), Ireland (2012), and Japan (2012). Data sources for each system are cited in the text and include author estimates where necessary. Shares may not add up to 100% as categories are not comprehensive and annual revenue budgeting may not match annual revenue inflows.

Figure 19: Global carbon tax revenues, 2013

Source: Carl & Fedor (2016)

7.3 How Carbon Tax Revenues are being utilised in some parts of the world

As mentioned previously, the use of carbon tax revenues depends on the jurisdiction's needs and priorities, and in many instances the revenue is allocated to multiple uses to achieve several goals.

Included below is a summary of how revenue is being utilised in some countries:

Jurisdiction	Use of Carbon Tax Revenue
Chile	• General budget • Intended to be spent largely on education and health
Denmark	• Reduce labour taxes, subsidise energy efficiency investments, and assist small companies with their administrative costs • Approximately 40 percent is used for environmental incentives and 60 percent used to reduce social insurance and pension contributions, and compensate small companies
France	• Reduce corporate income taxes • Provide energy assistance to low-income households • Reduce labour taxes
India	• Finance clean energy initiatives, environmental remediation, and research on clean energy technologies • Government-sponsored projects must be self-financed by at least 40 percent, with no assistance from any other government agency
Ireland	• General budget • Reduce public deficit

Jurisdiction	Use of Carbon Tax Revenue
Japan	• Promote low-carbon technologies, energy efficiency improvements and renewable energy
Mexico	• General budget • Earmarking of revenue is not generally favoured
Sweden	• General budget • Reduce labour and corporate taxes

Figure 20: Use of Carbon Tax Revenue by Jurisdiction
Source: Carbon Tax Guide (PMR, 2017)

Prior to the implementation of the Carbon Tax Act, South African stakeholders were concerned that carbon tax revenues were not being ringfenced, and were not specifically earmarked for revenue recycling initiatives. National Treasury & SARS (2019) responded that tight earmarking of specific tax revenues was not in accordance with 'sound fiscal management practices'. However, based on findings from the economic modelling analysis that was undertaken for South Africa, National Treasury & SARS (2019) proposed that the carbon tax revenues be used for reducing or not increasing other taxes, providing tax incentives through tax allowances, and 'soft' earmarking the funds for free basic electricity programmes and improved public transport. National Treasury intends on allocating carbon tax revenues on a similar basis to other tax revenues, being the usual budgetary process. Information regarding tax revenues and spending is published by National Treasury and is made available to taxpayers therefore allowing for transparency.

Carl & Fedor's (2016) findings prove that carbon taxes do generate substantially more revenues than ETSs. This revenue can be used in several ways depending on the jurisdiction's needs and priorities. South Africa, in terms of its carbon pricing policy, has chosen not to specifically earmark its carbon tax revenue, to treat the carbon tax revenue similar to other tax revenues, and base the allocation of the revenue as required by the jurisdiction's needs and priorities. This approach is in line with the recommendations by Marron & Morris (2016).

It has however been noted that South Africa does offer a number of tax incentives to taxpayers as discussed in Chapter 3. Although these tax allowances or incentives incentivise behavioural changes towards a low-carbon environment, and can assist in achieving climate goals more effectively in combination with the carbon tax, 'belt and suspender' policies are not recommended. It is recommended that the benefits realised from offering these incentives be weighed against the cost thereof, to ensure that they remain efficient.

CHAPTER 8:
CONCLUSION

The main purpose of this report was to obtain an in-depth understanding of global warming and the risks of climate change, and to determine whether South Africa's initiative of a carbon tax implementation can assist the country in achieving its domestic and international climate goals, such as its commitment to the Paris Agreement. Many critics are concerned that carbon tax is not an appropriate solution for South Africa, due to South Africa's downward trend in economic growth, and concerns over problems such as poverty and unemployment rates. Lobbyists are of the view that carbon pricing policies such as carbon tax is required, and that the tax rates should be higher to send a stronger price signal to emitters, to reduce their emissions.

Global warming is a serious issue, and many countries, including South Africa, are already experiencing extreme changes in weather patterns and a high occurrence of natural disasters. A global effort is required to address the risks of global warming and climate change therefore South Africa's participation in this cause is necessary. Many countries are implementing carbon pricing policies to combat global warming. Carbon pricing is identified as the most effective regulatory approach to reduce GHG emissions. Carbon pricing policies penalises the emitter for harmful gas emissions, and encourages investment in low-carbon technologies, thus reducing GHG emissions and slowing the rate of global warming.

South Africa has the second largest economy in Africa, and a fairly developed industrial sector that is energy intensive. The industrial sector is highly vulnerable to risks associated with climate change. This sector is important for South Africa since it substantially contributes to the South African economy. Its GDP creates employment and promotes socio-economic development in the country.

The excessive use of fossil fuels in the energy sector has been identified as one of the largest contributors to GHG emissions, and the result of global warming. South Africa is heavily reliant on coal as a primary source of energy, with little investment in renewable energy technologies. Besides the high carbon content of coal that is negatively impacting our environment and is contributing to global warming and climate change, there is also another concerning factor, that coal is a non-sustainable source of energy. Coal is a fossil fuel, and is a depleting resource. South Africa is already experiencing constraints in energy production due to the lack of investment in infrastructure in the energy sector, and are realising the harsh impact that this is having on the economy. A shortage of coal will significantly impact the growth of the economy therefore alternative sources of energy are required.

South Africa's renewable energy sources have improved over the last decade. The study of carbon pricing in India evidences that GHG emissions can be significantly reduced through investments in renewable energy sources, that are also more cost-effective than coal-produced energy. However, the infrastructure costs for renewable energy projects is costly, and requires significant amounts of capital.

Studies indicate that there are several opportunities for South Africa to further develop its renewable energy resources. Like India, South Africa should position itself to attract international investment in renewable energy sources, to obtain funding for these projects.

South Africa's commitment to combatting global warming and climate change is evident in the numerous environmental pledges that it has undertaken, the levies implemented to discourage pollution, and the allowances being provided to taxpayers to encourage growth in eco-friendly technologies. In addition to its contribution to the environment, these levies also contribute to the GDP of the country.

Chapter 4 compared a carbon tax instrument to an ETS, and highlighted the advantages and disadvantages of both instruments, to identify which alternative would be a better option for South Africa. Studies show that both carbon taxes and ETSs are popular across the globe, and have been effective in reducing GHG emissions. Based on the evidence gathered, carbon tax is easier to implement, maintain and administer, and is a more suitable option for South Africa. ETSs require a far more complicated policy and infrastructure, and is not easy to implement in a developing country. The other benefits of a carbon tax include, the additional source of revenue generated, the wider coverage it permits, and the greater certainty over price which is crucial for South Africa's volatile economy.

There is strong evidence that suggests that the carbon tax is more effective when used in combination with other mitigating policies. South Africa has various policies in place that will enhance the effectiveness of the carbon tax. Taxpayers are encouraged to utilise tax incentives that are available to lighten the burden of the carbon tax.

The use of a combination of carbon pricing instruments, such as carbon tax with an ETS, is common in some of the developed countries. However, using a combination of these instruments increases the compliance costs and creates additional complexities. Further research is required to identify the composition of effective policy portfolios to reduce GHG emissions.

South Africa's decision to implement a carbon tax was necessary. Not only is it required from a sustainable environmental perspective, but is also necessary for South Africa to sustain growth in the economy. Coal is a depleting resource, therefore alternative sources of energy, in the form of renewable energy, is required. The carbon tax enforces 'the polluter pays' principle, sending a message to emitters to reduce their energy consumption, and encourages investment in renewable energy sources.

South Africa has chosen a phased-in approach for the tax, to allow industries and its people the time and flexibility to adjust, thus reducing the risk of public resistance to the tax. As evidenced in Australia, political and public acceptability is key, and failure to achieving this can result in the unsuccessful implementation of the tax. The phased-in approach also allows National Treasury the opportunity to review and assess the effectiveness of the tax.

One of the major concerns regarding South Africa's carbon tax implementation is its carbon tax rate. South Africa's carbon tax rate is far below the recommended range of at least US$40 - 80/t$CO_2$e, required by 2020. The significant allowances provided to emitters under the Carbon Tax Act, results in a much lower effective carbon tax rate for South Africa. Given South Africa's volatility in economic conditions, and its history of public protests, it is understandable why National Treasury has chosen a less aggressive approach for its carbon tax implementation. Research suggests that it is not uncommon for jurisdictions to introduce the tax at a much lower rate, and gradually increase the rate over time. There are also studies that suggest that introducing carbon prices at very low levels and increasing the price over time is more feasible than starting with very high prices. Doing so, increases the political and social support for the tax, and may increase investment in 'long-lived, low-carbon infrastructure'.

On the other hand, low carbon tax rates and significant tax-free allowances may reduce the effectiveness of the tax. For the tax to remain effective in reducing GHG emissions, the correct balance needs to be met. Significant work is required to determine a more suitable rate that will be palatable for the public, and will at the same time, be effective in reducing emissions.

Chapters 6 and 7 analysed the potential socio-economic impact of a carbon tax for South Africa, and identified ways in which carbon tax revenues can be used to reduce any negative, unintended consequences of the tax. The introduction of a carbon tax can have a negative impact on the economy, and can lead to carbon leakage due to concerns over competitiveness and higher operating costs.

The tax can impact the competitiveness of the industry or business, especially those that are energy-intensive. Research evidences that many jurisdictions did not experience a negative impact on economic growth due to carbon tax, and that the risk of carbon leakage was low. Research has shown that a carbon tax will assist South Africa in reducing its GHG emissions, and will not have a significant impact on its economic growth.

Introducing a carbon tax also has the unintended consequence of negatively impacting low-income households. The tax increases the cost of goods and services, thus creating an additional burden especially on low-income households. Concerns over competitiveness and carbon leakage that can impact South Africa's economy, and the additional burden on low-income households, can be successfully managed through a well-designed carbon pricing policy, and the efficient use of carbon tax revenues.

Studies found that carbon taxes generate substantially more revenue than ETSs, that can be used to offset some of the unintended, negative consequences of the tax. Many stakeholders were concerned that South Africa's carbon tax revenue was not ringfenced, and was not being earmarked for investment in cleaner technologies and renewable energy projects. Research suggests that South Africa's approach to not earmark carbon tax revenues, and to allocate the revenues to the general budget is the recommended approach, and is the approach being followed by various other jurisdictions, including Sweden.

From the above we can conclude that the carbon tax is unlikely to significantly impact the economic conditions of South Africa, and that any unintended, negative consequences on South Africa's economy and society, can be effectively managed through a well-designed carbon pricing policy.

South Africa's carbon tax implementation can assist in the global fight against climate change and the reduction of GHG emissions. However, given the current carbon tax rate, and the lack of any indication of what the tax rate will be after phase 1 of implementation, it is unlikely that South Africa will achieve its emission reduction goals that it committed to in the Paris Agreement.

Having a carbon tax policy in place that will not sufficiently reduce emissions to achieve emission reduction targets, defeats the objective of introducing the tax. It is therefore recommended that the carbon tax rate be revised upwards, and that tax-free allowances be phased-out, to send a stronger message to emitters. A strong price signal will encourage energy-efficiency and investment in energy-efficient and renewable energy technologies.

National Treasury should bear in mind that price certainty is crucial. Providing regular feedback, and signalling anticipated price increases to the market and its taxpayers is therefore essential. Early communication of the potential increases in tax rates can also incentivise emitters to invest in cleaner technologies now, to avoid the higher costs in future. One of the key principles identified in the 'FASTER Principles for Successful Carbon Pricing', is that carbon pricing policies should offer 'Stability and Predictability', providing a 'consistent, credible and strong investment signal, the intensity of which should increase over time'.

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