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Role of market based instruments in transitioning to a low carbon economy:  
experiences from BRICS countries and lessons for South Africa

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## Abstract

Market based instruments have become a common feature in country policies aimed at transitioning to low carbon economies. BRICS countries are responsible for approximately two-thirds of the global average of carbon emissions. These countries are under continuing international pressure to demonstrate leadership in their carbon emission reduction efforts.

This research explored the implementation of market based instruments in Brazil, China, India and South Africa as they transition to low carbon economies and determined the elements and driving forces informing the selection of market based instruments.

The research sought to achieve three objectives, the first objective was to establish whether market based instruments were regarded as a policy option for low carbon transition initiatives by these four countries. The second objective was to determine the drivers and sectors informing a selection of market based instruments. The third objective was to extract lessons from these countries for South African to consider in its low carbon transition.

The research outcomes included a model of the interrelationship between driving forces for decisions to adopt market based instruments, targeted sectors that would be subjected to such mechanisms and the eventual combination of instruments that gets implemented.

## Key Words

Low carbon economy, Green Economy, Market-Based Instruments, BRICS, Climate Change

## Declaration

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

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## 1. Chapter 1: Introduction to the Research Problem

### 1.1 *Introduction*

This chapter provides a background to the research statement that explores the role of market based instruments in transitioning to a low carbon economy and extracts experiences from BRICS countries in order to extract lessons for South Africa. The chapter begins with an elaboration of the problem statement and highlights the key occurrences and findings that stimulated this research. The concepts used in this research often have multiple meanings to different individuals therefore a brief subsection on definition of constructs provides an upfront explanation of what the key terms mean within the context of this research. The chapter further discusses the significance of this research and the objectives that informed the three research questions in the report.

### 1.2 *Background*

The 2007 Intergovernmental Panel on Climate Change (IPCC) forth assessment report confirmed the scientific bases for climate change. The panel of scientists observed that the warming in the earth's atmosphere over the past 50 years has been due to anthropogenic activities. These scientists were able to link changes in global mean temperatures to the outcomes and impacts on the natural environment associated with different levels and movements of greenhouse gases in the atmosphere (IPCC, 2007).

Given the overwhelming science behind climate change and its impacts on sustainable development, governments throughout the world are considering and implementing a range of mechanisms aimed at mitigating the causes of climate change and adapting to its impacts.

Stern (2006) reviewed the implications of action versus inaction and described climate change as a greatest and widest-ranging market failure ever seen. This is due to the fact that greenhouse gas (GHG) emissions are by-products of successful production activities, and the impacts of such emissions are not felt by direct

producers but rather future generations and/or most vulnerable countries, communities and individuals. Markets are seen to have failed by overproducing carbon emissions because such emissions have traditionally not been factored in production costs and have therefore remained outside the market (Stern, 2006). GHG emissions have therefore been regarded as external factors to mainstream market and economic considerations, better known as externalities.

Various climate change regulatory instruments at both multilateral and national levels have been considered and/or implemented. Markets based instruments as one of a range of other regulatory instruments directly tackle the externality concerns of GHG emissions. Placing a price on GHG emissions has been viewed as a sure way of addressing the climate change market failure. The global climate change regime, the United Nations Framework Convention on Climate Change (UNFCCC), and national governments have had challenges in determining the amounts, extent, speed and geographical applications of market based instruments (Nordhaus, 2007).

### **1.3 Problem Statement**

The South African Government has approved its climate change policy in 2011 and is in the process of developing the policy related implementation mechanisms. Market based instruments are part of the country's policy mix and those directly related to putting a price on carbon, i.e. the carbon tax and carbon budgets are at different levels of conceptualization (NPC, 2012).

The other members of the BRICS countries that are non-annex one, i.e. China, India and Brazil share similar characteristics with South Africa in the global climate change negotiations platform and might be subjected to similar carbon reduction requirements. This group of countries, referred to as BASIC in the UNFCCC negotiations, undertook to reflect their national carbon emissions reduction pledges in an international instrument, to report on their GHG inventories and their mitigation actions in biennial national communications, and to subject their actions either to an international monitoring and verification system MRV (Bodansky, 2010).

The shift by these countries and the acknowledgement of their special characterization happened in 2009 and the Copenhagen round of UNFCCC negotiations. This dynamic was viewed as having been “the first time that these countries have accepted any type of “internationalization” of their national climate change policies” (Bodansky, 2010, p. 240)

The effectiveness of market based instruments is still a subject of discussions and research throughout the world. This research aimed to contribute to a continued body of knowledge and discussion on understanding the application and effectiveness of market based instruments in transitioning to a low carbon economy in Brazil, China, India and South Africa given the countries’ circumstances in the UNFCCC negotiations.

The research explored the adoption of market based instruments by BRICS countries as they transition to low carbon economies and determined the elements and driving forces informing the selection of market based instruments. The study concluded by extracting lessons for South Africa to inform its transition process to a low carbon economy.

## **1.4 Definition of Constructs**

### *1.4.1 Market Based Instruments*

Market based instruments is a concept commonly used to define regulatory mechanisms that can be either mandatory, discretionary or even voluntary and are based on economic and market principles. Stavins (2003) defined market based instruments as “regulations that encourage behaviour through market signals rather than through explicit directives regarding pollution control levels or methods” (Stavins, 2003, p. 358).

The onset of the global climate change regime brought the first international market based mechanisms through the Kyoto Protocol which designed three carbon emission reduction market mechanisms. These mechanisms were aimed at providing a market and economic growth imperative to carbon emissions.

Organisations which had larger emissions allowance were able to sell credits to organisations with lesser allowance and who required space to emit more in light of their specific activities and/or circumstances. In developed countries, financial institutions have established carbon based insurance products and the carbon market has reached maturity. (Zeng & Zhang, 2011).

The Stern review on economics of climate change, released in 2006 pointed out an emerging reality that a determination of a country's carbon price could be done through a number of avenues. This, he asserted could include tax, trading or regulation and be included as an essential component of any climate change policy (Stern, 2006). This study has adopted the definition of market based instruments as provided by Stavins (2003) and categories of such instruments would include pollution taxes, tradable permits; and government subsidies.

#### *1.4.2 Transitioning to a Low Carbon Economy*

The concept of Sustainable development was first defined in the Brundtland Report in 1980. The global sustainable development architecture evolved through subsequent Earth Summits in Rio de Janeiro in 1992 and Johannesburg in 2002. The most accepted definition is contained in the Brundtland report, which states that sustainable development is "development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (UN, 1987, p. 34). The sustainable development concept recognizes that natural systems can be vulnerable to human activity and that these systems can at the same time sustain development and economic activities (Ambec & Lanoie, 2008). Climate change is a sustainable development challenge because its impacts span the three pillars of sustainable development, being the social systems, economic systems and environmental systems.

The establishment of the physical science bases on climate change in 2007 through the IPCC and the onset of the economic and financial crises in 2008/2009 as well as the pressure for countries to develop actions to mitigate climate change heightened the realisation of a need to transform economic activities. An issue that emerged

from these occurrences was development of innovative approaches to reduce carbon emissions while ensuring that economic growth targets were not compromised. The concepts of green economy, green growth and low carbon economy have been used interchangeably to reflect this new reality (UNEP, 2011).

A low economy approach emphasizes economic growth activities that ensure low energy consumption, low material consumption, environmentally responsible practices and reduced GHG emissions. GHGs relates to a group of gasses that are proven to have a marked contribution to global climate change, these gasses are; carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and sulphurhexafluoride (SF<sub>6</sub>), whose emissions are covered by the UNFCCC (IPCC, 2007). These gasses are also commonly referred to as is also commonly referred to as carbon dioxide equivalence (CO<sub>2eq</sub>). A further term used to imply GHG emissions is carbon emissions - a term that has been used throughout this research report.

The low carbon approach cannot be implemented in the immediate term due to the medium to long term nature of macro-economic policies and therefore the term transitioning is used to reflect its evolutionary nature (UNEP, 2011).

#### 1.4.3 BRICS Countries

The acronym “BRICS” stands for Brazil, Russian Federation, India, China and South Africa, with South Africa having joined the group of countries in early 2011. The BRICS countries have formed an alliance on the basis of their unique economic characteristics and the key objective is to leverage on their trading characteristics. The BRICS Countries combined, make up the largest economic growth rate in the world and such an elevated rate of growth could coincide with unsustainable levels of consumption, therefore imposing pressure on the block’s natural resource base which in most instances act as life support systems for these countries (May, 2006).

This study has focused on four of the five BRICS member states namely; India, China, Brazil and South Africa. Based on their similar characteristics in the UNFCCC negotiations, these four countries have formed a negotiations alliance

called BASIC to strengthen their negotiating muscle. Russian Federation, is an Annexure 1 country in the Kyoto Protocol tool of the UNFCCC while the other four countries are non- annexure 1 countries, this dynamic places them on the opposite side of the fence in terms of the protocol's implementation requirements. This difference therefore creates a fundamental difference in the implementation of mechanisms under the protocol.

According to May (2006), the BRICS countries, represented 43% of the world's population, 30% of its terrestrial land area, and the carbon emissions were at 2.5 t/yr per-capita, which was approximately two-thirds of the global mean. This relatively high emission profile coupled with increasing population growth has placed these countries under pressure to adopt ambitious carbon reduction policies and make global commitments to that effect in the UNFCCC. Therefore BRICS countries have been working on low carbon economy strategies that are aimed at ensuring the elevated percentage growth rates while reducing their carbon dependence (May, 2006). This research sought to establish whether market based instruments were considered as being pertinent to their strategies.

### ***1.5 Significance of the Study***

Work has been done on defining the climate change challenge, especially its impact on sustainable development of economies across the globe. Recommendations on the likely policy options that need to be considered have been given by the IPCC (2007), Stern (2006) and May (2006) and UNEP (2011). The relationships between carbon emissions and required reduction measures and economic growth ideals have been explored as discussed in chapter 2.

There is a need to explore whether carbon reduction measures can be subjected to market instruments in order to correct the carbon emissions externality factor. Fundamental questions that need to be answered through research are; how much, how fast, and how costly will a low carbon economy be and under what national circumstances (Stavins, 2003).

According to Stern (2006) climate change has been proven to threaten the basic elements of life for people around the world. These basic elements include access

to water, food production, health, and use of land and the environment. The impacts of climate change are not evenly distributed and the poorest countries and people are bound to suffer earliest and most. If and when the damages appear it will be too late to reverse the process. It is therefore imperative to conduct research on measures that can be implemented to mitigate the impacts of climate change. This research adds value to the challenge by providing an understanding on factors being considered by governments in the adoption of market based instruments as part of their carbon emissions reduction strategies.

### **1.6 Research Objectives**

This research project covered three questions aimed at establishing whether market based instruments were regarded as a policy option for low carbon transition initiatives by selected BRICS countries. An analysis of drivers and sectors informing a selection of market based instruments was conducted and finally lessons were gathered from these countries to consolidate key lessons for South African context to consider in its low carbon transition. The objectives of the research are:

- Objective 1: To understand the status of implementing market based instruments for a low carbon economy transition in South Africa, China, India and Brazil.
- Objective 2: To determine factors informing adoption of market based instruments in transitioning to a low carbon economy
- Objective 3: To draw lessons that South Africa can adopt in the implementation of market based instruments for a low carbon transition.

### **1.7 Structure of the Report**

Chapter 2 reviews the current theory base on the subject. The chapter begins with an assessment of how the low carbon economy transition as it relates to the application of market based instruments has been contextualised by authors in the field. The chapter then dives deeper into special circumstances in Brazil, China, India and South Africa and concludes by analysing the implementation challenges.

Chapter 3 draws from the reviewed literature in chapter 2 and defines the purpose of the research by outlining three research questions that are to be answered in subsequent chapters.

Chapter 4 provides details of the methodology used in the research. The chapter outlines the research design, population, sampling method as well as data collection and analysis techniques used. The chapter concludes by outlining the limitations of this research.

Chapter 5 presents results of the research and the data in this chapter is clustered according to the three research questions outlined in chapter 3.

Chapter 6 discusses the research results presented in chapter 5 against the theory base reviewed in chapter 2. This chapter is structured according to the research questions and provides answers to each of the three questions. A model on interrelations between driving forces, low carbon economy sectors and market based instruments is presented.

Chapter 7 serves as a formal conclusion of the research and presents its key findings, recommendations for stakeholders, managerial implications and recommendations for further research.

## 2 Chapter 2: Literature Review

### 2.1 Introduction

Most literature in this field, as reflected in the sub-sections below has focused on the impact of environmental regulation on enhanced innovation, on competitiveness (Ambec, Cohen, Elgie, & Lanoie, 2011), on economic effectiveness and on investment decisions (Gerasimchuk, 2010). Most of these reflections are based on the Porter's Hypothesis that asserts that proper environmental regulation and effective compliance inevitably yields economic benefits (Ambec, Can Environmental Regulation be Good for Business? An Assessment of the Porter Hypothesis, 2006).

This literature review looked at the inception of the sustainable development architecture which has in recent years evolved to encompass the concept of Green Economy (UNEP, 2011), Green Growth (OECD, 2011) or Low Carbon Economies (Stern, 2006) all of these terms are used to describe one overarching principle, being the enhancement of environmental sustainable practices in economies to reduce carbon emission, protect natural resources while making a significant contribution to development objectives such as employment creation, poverty reduction, local industry creation and creation of new markets.

This research was aimed at extracting lessons for South Africa, and the country has adopted the phrase low carbon economy in its economic growth objectives. For example the South Africa faces urgent developmental challenges in the country's national development plan states that " By 2013, South Africa's transition to an environmentally sustainable, climate-change resilient, low-carbon economy and just society will be well under way" (NPC, 2012, p. 199). Among other interventions, the plan mentions the implementation of targeted carbon pricing mechanisms as one of the key interventions towards reaching the 2030 vision on a low carbon economy.

The review further focused on the use of market based instruments in encouraging sustainable behaviour while meeting the objectives of a low carbon economy transition. It looked deeper into four of the five BRICS countries (i.e. South Africa, India, Brazil and China) as a unique group of countries based on their status in the UNFCCC negotiations. Content was gathered from a number of research reports

that have studied the specific characteristics of the BRICS group of countries in relation to sustainability characteristics. For example, Zhang (2010) assessed China's unique characteristics and found that the large population size of China could be an advantage for an effective carbon price. This he pointed out would save millions of tonnes of carbon emissions and therefore benefit the creation of a good emissions trading scheme.

## **2.2 Transitioning to a Low Carbon Economy**

Environmental concerns and tightened environmental policy parameters have been associated with the notion of additional costs of compliance rather than with innovation and sustainability (Cerin, 2006). This point was countered by May (2006) who argued in favour of the Porter's Hypothesis that environmental regulation and compliance have led to industrial innovation. These differences in views of environmental regulation being a cost to and burden for economical growth versus environmental regulation stimulating innovation and industrial and economic growth has been marked in the literature on environmental regulation and sustainable growth (May, 2006).

The impact of environmental regulation, positively or negatively, on industrial development therefore has been widely covered in the literature. However, the extend and full understanding of the actual costs of environmental utilisation and regulation, and incorporation of these costs in economic micro and macro analysis models, has seldom been dealt with in detail (Cerin, 2006).

One of the recent attempts at doing so was outlined by the United Nations Environment Program (UNEP) highlighting a new dynamic in sustainable development focusing on issues of market creation, employment creation and economic development (UNEP, 2009). UNEP's report was released in the midst of the financial crisis, and their Global Green New Deal provided a sustainable alternative to the utilisation of the global economic crisis stimulus packages. These stimulus packages provided by different governments were viewed as having a potential to provide the critical mass of green infrastructure needed to seed a significant greening of the global economy and thereby utilising credits from such

green infrastructure programmes to ignite national and international carbon markets (UNEP, 2011).

Nadec (2009) investigated ways in which governments could “through targeted investment, regulation and policies create a framework for the transition to a low carbon, environmentally friendly, sustainable economic future” (Nader, 2009, p. 3951). Nader argued that economic growth remained and will remain the key priority of all countries and that since this growth was increasingly being measured by a country’s effectiveness in protecting its natural resources and reducing its carbon emissions, that it was inevitable for countries to start adopting market related carbon reduction policies. He used the case of Masdar City in Abu Dhabi to reflect how the city had undertaken initiatives to reduce their carbon emissions (Nader, 2009).

Environmental resources have been considered as natural capital with no specific owner, governments function as custodians of these common pool resources and therefore bear a responsibility to ensure that they are used for the benefit of all and not overly exploited. This has remained a challenge for most governments and as reflected by Ambec & Lanoie (2008) most economists tend to use environmental resources at zero cost and neglect their greater cost to society. This zero cost approach has in many instances led to over exploitation and unsustainable use, the intervention of government through regulation in these instances could be considered as most suitable.

The introduction of market-based instruments such as pollution permits, green taxes and incentives have been met with mixed reaction by private sector, governments and civil society organisations with certain sectors viewing it as a necessary approach to deal with market failures by providing incentives for continuous innovation, and other proponents viewing it as ways to stifle competitiveness and growth through the increase of production and operating costs. (Ambec & Lanoie, 2008).

Better environmental performance by organisations has been associated with lower regulatory costs when considering costs associated with litigation in cases of non-compliance and potential fines or even higher environmental taxes. This notion was elaborated by Farinelli et al (2005) when they compared market based instruments

to promote energy efficiency where the authors demonstrated that the advent of trade liberalisation where most state energy companies were privatised has brought about the reduction in command and control mechanisms and the introduction of economic instruments that would take care of externalities (Farinelli, et al., 2005).

### **2.3 Market Based Instruments**

Following challenges in environmental governance globally, environmental scientists and environmental authorities shifted attention from government-driven regulatory interventions for environmental governance, to include other initiatives that were aimed at promoting voluntary action. In this regard a prominent feature has been the adoption and use of market mechanisms. The implementation of such mechanisms had spread from developed countries into the multilateral platform and had recently also found their way into the macro-economic policy space of developing countries (Economy, 2006).

A range of innovative instruments was introduced into the market and Economy (2006) clearly outlines the mix of such instruments which included market-based instruments, larger responsibilities and tasks for private sector, public-private partnerships in environmental governance, economic valuation techniques and approaches, a stronger reliance on environmental taxes (e.g. on water, energy, pesticides). Carbon tax can be called a tax on carbon or an environmental tax that is mostly levied on carbon content of the fuel. The fundamental concept behind carbon tax is to prevent the over use of fossil fuels and limit it to a certain level. In addition it helps to pave ways for non-carbon or less carbon technologies (Stavins, 2003) .

Stern (2009) and the Stockholm Environment Institute (2011) described climate change as a greatest market failure ever because market mechanisms that have been put in place by its international regime, the UNFCCC, were not seen to adequately internalise costs of carbon emissions. The authors therefore identified a need to place higher prices on carbon through different market based mechanisms thereby providing an incentive for governments, companies, and individuals to produce and consume less carbon-intensive goods and services, and to undertake

innovative reduction opportunities. By making pollution rights explicit and transferable through effective emission trading schemes, the market would be able to value and trade these rights thereby ensuring that emission reductions occur wherever they are cheapest.

The efficiency of environmental taxes has been regarded as being weakened by factors such as infrastructure lock-in, which reduce the flexibility to substitute polluting activities/fuel sources with cleaner alternatives. This underscores the importance of supplementing any price mechanism with other policy instruments, like subsidies for research and development (R&D) or efficiency standards, to increase the possibilities for substitution. Environmental taxes can and should be designed, marketed and implemented to address public and business concerns without jeopardising environmental objectives. (Stockholm Environment Institute, 2011)

Farinelli et al (2005) studied the white and green certificates traded on the open market in Europe. Using white certificates, energy producers undertake the promotion of energy efficiency among their end users who then measure the annual percentage of energy savings. Energy savings are then certified through the issuing of white certificates that can be exchanged or traded on the market. The punitive element of this measure has been that generators unable to submit their efficiency savings certificates were then subjected to sanctions at prices higher than the estimated market value.

Green certificates on the other hand are awarded for renewable energy generated electricity, the application of this is through the provision of verified figures for amount of renewable energy generated by the producer or used by the consumer and these certificates can also be traded through the market (Farinelli, et al., 2005). According to Freitas, Dantas, & Lizuka (2011) the Kyoto Protocol financial mechanisms may have supported the spread of existing technologies. They use renewable energy as one such example therefore supporting the point made by Farinelli (2005) that mixed applications of such mechanisms contributed to a quicker spread and use.

Market-based mechanisms were regarded by Murphy, Drexhage & Wooders (2009)

as having to play a large role in the global effort to address climate change under the United Nations Framework Convention on Climate Change (UNFCCC). The Kyoto protocol to the UNFCCC, adopted in 1997 identified three such instruments, namely the International Emissions Trading (IET), Joint Implementation (JI) and the Clean Development Mechanism (CDM). These mechanisms were aimed at assisting developed countries meet their carbon reduction targets through the creation of a carbon market.

CDM is the one carbon mechanism that was targeted for developing countries that were listed under annexure 2 of the protocol (Murphy, Drexhage, & Wooders, 2009). Of the five BRICS countries (Brazil, Russian Federation, India, China and South Africa), four were classified as non-annexure 1. Russian Federation is the only country that is classified under Annexure 1 and hence has been excluded from the scope of this study.

The carbon reduction market mechanisms were designed to facilitate the meeting of carbon reduction targets by countries in a cost-effective manner, encourage the private sector to contribute to Greenhouse Gas (GHG) emission reduction efforts, and encourage the participation of developing countries as well as stimulate sustainable development, technology development and transfer and foreign direct investment (Murphy, Drexhage, & Wooders, 2009).

An assessment by the Stockholm Environment Institute (2011) asserted that the carbon markets could not yield success on their own and that the prices on fossil fuels needed to be raised further, either through taxes or tradable permits systems. The Institute further observed that using the carbon markets and emission permits in combination could yield maximum impacts in reducing carbon emissions. This combined benefit would be due to a situation where carbon taxes would act indirectly to reduce demand and thereby emissions while emissions permits limit emissions directly by defining and restricting the available amount of emissions permits (Stockholm Environment Institute, 2011)

The development of carbon markets has been widely criticised by environmental lobby groups as a shifting of the problem rather than a solution. They claim that carbon markets effectively amount to permits to emit or credits to not emit.

MacKenzie (2009) described the inception of market based instruments, and further analysed the different viewpoints expressed by stakeholders. He proposed the development of policies for market design focusing on tools for making such markets work effectively. This assessment by MacKenzie (2009) raised a question of whether or not carbon markets and other economic instruments should be made to be suitable for certain sectors of economies or mainly focus on the ultimate goal of any economy, which is to increase economic growth. Or, as in the context of the research objectives of this report, to ensure that growth happens in a way that enhances the transition to a low carbon economy by a specific country.

Carbon tariffs (or border tax adjustments) have been proposed through the international climate regime as a measure to eliminate any unfair advantage from low-carbon prices, where certain countries might not have implemented market mechanisms that put a premium on carbon emissions. This tax is essentially a tariff on the carbon embedded in imports, bringing the price of the embedded carbon up to the importing country's standard. Large-scale emissions leakage can only occur in industries that are both internationally competitive and highly carbon-intensive (i.e. energy intensive, primary materials industries). Proposals have therefore focused on targeting policies specifically at such industries, where international differences in carbon prices could continue (Zhang, 2011).

#### ***2.4 Characteristics and Practices in BRICS countries***

The Stern Review on the economics of climate change pointed to the need for all countries to go through certain structural adjustments and to do so with the flexibility to adapt to rapidly changing circumstances. The notion of a transition to a low carbon economy brings with it a need for changes in macroeconomic policy approaches, this need was viewed as an opportune occurrence for BRICS countries by Stern (2006) as they are viewed to be in the process of redefining their place on the global economic space (Stern, 2006).

Academic literature on low carbon economy in BRICS countries has focused on institutional mechanisms and reorganisation of these economies and this research project adds a previously unexplored element that focuses on a growing area of regulation in the sustainability arena. May (2006) conducted a brief comparative

summary of major development and environmental indicators in BRICS Countries and found that pressures on resources and society in the areas of education, resource availability and equitable access of resources stifle the rate at which these countries can transcend to green economies (May, 2006). Tanazian, Chousa & Vandlamannati (2009) added to this work by focusing on the adoption of policies that enhance trade liberalisation mainly in technologies and services aimed at reducing environmental degradation between the group of countries (Tamazian, Chousa, & Vadlamannati, 2009).

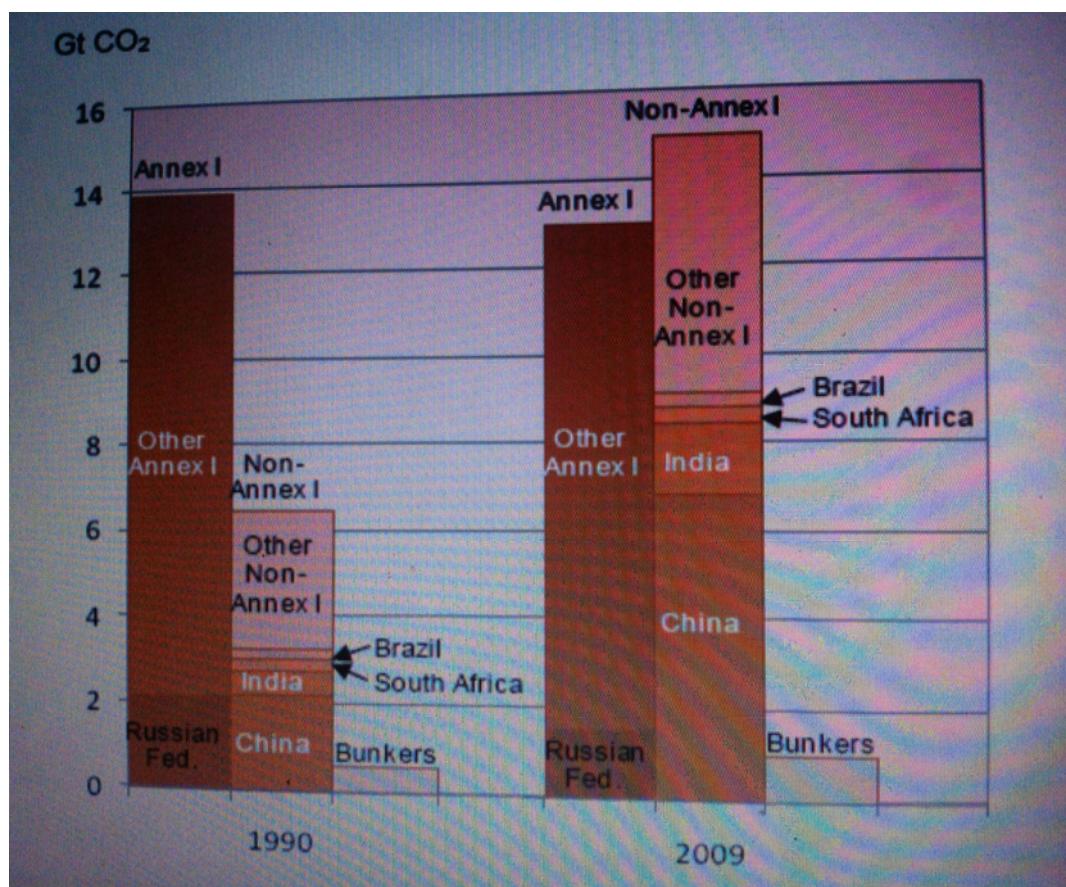
Flavin (2008) pointed out that energy needs of emerging countries such as India and China had accelerated over the past five years as these economies have entered the most energy-intensive stages of their development, mainly composed of large infrastructure programmes. This, according to Flavin has resulted in the equivalent hike in their percentage contribution to global carbon emissions.

China and India have since 2006 contributed close to 40% of global carbon emissions, and they are responsible for more than 60% of the total carbon dioxide that fossil fuel combustion has added to the atmosphere since the Industrial Revolution began. This picture is said to be changing, particularly in China, where emissions are now rising at 10% a year and, according to Flavin (2008), at 10 times the average rate in industrial nations. This point was further asserted by Jiang, Sun, & Liu (2010) who pointed out that China's emissions had increased from 3.8 billion tonnes of CO<sub>2</sub>eq in 1990 to 8 billion tonnes in 2010. The authors also estimated that half the growth in energy-related emissions until 2030 will come from China. It can therefore be assumed from these facts that these countries are able to influence global policy should they chose to fully pursue the introduction of market mechanisms in their low carbon policy architecture.

According to May (2006), the BRICS countries, represented 43% of the world's population, 30% of its terrestrial land area, and the carbon emissions were at 2.5 t/yr per-capita, which was approximately two-thirds of the global mean. These societies have become more fossil fuel dependent and it is feared that the elevated growth rate of 8.0% which is double the global average. This high growth rate, coupled to the energy intensity of these countries' growth trajectories would translate to an increase in their carbon intensity.

All the countries in the block are therefore working on low carbon economy strategies that are aimed at ensuring the elevated percentage growth rates while reducing their carbon dependence (May, 2006). Except for the Russian Federation, all other BRICS countries have reflected an increase in energy related emissions from 1990 to 2009 (Treaton, 2011). As reflected in figure 1, the BRICS countries hold most of the global share of carbon emissions, however as reflected in the country specific literature, each of these countries has had different emissions profiles, sources as well as consumption demands and patterns.

**Figure 1: BRICS Countries share of carbon emissions in the world between 1990 and 2009 in Giga tons of Carbon Dioxide emissions (GtCO<sub>2</sub>) (Treaton, 2011, p. 21)**



In a review of existing and proposed emissions trading systems conducted for the International Energy Agency, Hood (2010) pointed out that “Putting a price on greenhouse gas emissions is a cornerstone policy in climate change mitigation” (Hood, 2010, p. 6). She emphasized that the absence of price measures would make

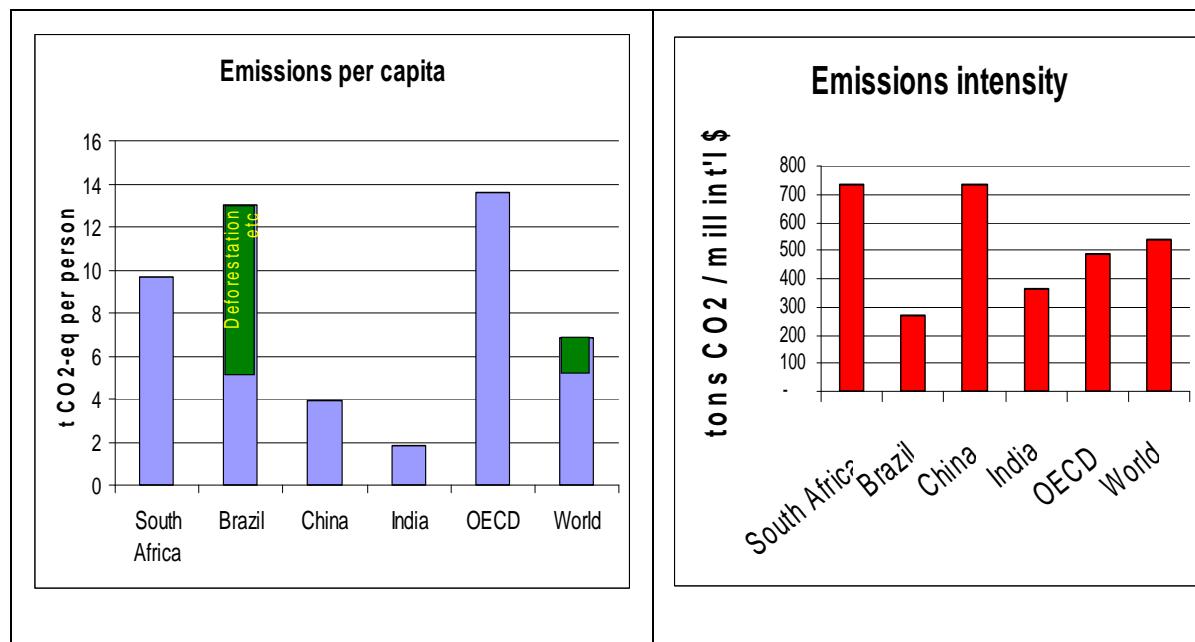
it difficult and expensive for countries to implement the economic transformation required to reduce global carbon emissions to acceptable levels. Energy sector carbon emissions are said to account for two thirds of the world's total anthropogenic emissions and the sector would therefore be a critical target for reductions (Hood, 2010)

#### 2.4.1 Practices in South Africa

South Africa is a high-energy intensive country with about 85 % of its energy still arising from fossil fuels (Winkler & Marquand, 2009). This high fossil fuel based energy intensity means that carbon emission reduction efforts would be complex and involve tradeoffs with other development imperatives (NPC, 2012). The country's development challenges with an inequality gap being one of the highest in the world at Gini Coefficient of 0.70, however the NPC noted the inevitable tradeoffs and called for the careful design and sequencing of decisions [that would] ensure that the decline of legacy sectors, such as coal-fired electricity generation, are balanced by concurrent growth in green economy sectors" (NPC, 2012, p. 199). Winkler & Marquand (2009) examined ways in which the alternative conceptions of a development path in South Africa could be achieved.

Relative to its population size, South Africa's carbon emissions are very high and as demonstrated by DEAT (2007), figure 2 shows that South Africa's emissions intensity per GDP is high compared to China, Brazil (if emissions from deforestation and land use change are not included) and India. The use of per capita as a measure results into countries with relatively large populations like China and India who are also coal based energy economies. Figure 2 reflects that South Africa's emission intensity exceeds the global average and this places the country in a unique position in terms of global climate change reduction efforts.

**Figure 2: South Africa's emissions per capita and emissions intensity compared to other BRICS countries and the world average (DEAT, 2007, p. 5)**



Winkler & Marquand (2009) explored three elements that they considered valuable in strengthening the low carbon transition objectives in South Africa, and they outlined such elements as; a) the energy efficiency potential in the short term, b) the longer term changes in the energy fuel mix which would prove extremely difficult considering the country's high reliance on mineral resources and, c) the more dynamic transformation of the economic structure. This longer term transformation that Winkler and Marquand refer to could be composed of a substantial component of market mechanisms in the county's low carbon policy framework to allow market forces to push the desired change in the right direction (Winkler & Marquand, 2009).

Van Heerden et al (2006) who investigated the potential for a double or triple dividend in the economy if the revenues raised from an energy-related and carbon reduction environmental tax were to be recycled to households and industry through lowering existing taxes. They analysed and compared the four environmental taxes namely; environmental taxes, being a) a tax on greenhouse gas emissions, b) a fuel tax, c) a tax on electricity use, and d) an energy tax with the three revenue-recycling schemes, namely; a) a direct tax break on both labour and capital, b) an indirect tax break to all households, or c) a reduction food prices.

The result of their investigation was that there was a potential triple dividend in a) decreasing emissions, b) increasing GDP, and c) decreasing poverty when any one of the environmental taxes was recycled through a reduction in food prices (van Heerden, et al., 2006). Given South Africa's development challenges, such an approach if applied would have a positive contribution to the country's growth objectives. The South African National Treasury (2009) developed an environmental fiscal policy paper on market-based instruments to Support environmental fiscal reform in South Africa. The paper provides a guiding framework and criteria for developing and assessing environmentally related tax proposals (National Treasury, 2009). Since 2009, South Africa has introduced range of taxes that range from electricity tax generated from non-renewable energy sources to energy efficiency tax incentives.

#### 2.4.2 *Practices in China*

The People's Republic of China is the fastest growing economy in the world and the second largest by market size after the United States of America. Jiang, Sun, & Liu, (2010) estimated that by 2030 China could account for half of the world's emissions. The authors asserted that China's ambitions to grow its low carbon economy as it attempts to reduce emissions meant that it was also likely to be a world leader in low-carbon development and the global carbon markets.

Based on the IEA assessments on China's fossil fuel based carbon intensity and the predicted increase in its carbon intensity China has been viewed as one of the critical countries that would make a positive dent in climate change mitigation (Treaton, 2011). Zhang (2010) made a related observation by pointing out that China could not afford to be inactive in the low carbon economy area and that international forces were not going to allow China to continue on its trajectory of encouraging economic growth which is often at the expense of the environment.

Instead, Zhang (2010) argued that China needed to transform its economy to effectively address concern about a range of environmental problems from burning fossil fuels and steeply rising oil import and international pressure on it to exhibit greater ambition in fighting global climate change. He assessed China's efforts towards energy saving and pollutants reductions, the use of renewable energy and

the country's well acclaimed participation in clean development mechanism to reduce its carbon emissions and concluded by recommending issues related to energy conservation and pollution control, wind power, nuclear power and clean coal technologies and articulates a roadmap for China regarding its climate commitments to 2050 with clear deliverables on the adoption of a range of market-based instruments (Zhang, 2010).

Since 2010, China had expressed concern over possible imposition of unilateral carbon price measures by other countries that would result in potential loss competitiveness (Zhang, 2011). At the international level, cutting China's CO<sub>2</sub> emissions in exports therefore creates a new impetus for strengthening international coordination on climate change and establishing a global carbon price framework.

The absence of a global carbon price had failed to internalize the carbon costs. Given that the internalization of carbon costs would send a clear signal to both producers and consumers, international coordination of carbon prices has been expected to ensure that the costs of carbon emissions embodied in traded goods be reflected in the price to the consuming countries as well as those goods for domestic use (Zhang, 2011).

Zhang (2011) concluded that though the international community plays a major role in market instruments, it was imperative for China to start from selected sectors while considering that the country needs reasonable length of time to develop and operate a national carbon market.

China was viewed as having the potential of extending its offsets program to gradually access the global carbon market. This would eventually drive down the transaction costs while building monitoring and reporting capacities for such a trading regime in the future (Jiang, Sun, & Liu, 2010). This suggest that china could concurrently run the two carbon pricing systems where a national carbon tax would be implemented in conjunction with cap-and-trade until such time as China chooses to join an international emissions trading regime.

According to Economy (2006) the most explicit attempt by the Chinese government to use the changing nature of the Chinese economy to advance environmental

protection may have been the effort to promote market-based tradable permits to control a range of emissions especially Sulphur Dioxide ( $\text{SO}_2$ ) considering the fact that acid rain is one of the key environmental challenges that has visible impact on economic activity and infrastructure.

As quoted in Economy (2006) Wang et al. (2004) described how China initiated a Total Emissions Control (TEC) policy, in which the government annually set caps for total emissions throughout the country, and divided the target among the provinces, autonomous regions and municipalities, who were then responsible for assigning their own TEC targets to local governments or emission contributors, with this policy China already began conducting trials in emissions trading at that Emission trading has been regarded as a critical means of cutting carbon emissions and there is a sizeable number of advantages for this market based mechanism, most notably being its ability of allow industry and organisations to chose the most appropriate method of emission reductions thereby yielding economic benefits through avoidance of buying permits (Shuwen, 2004).

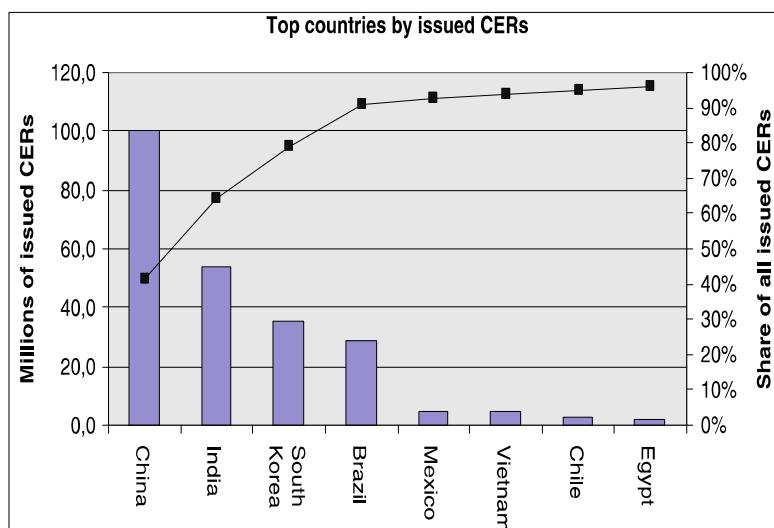
#### 2.4.3 *Practices in India*

In 2009, India was the fourth largest energy consumer in the world, after the United States, China, and Russian Federation. Similar to China, South Africa and Brazil during the global economic slowdown (Zhang, 2010) (Winkler & Marquand, 2009), India's energy demand continued to rise and as the increase in vehicle ownership and industrial manufacturing capacity continues to grow it is expected that the petroleum demand will grow exponentially in the coming years. While India's domestic energy resource base is substantial, the country continues to rely on imports for a considerable amount of its energy use (Benecke, 2009).

Through the substantial implementation of the CDM projects in India, where India in 2009 had a total of 1,158 CDM projects, with 26.5% of the CDM project market share worldwide (Fenhann, 2007) as reflected in figure 3, the country has managed to make progress in developing a functional local carbon market. However Benecke (2009) argued that there were repeated concerns over the efficient working of the

CDM, its distributional quality, its effectiveness in meeting broader societal goals and its impacts on sustainable development.

**Figure 3: CDM Certified Emission Reductions issued by 2007 (Fenhann, 2007)**



The author asserted that India presented a case of market-dominated carbon governance that occurred under weak hierarchical architecture and minimum civil society involvement and this, he argued, presented a fatal flaw in its and other market mechanism's future both at a national and local perspectives.

Benecke (2009) further noted the visible lack of forestry projects in India's carbon reduction projects that are registered under CDM despite the substantial carbon reduction potential of this sector. He attributed this omission to regulatory complexities and obstacles especially at the international but also at the local levels, uncertainties with regard to forest ownership and the lack of data as well as sector awareness.

In 2008, the Indian Prime Minister's council adopted a National Action Plan on Climate Change (NAPCC) which laid down principles that led to the adoption eight climate missions of India developed and implemented by specific ministries. Kakhijani & Ochs (2010) analysed these missions and provided an expert perspective on their implications for India's low carbon development path. One of these missions involves the promotion of energy efficiency and it is under this

mission where the application of market based instruments was identified as strategic for the country (Makhijani & Ochs, 2010).

#### 2.4.4 *Practices in Brazil*

In December 2009 the Brazilian Parliament adopted a National Climate Change Policy, which aimed to reduce the country's carbon emissions while ensuring the resilience of its natural resources. A significant element of the country's policy has been the phasing in of market based instruments, especially because Brazil is the country that first proposed CDM as an international market based mechanism to benefit developing countries into the international climate change regime (de Gouvello, 2010).

As reflected by Treaton (2011) and DEAT (2007), compared to other BRICS countries, Brazil as the world's largest tropical country is unique in its carbon emissions profile. India, South Africa, China and the Russian Federation's emission profiles are dominated by burning of fossil fuels for energy generation while Brazil's profile is dominated by deforestation and land-use change activities. The availability of large volumes of land suitable for crop cultivation and pasture allowed economic transformation where agriculture and livestock became key sectors for sustaining the country's economic growth.

However, the growth of these sectors resulted in the expansion of crop land which required the conversion of more land therefore resulting in making land-use change activities becoming the country's main source of carbon emissions. According to Ellis, Baker, & Lemma (2009) at the time, 45.8% of the energy portfolio in Brazil consisted of renewable energy compared to the global average of 12.9%. The electricity sector had 77.3% of generation capacity coming from hydro, 3.6% from natural gas, 2.8% from oil, 2.5% from nuclear, 1.3% from coal, 3.5% from biomass and 1.0% from industrial gases, and imports were 7.9%. Compared with South Africa where 95% electricity generation is coming from coal, Brazil's energy mix is dominated by hydropower and according to Treaton (2011) Brazil is exploring further diversification into nuclear energy. Therefore the Country's emission reduction approach, including the adoption of market based instrument has been targeted at correcting the damage caused in this sector while ensuring its long term

sustainability (de Gouvello, 2010).

Brazil also made progress in the implementation of market based instruments through CDM projects. The country is responsible for about 7% of all CDM projects in the world (Treton, 2011), however even with the adoption of a national climate change policy there is no specific fiscal regulation for carbon credits obtained from CDM projects and other environmental taxes and incentives, this he noted, could be one of the major reasons why the development of an effective carbon market in Brazil would be complex and long (Flavin, 2008).

De Gouvello (2010) concluded by asserting that Brazil would require large volumes of investment and incentives, which may not be sufficiently covered by national action alone and would require international action. The author further asserted that for Brazil to fully benefit from opportunities presented by carbon emission reduction actions, market based instruments would not in themselves be sufficient and that public policies and planning would be important, with careful management of land competition and forest protection at the forefront.

## 2.5 Implementation Challenges

An assumption that environmental protection policies result in additional costs to economic activities has been challenged by researchers over the past two decades (Ambe & Lanoie, 2008). A more comprehensive assessment of the mutually beneficial relationship by (Ambe & Lanoie 2008) assessed the benefits in market access, product differentiation, selling of pollution control equipment, risk management and relationship with external stakeholders as well as costs of capital labour and material. This was an improvement from the work done by Ambe (2006) which was mainly a broad analysis of whether or not environmental regulation was good for business and failed to explore specific elements of a business process to better explain the perceived benefits.

The authors argued that environmental regulatory requirements often redirect attention of managers from key business activities and that at times introduction of resource efficiency measures can increase the cost of production and material. However there has been a significant benefit to responsible action through financial

and economic gains in other areas such as improved customer loyalty, increase in demand of products due to an increasing citizen awareness on limitations of the natural environment, increased energy efficiency and reduced disposal costs (Ambec & Lanoie, 2008). While Ambec & Lanoie (2008) did substantive work on demonstrating that the Porter's hypothesis was correct.

There has however been a key gap in their work because they used a general notion of environmental compliance. Farinelli et al (2005) was more specific by focusing on at renewable energy and energy efficiency instruments. Cerin (2006) added to the debate by arguing that Porter's hypothesis was based on false examples; he added that environmental regulation by itself did not necessarily stimulate innovation. And that there were other factors that needed to substantiate regulations.

Torres & Pinho (2011) added a further implementation challenge of the level and extent of involving local authorities in localised emissions trading schemes that would ensure the vibrancy and effectiveness of the carbon markets within national boundaries. The authors proposed the introduction of local cap and trade systems that will ensure that local governments directly benefited from their emission reduction efforts (Torres & Pinho, 2011).

## 2.6 Conclusion to Literature Review

From the literature analysed, a direct comparison between the countries would not be ideal because of different national circumstances that inform their emissions profiles and their related responses to such circumstances. The literature has revealed that market based instruments have a significant role to play in transitioning to low carbon economies and that the implementation of such instruments need to be done in a balanced manner that considers unique development challenges of each country and that such instruments alone cannot be enough and will need to be complemented by other mechanisms and approaches.

Table 1 present a summarised view of the theory base reviewed in this chapter and its linkages to the research questions.

**Table 1: Summary of literature review – value added by this research to theory base**

Research questions	Current theory base	Authors	This research's contribution to theory base (gaps in current)
• What is the status of implementing market based instruments for a low carbon economy transition in South Africa, China, India and Brazil?	Low carbon economy characteristics and practices in BRICS countries  Emissions intensities in comparison with other countries	(Hood, 2010) (van Heerden, et al., 2006) (Zhang, 2011) (Benecke, 2009) (Economy, 2006) (Winkler & Marquand, 2009) (de Gouvello, 2010) (Jiang, Sun, & Liu, 2010)	- Kinds of instruments being implemented and planned in the selected BRICS Countries
• What are the factors informing adoption of market based instruments in transitioning to a low carbon economy?	Special country circumstances leading to emissions profiles and intensities	(Stern, 2006) (Cerin, 2006) (Farinelli, et al., 2005) (Freitas, Dantas, & Lizuka, 2011) (Gerasimchuk, 2010) (Ambec & Lanoie, 2008)	-Underlying reasons for countries decisions to adopt market based instruments  - Priority sectors for implementation of market based instruments and how such sectors get selected  - A model for decision makers to use in considering the adoption of market based instruments
• What lessons can South Africa take from the experiences of India, China, and Brazil in the implementation of market-based instruments	Low carbon economy policy approaches  Fundamental components of a low carbon economy Issues to consider in implementing market based instruments	(Zeng & Zhang, 2011) (Cerin, 2006) (Ambec, Can Environmental Regulation be Good for Business? An Assessment of the Porter Hypothesis, 2006) (Fennann, 2007) (May, 2006) (MacKenzie, 2009) (Farinelli, et al., 2005) (Flavin, 2008)	- Model of interrelations that guides selection of ideal market based instruments

This theory is analysed in chapter 6 within the context of the research findings and conclusions in chapter 7 are drawn from the combination of literature that has been reviewed and findings of the empirical component as presented in chapter 5.

### 3 Research Questions

#### **3.1 Introduction**

This research aimed to explore whether market based instruments played a role in a country's transition to a low carbon economy. Through the practices in selected BRICS countries, the study determined factors that inform adoption of market instruments and drew lessons for South Africa to consider in its transition to a low carbon economy.

The questions answered in this study are as follows:

#### **3.2 Research Question One**

What is the status of implementing market based instruments for a low carbon economy transition in South Africa, China, India and Brazil?

#### **3.3 Research Question Two**

What are the factors informing adoption of market based instruments in transitioning to a low carbon economy?

#### **3.4 Research Question Three**

What lessons can South Africa take in the implementation of market base instruments for a low carbon economy transition?

## 4 Methodology

### 4.1 Introduction

This chapter provides the methodology used to answer the research questions as outlined in chapter 3. This is an exploratory qualitative research and a content analysis was carried out to effectively analyse the data collected.

The chapter follows from chapter 2 which provided the theory base and understanding of why this research is necessary. The chapter begins with an elaborate explanation of the research design and scope; followed by sampling methods, data collection and analysis procedures. The chapter concludes by identifying the research limitations.

### 4.2 Research Design

According to Sounders & Lewis (2012, P.141), a structured interview is one that uses a questionnaire where each person is asked a standard set of questions in the same order. A structured interview in the form of a questionnaire was therefore selected as the most suitable method for use in this study because it ensured that a comparison on the implementation of economic instruments in selected BRICS countries was conducted based on similar characteristics and therefore provided a structured result for analysis.

The first question aimed to establish an understanding of the implementation of market based instruments in a low carbon economy transition; the second question aimed to determine factors informing selection of market based instruments. According to Sounders & Lewis (2012) questionnaires can be distributed face to face, by telephone, by hand, by post and by web. Therefore based on the wide geographic location of the potential respondents a web based distribution approach was conducted (Saunders & Lewis, 2012). The survey monkey web system was used where respondents received e-mail communication that contained the web link for the questionnaire. Each respondent had to read the questions and record their own data on the system.

The third research question was aimed at extracting lessons for South Africa to consider in its transition to a low carbon economy. To effectively answer the third

research question, an extended assessment of available literature and data using the six thinking hats of de Bono were utilised as a guiding model. The approach to the extended literature and data analysis was through the six thinking hats of de Bono provided a guide of themes to be extracted from the literature and research results (van Assen, van den Berg, & Pietersma, 2009).

### **4.3 Population and Sampling**

#### **4.3.1 Population**

The study population was composed of senior professionals in the low carbon economy or sustainability sector, researchers, private sector experts and government negotiators from the selected BRICS Countries. Even though BRICS stands for Brazil, Russian Federation, China, India and South Africa, this research project excluded the Russian Federation.

The exclusion of Russian Federation was due to two reasons, first one is the limitations in accessing participants from this country and secondly when considering the international climate change regime which is more relevant to this project, Russian Federation has been classified as an annexure 1 country with all the other developed countries. This difference in classification imply that instruments implemented by countries in that classification are not the same as those implemented by developing countries who are regarded as non- annexure 1, where the other four BRICS countries are classified.

Brazil, China, India and South Africa were selected for this study because of their circumstances and role in the global climate change negotiations and the pressure that these countries face in showing ambitious carbon emission reduction measures. The special treatment of these four countries emerged in 2009 at the Copenhagen climate change negotiations, formerly known as the 15<sup>th</sup> session of the conference of parties to the United Nations framework convention on climate change and the 5<sup>th</sup> meeting of parties to the Kyoto Protocol (UNFCCC COP 15/CMP 5) (Bodansky, 2010).

At this round of negotiations, serious attention to developing country GHG emissions mainly because major developing countries, referring to China, India,

Brazil and South Africa, emissions represented more than half of the global total emissions. Noticing the eminent shift in global climate change negotiations, the four countries formed a negotiating alliance block called BASIC and has since been negotiating as a united force on issues of common interest (Bodansky, 2010). It was therefore interesting to explore low carbon reduction practices in these countries based on their similar circumstances in the global climate change regime.

#### *4.3.2 Sampling Unit and Technique*

A sample of individuals was first selected from the population described under subsection 4.3.1. The country embassies were given the flexibility to propose alternative participants based on relevance and their own assessment of best potential participants.

A Non-probability quota sampling was selected because there was no full list of participants and the selection of individuals who responded to the research questions was the sole discretion of the government departments in the BRICS countries, this approach was in line with the definition of non-probability sampling provided by Saunders & Lewis (2012, p. 134).

#### *4.3.3 Sample Size*

A total of 14 respondents from the four countries were selected for this research. Based on the high level nature of respondents, the data collection technique took the form of expert interviews and according to Sounders & Lewis (2012), a selected small number of experts is appropriate to extract insight and experiences. All the 14 respondents specialise on an element of low carbon economy policy making and implementation. Out of the 14 respondents, six were from South Africa while the remaining eight were spread between China, India and Brazil. It was necessary to obtain more responses from South Africa compared to the other countries in this study in order to clearly identify areas where lessons could be applied.

#### 4.4 Data Collection

Secondary data used in this research was collected through desktop research of electronic databases, textbooks and research reports. The low carbon economy and climate change is subject of a number of international processes and therefore most information in this area is contained in United Nations and other international institutions' publications. However this study attempted to use such sources to the minimum and focused on peer reviewed journals. Most of the literature used has been gathered and published over the past six years to ensure relevance usefulness.

Primary data was collected through the distribution of structured questionnaires through an email hyperlink to specific participants as identified by country embassies. Initial meetings with embassy personnel, scheduled through the South African Mission to the United Nations in New York was conducted in May 2012 and through those meetings contact details of suitable respondents were presented. Email communication with the hyperlink to the questionnaire which also contained the promise of confidentiality was sent out in June 2012, questionnaire is attached as appendix 1 (Saunders & Lewis, 2012).

The research questions in the questionnaire evolved from the main research questions. Each of the three research questions were broken into different components that were to ultimately provide an acceptable answer from each respondent. Multiple phrases that mean the same thing were used in the questionnaire to ensure that each respondent understands the question from their own perspective. An example is the use of a phrases low carbon economy, green economy or green growth. Different countries and institutions have adopted the use of these terms interchangeably.

#### 4.5 Data analysis

To ensure effective analysis of data from the interviews and extended literature review, a content analysis approach was used. In this analysis approach, all relevant gathered data was categorised into major themes of the project and the identification of core consistencies and meanings was analysed. Themes used in

the literature review were used for the categorisation and such themes are discussed in the section dealing with results (Welman & Kruger, 2005).

The approach was used in order to achieve a balanced data analysis process where both objectivism elements and subjectivism are considered. According to Silverman 1998, objectivism in quantitative research methods is when concepts and issues are defined and considered “out of existence whereas subjectivism is linked to the “authentic rush of human experiences” and it mainly presents tales of human experiences and might neglect to provide actual underlying facts.

Figure 4 presents a basic representation of the balanced approach that was taken in analysing the data (Silverman, 1998). Using the Survey Monkey software, all relevant data was categorised into themes used in the literature review and presented in three sub-sections that addresses each of the three research questions.

**Figure 4: Qualitative data analysis combining subjective & Objective Elements, adapted from (Silverman, 1998)**



The identification of both objective and subjective responses was done and both dynamics are clearly outlined in chapter 5. The first five questions in the questionnaire were factual in nature and therefore required objective responses where concepts and issues were defined and considered out of existence.

The remaining five questions were opinion based and required a subjective response based on the respondent's opinion and the analysis of data on this component mainly reflected perceptions and experiences of respondents and not necessarily based on factual information, this component was therefore supported by literature

review. Themes were developed from the responses and areas of commonality were identified and presented as part of the findings.

Survey Monkey online software was used to code and categorise the data. Graphs and tables were drawn from the software using the different functions that could cross tabulate different questions. The model on factors that lead to the selection of market based instruments was developed using coded data that demonstrated relationships between drivers of a low carbon economy.

#### **4.6 Research limitations**

This research project excluded the Russian Federation in the analysis of implementation in BRICS Countries mainly because it is categorised as an annex 1 country together with all the other developed countries in the Kyoto protocol. Therefore the Russian Federation's implementation of market based instruments in the transition to a low carbon economy cannot effectively be replicated in South Africa because of this different classification.

The study did not single out national from international instruments and rather grouped them all under one basket based on implementation by countries. The study scope did not include an assessment of whether countries being researched held different considerations for international mechanisms compared to national initiatives.

The study did not investigate the effectiveness of each instrument under implementation. The focus was to establish which instruments were being implemented and factors informing the selection of instruments.

## 5 Research Results

### 5.1 Chapter Introduction

This research was aimed at assessing the adoption of and contribution of market based instruments in low carbon economy transition in selected BRICS countries with a view to drawing lessons and areas of consideration by South Africa. This chapter outlines opinions of experts in governments of India, Brazil, China and South Africa as well as views of experts in South African business, Research and civil society sectors.

Findings from the questionnaire are presented in accordance to the research questions as follows:

- What is the status of implementing market based instruments for a low carbon economy transition in South Africa, China, India and Brazil?
- What are the factors informing adoption of market based instruments in transitioning to a low carbon economy?
- What lessons can South Africa take in the implementation of market base instruments for a low carbon economy transition?

To gather key lessons for South Africa in the effective implementation of market based instruments, an investigation into the use of such instruments in other BRICS countries and extracting applicable approaches and mechanisms that South Africa can take forward.

### 5.2 Method used in analysing questionnaire data

As outlined in sub-section 4.5, a content analysis approach was used in analysing the data collected through the on-line questionnaire. Using the Survey Monkey software, all relevant data was categorised into themes used in the literature review and presented in three sub-sections that addresses each of the three research questions. The identification of core consistencies, contradictions and meanings and elements of was conducted and an analysis of result is presented below.

### 5.3 Sample Description

A non-probability quota sampling was used in this research mainly because there was no full list of participants drawn beforehand and the selection of individuals who responded to the research questions was based on referrals due to field of expertise of respondents as well as own professional networks (Saunders & Lewis, 2012). All respondents were assured that their participation was to remain confidential, however to ensure a clear and logical presentation of information respondents have been referred to by country and organisation type in instances where quotes and graphical illustrations have been used. Table 2 below provides an overview of respondents' organisations and their areas of specialisation.

**Table 2: Overview of respondents' details**

Country	Response Count	Organisation and Field of Expertise
South Africa	6	Two senior officials from National Treasury, concerned respectively with tax policy and fund allocation
		A senior official from National Department of Environmental Affairs specialising in Director in Resources & Funds allocations unit
		A Chief Climate Change Negotiator
		A senior manager at World Wide Fund for Nature (WWF) focusing on the living planet unit issues,
		Member of the international CDM review committee
		Head of a Corporate Sustainability Unit of a large South African State owned Enterprise
India	3	Member of the National Planning Commission focusing on low carbon growth
		Head of Sustainability Unit at a Government Sustainability Utility
		Senior Government Official specialising in international climate change negotiations
Brazil	3	Senior official at the ministry of finance focusing on International Affairs
		Climate change and sustainable development negotiator from the Ministry if Environment
		Manager at the Rio de Janeiro Environment Secretariat (Green Economy)
China	2	Senior Official at the ministry of environmental protection focusing on Environmental development
		Senior official at the ministry of international affairs focusing on Climate Change negotiations

Much focus was placed on gathering responses from experts in the public sector mainly because the research focuses on the implementation of government policy in stimulating growth of the green sector. However to provide a different perspective to views by public sector experts, responses were also sought from participants in the research, business and NGO sectors, especially in South Africa. Table 2 indicates a sector spread of respondents where nine out of 14 respondents are from governments and related institutions while three were from research and/or academic institutions and the remaining two were from NGO and business sectors.

**Table 3: Respondents per sector**

Sectors	Response Percentage	Response Count
Government	64.3%	9
Research/ Academic Institution	21.4%	3
Business/Private Sector	7.1%	1
NGO	7.1%	1

#### **5.4 Research Question One Findings**

##### **5.4.1 Status of implementing market based instruments**

The first part of the research questionnaire was aimed at establishing the extent of implementation of market-based instruments in the low carbon economy space within the respondent countries. The research questionnaire contained sections that were definitional in nature in order to get a sense of how the respondents define low carbon economy and market based instruments. The questionnaire then moved from definitional elements to key aspects that would determine whether or not market based instruments were being implemented.

Section 3 of the interview questionnaire was seeking to understand how the respondents defined green growth or low carbon economy in order to establish a link between their understanding of the concept and the interpretation and application of market-based instruments.

This sub section therefore presents responses of the first research question.

##### **5.4.2 Defining low carbon economy**

A view at the most common words and phrases used by respondents reveal that

low carbon economy is associated with sustainable development and that there is a combined use of economic growth and or relation to national economies and that an element of low carbon and resource protection are regarded in equal terms as objectives of a low carbon economy transition processes. Table 4 shows a percentage split of the top 5 words and phrases used in the responses.

**Table 4: Top five Words and Phrases used by respondents in defining the low carbon economy:**

Words and Phrases used	Percentage	Count
Sustainable Development	35%	5
Economy	28%	4
Economic Growth	21%	3
Low Carbon	14%	2
Natural Resources	14%	2

Based on these phrases, results were then grouped into thematic categories that emerged in each of the responses as follows: a) Economic growth; b) Industrial innovation; c) Low carbon transition; d) Sustainable development.

#### a) ***Economic growth***

A number of respondents seem to have linked a low carbon economy with efforts towards enhancing economic growth, a clear articulation of this notion was provided by a respondent from the Brazilian Government who said it is:

*“An economic growth approach that ensures that resources are protected and well managed”* (Brazilian respondent 2012)

Other respondents have in addition to emphasising economic growth, linked it with elements of resource protection and innovative approaches. This was reflected by a respondent from India who asserted that a low carbon economy:

*“...involves proactive initiatives by the government, industry and communities that contribute to economic growth and also protect the natural resources”* (Indian respondent 2012)

Additional responses from Indian and Chinese respondents reflect a combination of technological innovation and the use of international carbon reduction pressures to

gather economic benefits.

*“inclusive economic growth that seeks to ensure equal access to opportunities and balance economic and social development with environmental costs”*  
(Chinese respondent 2012)

The striking observation in the responses to this question was that none of the South African respondents had strong economic growth assertions, however one South African respondent provided a unique perspective by mentioning that a low carbon economy is :

*“Sustainable economy that is able to balance its consumption of natural resources with earth's capacity to renew itself i.e. an economy that exists within the planetary boundaries for different ecosystems. Also an economy that is equitable with decentralised ownership and able to lift poor out of poverty”*  
(South African respondent 2012)

#### **b) Industrial innovation**

South African respondents were the only ones that placed emphasis on industrial innovation, an elaborate explanation was provided by a respondent from government as follows:

*“Takes into account opportunities in key industries/sectors for reducing resource intensity of these activities, at the same time, developing country objectives of poverty alleviation and job creation can also be achieved by investments in sectors that are more labour intensive and can involve community participation. The principles of sustainable development underpin a country's low carbon economy strategy and seeks to ensure that resources are used sustainable”* (South African respondent 2012)

In this category, respondents attributed a low carbon economy development path that ensures industrial innovation and development for the benefit of national development goals and resource protection.

#### **c) Low carbon transition**

Respondents from both India and South Africa reflected on elements of a low carbon transition and the creative use of international carbon reduction pressures in transforming growth models. One respondent reflected on this issue by saying:

*“System wide and transformative and deals with transition away from the dependence on fossil fuels, we look at low carbon transitions”* (South African respondent 2012)

While another respondent elaborated on this point by adding an element of living standards and long term prosperity as:

*“Need to become less carbon intensive and resource intensive. This should not compromise the need to deal with the problems of unemployment, poverty and inequality. To make sure we leave a liveable planet behind for future generations, whilst increasing the living standards of the current generation.”* (South African respondent 2012)

#### d) **Sustainable development**

A number of respondents emphasised the issue of sustainable development linked to poverty eradication and economic development, views of respondents include:

*“India views the issue as an opportunity to meet poverty reduction needs and expand access to energy services while at the same time moving [the country down] a low carbon development growth path.”* (Indian respondent 2012)

*“The main objective for green economy is to achieve sustainable development. A low-carbon transition can also be viewed as a business opportunity especially for China which is positioning itself as a global technology innovator.”* (Chinese respondent 2012)

A perspective from a private sector respondent focused at a firm level and reflected low carbon economy as

*“ An economy based on principles of sustainability throughout each and every business process and affecting all customers and suppliers, employees and service providers”* (South African respondent 2012)

### 5.4.3 Market based instruments

To establish a context upon which respondents regarded implementation of market based instruments, the research questionnaire contained a section that requested respondents to provide their understanding of market based instruments, the question elaborated the concept into the two main components, namely the economic and financial instruments to enable respondents that might have been more conversant with one or the other term to understand the question. This part of the questionnaire also required the perspective to be given in the context of sustainable growth/development. Based on elements extracted through an analysis of the most common words and phrases used as presented in table 6, responses were coded according to three thematic areas, namely a)Measures of pollution control and environmental protection; b)Best practice through market forces and industry creation and c) Measures to enhance sustainable development and behaviour change.

**Table 5 : Most used Words and Phrases**

Words/Phrases	Percentage	Count
Environmental Taxes	42%	6
Instruments	35%	5
Carbon	28%	4
Encourage best Practice	21%	3
Behaviour	21%	3
Green Economy	14%	2
Market Forces	14%	2
Price Signals	14%	2
Sustainable Development	14%	2

#### a) Environmental Protection and Carbon Reduction Instruments

Market based instruments; especially taxes have been traditionally used as punitive measures for environmental damage, the introduction of financial incentives like energy efficiency rebates have added an element that encourages best behaviour for financial gains. Four out of the 14 respondents reflected this element and from their responses it appears that there is a common understanding between the four countries on the environmental protection and the reduction of carbon emissions

benefits arising from the use of market based instruments. The quote below provides an elaboration of the three dynamics to such instruments:

*“....taxes and incentives tending to disincentives polluting behaviours and give rise to favourable fiscal treatments. Can be considered in broad and proper sense, the broad sense is that adopted to benefit environmental protection efforts and the proper sense is measures that is charged on the use of the environment by economic actors. There is however a third category of market instruments that is aligned with the climate change regime looking at carbon trading and credits.”*

(Brazilian respondent 2012)

While other different formulations were provided in the responses, they all contained key phrases of inducing appropriate environmental decisions by raising the relative costs of polluting inputs and outputs. Mention was also made on the notion of correcting externalities by internalising the cost of environmental damage in prices of goods and services. Another respondent highlighted that market based instruments were viewed as:

*“a package of policy instruments that seek to correct environmentally related market failures through the price mechanism by seeking to alter the relative process that individuals and firms face, market based instruments could be more efficient way of addressing certain environmental concern”* (South African Respondent 2012)

Respondents in this category further elaborated on the possibility of using such instruments to replace command and control measures and even implement as a complement to such measures. The other element that was highlighted was the use of market forces to encourage best practice in global effort to reduce carbon emissions

#### b) Best Practice through Market Forces and Industry Creation

This category classes responses that considers market based instruments as mechanisms to encourage best practice in a low carbon economy transition through the use of market forces thereby encouraging industrial innovation and creation of

new industries. This notion was well covered by one respondent from China who stated that market based instruments:

*“Mainly has[ve] to do with putting a price on carbon as a crucial step for China’s endeavour of harnessing the market force to reduce its energy consumption and carbon emissions and therefore genuinely transiting into a low-carbon economy.”*  
(Chinese respondent 2012)

Another respondent mentioned that the primary aim of market based instruments was to deal with market distortions through price signals thereby allowing the market to respond and a supporting element arising from another respondent's explanation is that the market figures out the best way to deal with externalities. One of the respondents also drew a link between low carbon economy transition and pricing externalities and gave an example of climate change where introducing a price for carbon through carbon tax or carbon trading systems could be regarded as a measure that enhances a transition to a low carbon economy.

### c) Measures to Enhance Sustainable Development and Behaviour change

The concept of sustainable development is normally used to reflect the consideration of social, economic and environmental elements in a balanced manner for the benefit of current and future generations. Respondents have highlighted the importance of sustainable development as a central element for adoption of market based mechanisms and the use of market forces to engineer new and innovative forms of market, regulatory and voluntary initiatives to promote sustainable development.

An interesting link on the use of market based instruments by government and other organs of state to impart behaviour change was reflected by two participants. One highlighted market based instruments as:

*“instruments of public policy or legislation used to modify behaviour towards Governments stated aims, objectives and goals by including changes in behaviour that happen while the organisation is trying to avoid the penalty”* (South African respondent 2012)

The other issue highlighted in this category was the dual nature of these instruments in achieving desired outcomes where a respondent pointed out that market based instruments can be used:

*“either as punitive measures to reduce activities that may be detrimental to the development path or as an incentive to encourage good practice”* (South African respondent 2012)

#### **5.4.4 Low Carbon Economy Policies Adopted**

All respondents indicated the availability of low carbon economy policies and/or frameworks in their countries. From the data collected, it appears that these are different instruments and at different levels of implementation. The common element is the availability of a climate change policy or strategy that integrates market based instruments as part of the policy mix. The following is a short summary of responses per country on the type of policies and frameworks adopted and implemented.

#### ***South Africa***

South African respondents reflected the following policies and/or frameworks that have either been implemented or subject of public policy-making processes and discussions:

- National climate change policy which integrates elements that promote low carbon development
- National Development Plan, National Growth Plan, Green Accord, National Strategy for Sustainable Development

#### ***India***

India respondents reflected the following policies and/or frameworks that have either been implemented or subject of public policy-making processes and discussions:

- National action plan on climate change and in the process of establishing a low carbon strategy

## **Brazil**

Brazil respondents reflected the following policies and/or frameworks that have either been implemented or subject of public policy-making processes and discussions:

- National policy on climate change
- Renewable energy feed in tariff, mechanism to encourage CDM projects through the designated national entity

## **China**

China respondents reflected the following policies and/or frameworks that have either been implemented or subject of public policy-making processes and discussions:

- China Low Carbon Strategy. The strategy aims to increase the renewable energy capacity in China and explore growth in clean technologies
- China low carbon economy strategy. Started work towards a china climate change legislation

### **5.5 Research Question Two Findings**

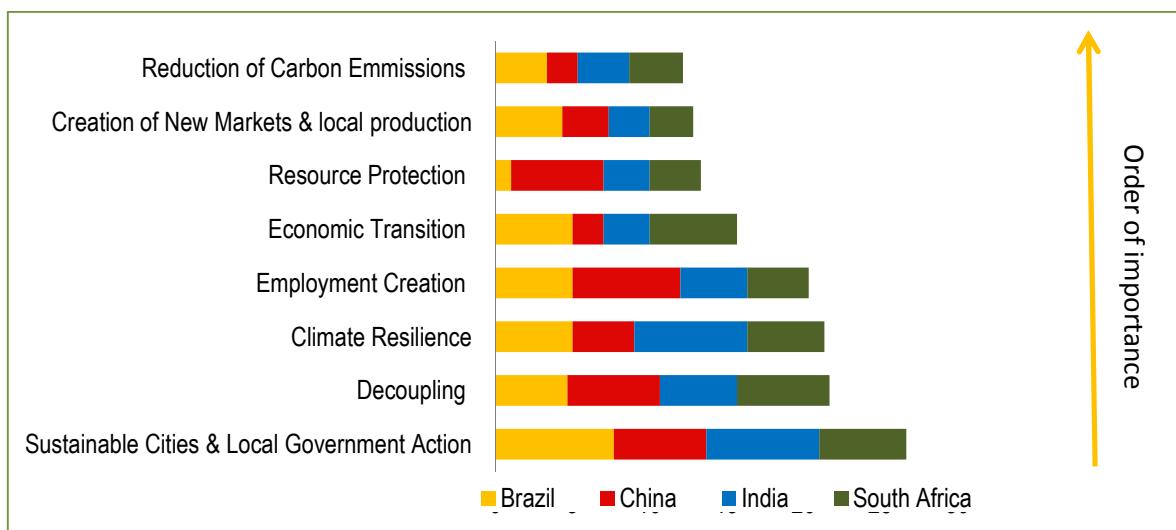
The second research question was aimed at determining factors informing adoption of market based instruments in transitioning to a low carbon economy. The responses to the interview questionnaire have been divided into two components, namely; drivers of green innovation and growth as well as enablers of low carbon economy transition.

Part 7 of the questionnaire contained elements driving low carbon economy action and respondents were asked to rank issues in terms of importance from one, being the highest to eight being the lowest.

### 5.5.1 Drivers of green innovation and growth

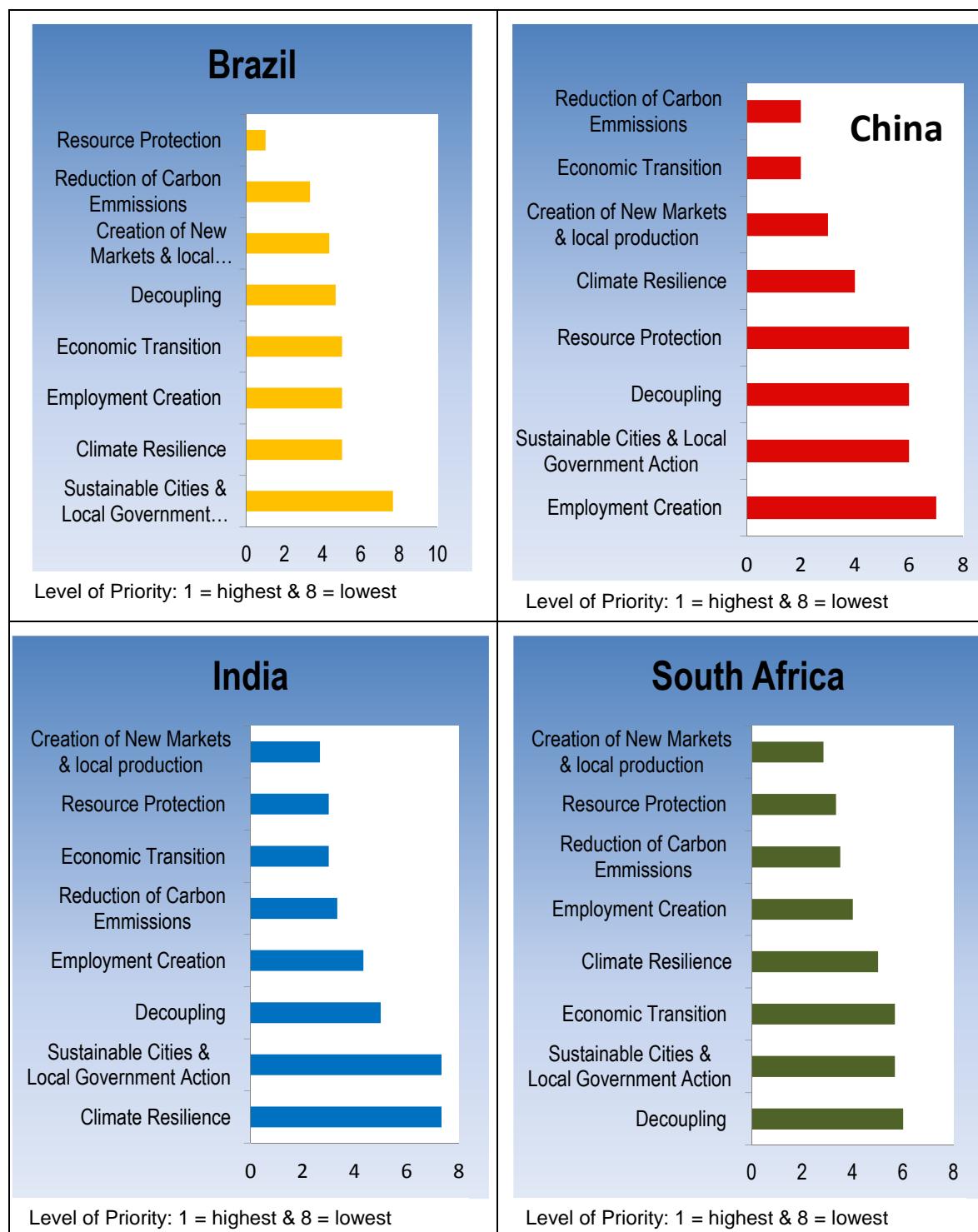
Due to the fact that each country had a different number of respondents an average for each element was used to derive a ranking system based on all the responses for that country and as reflected in figure 5 below the creation of new markets, resource protection and reduction of carbon emissions tended to be on the top 3 of the list while the element of sustainable cities and local government is considered the least important from the list provided.

**Figure 5: Combined prioritisation of low carbon economy transition elements**



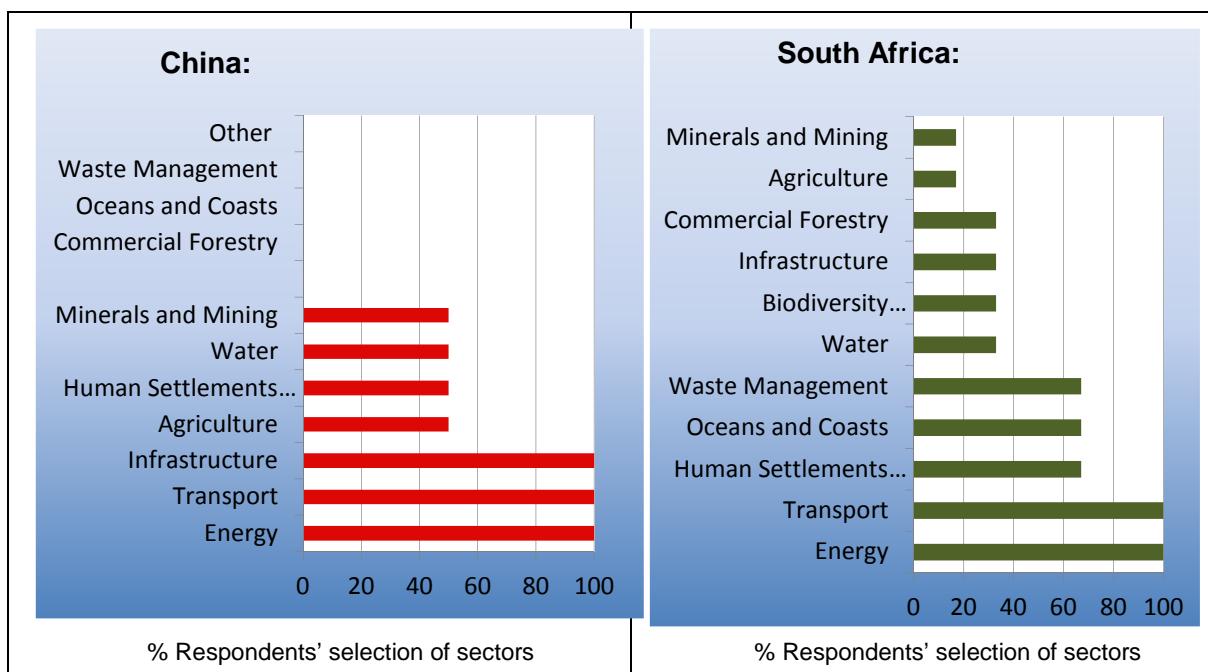
A breakdown of elements per country in figure 6 below demonstrates how the different countries prioritised these elements. For Brazil resource protection and reduction of carbon emission feature as top two elements while Chinese respondents prioritised reduction of carbon emissions and economic transition. Both India and South Africa have similar issues as top two priorities, being creation of new markets and local production as well as resource protection. China is the only country out of the four countries that does not have resource protection as one of the top three elements.

**Figure 6: Elements of a low carbon economy transition per country**

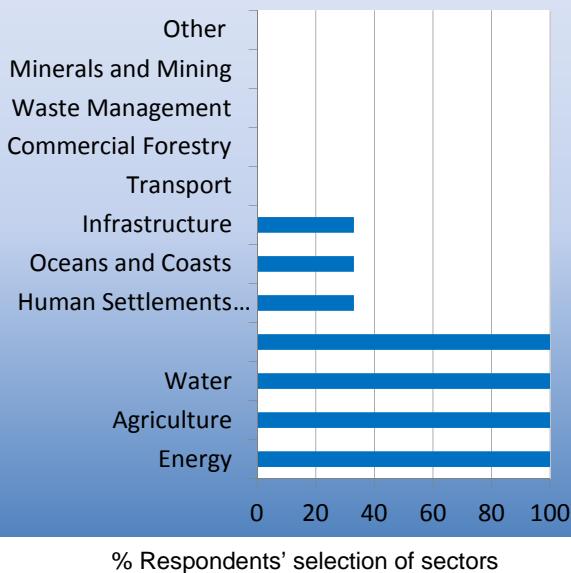


Part 8 of the questionnaire aimed to identify sectors that were considered as most important for low carbon economy transition and therefore could be subjected to different forms of market mechanisms to speed up low carbon economy transition. Figure 7 provides a country breakdown on the percentage of respondents per country that rated the list of sectors. Looking at the two top sectors that were rated high by respondents, it was interesting to observe that a 100% of respondents from China and South Africa selected energy and transport while a 100% of respondents from Brazil and India selected energy and agriculture.

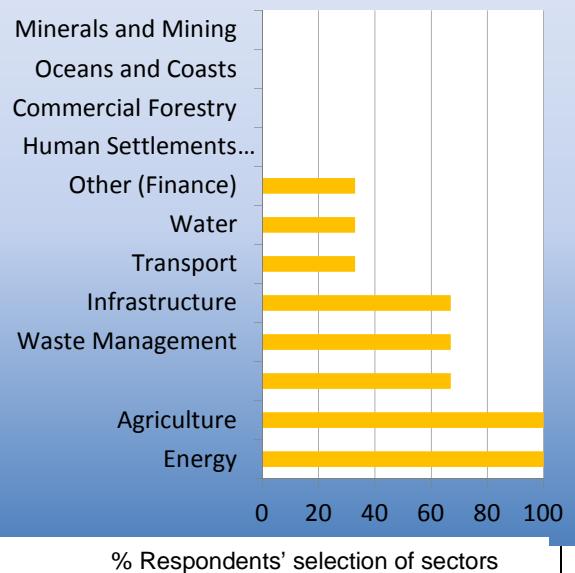
**Figure 7: Percentage breakdown of responses per country on most important sectors**



### India:



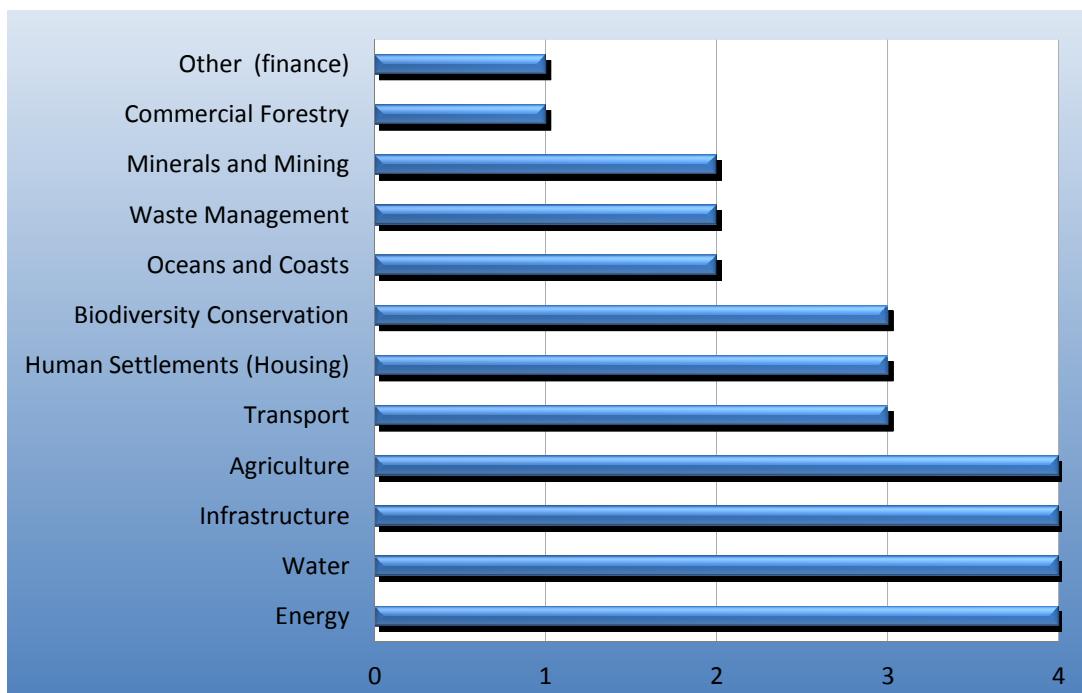
### Brazil:



Brazil respondents did not view human settlements and oceans and coasts as sectors that should be considered in the top 5 prioritisation while China did not include Biodiversity, waste management and oceans and coasts, India did not include transport and waste management and due to the fact that there were more respondents from South Africa, all sectors are included however it is evident that agriculture, biodiversity and infrastructure rate much lower than the other sectors.

Further analysis of this data into country specific responses revealed that while all countries agree on energy as the most important sector, there are differing levels of prioritisation between the different sectors and this can be attributed to country specific circumstances and policy priorities. Figure 8 reflects the average of different levels of prioritisation by country and points out that sectors that rank high on the priority list include energy, transport, water, agriculture and infrastructure while commercial forestry received a zero ranking by all respondents meaning that it is not viewed as a sector of priority for a low carbon economy transition.

**Figure 8: Sector prioritisation by country**



### 5.5.2 Enablers of Low Carbon Economy Transition

Part 10 of the questionnaire aimed to get views from respondents on whether or not market based instruments were enablers of growth and respondents from the countries in question presented different views as follows:

#### India

*"Taxes, levies and financial incentives are a sure way of inducing responsible behaviour because to avoid high prices or benefit from incentives, producers of goods and services will continue to explore more efficient ways and the use of non-polluting substitutes."* (India respondent 2012)

The other respondent from India pointed out that such instruments can be regarded as enablers only if there is commitment towards objectives of a low carbon economy.

#### South Africa

All respondents agreed that such instruments can be enablers of a low carbon economy transition and pointed out conditions that include:

- Implementation as part of an overall low carbon strategy and used to encourage best behaviour through incentives
- When used as platform generating mechanisms for industrial innovation and in country manufacturing.
- A global transition to a low-carbon economy will require large investments and this cannot happen without participation of all role players.
- If such instruments are introduced alongside other instruments that will support efficiency measures.
- As long as they modify behaviour and do not allow consequences to be passed directly to the customer

### **China**

*“Market instruments can be beneficial in encouraging competition and innovation towards cleaner processes.”* (China respondent 2012)

The second perspective from China asserted that such instruments can be regarded as enablers if they are able to create the right incentive framework for low carbon economy to develop. The respondent also noted that such instruments are not sufficient if viewed alone and needed to be accompanied by measures on investment, technology and innovation side.

### **Brazil**

A respondent from Brazil noted that such instruments can enable a transition through their effective use in the reduction of command and control approaches of managing environmental pollution and rather encourage voluntary action by industry. The second element highlighted was that such instruments should be implemented as part of a package of instruments that covers both positive and negative incentives.

A unique perspective highlighted by one respondent shifts attention to the balance between demand and supply side intervention, the response was reflected as

follows:

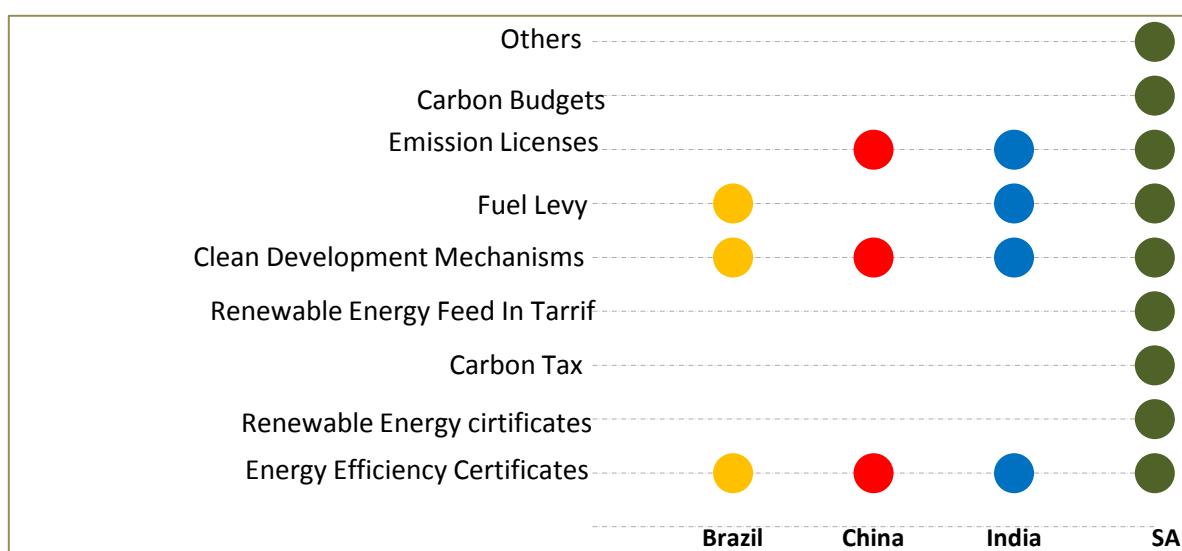
*"Key issue is whether demand or supply side interventions (or both) are most effective. We tend to focus a lot on supply side, but interventions like labelling and consumer information can have a big impact." (Brazil respondent 2012)*

### **5.6 Research Question Three Findings**

The third research question aimed to gather lessons for South Africa either from the approaches used and decisions taken by the three BRICS member states ad also interventions undertaken in South Africa itself to perfect the adoption and implementation of market based instruments in low carbon economy transition. To assist in answering this question, part 7 of the questionnaire focused on determining the mechanisms adopted by the countries in question.

The data gathered reflected that South Africa seems to have taken a blanket approach in adopting a number of instruments; however it is difficult to extract from the data gathered whether or not adoption translates into effective implementation and economic benefits. Figure 9 demonstrates the combination of mechanisms being implemented or considered by the four countries and shows that while the other 3 countries have a selected number; South Africa has considered all mechanisms on the list.

**Figure 9: Mechanisms under implementation and/or consideration by country**



Respondents were further asked to rate their top 3 market based mechanisms in order of importance along 3 scales of importance, the main aim of this question was to determine the level of importance awarded by the four countries to these mechanisms in order to determine areas of commonality and differentiation. Table 7 reflects that all the countries consider the carbon tax and white certificates as priority mechanisms. Carbon budgets and fuel levies are also reflected on the priority rating at least 3 of the 4, followed by the renewable energy feed in tariff and clean development mechanism. An interesting finding is that none of the countries have renewable energy certificates featured on their top 3 priorities.

**Table 6: Priority mechanisms per country**

Market Mechanism	South Africa	Brazil	India	China
Energy Efficiency Certificate Trading Scheme (White Certificates)	Green	Yellow	Blue	Red
Carbon Tax	Green	Yellow	Blue	Red
Renewable Energy Feed In Tariff (REFIT)	Green	Yellow	White	White
Clean Development Mechanisms	White	Yellow	Blue	White
Fuel Levy	Green	Yellow	Blue	White
Emissions licenses	Green	White	White	White
Carbon Budgets	Green	Yellow	White	Red

## 5.7 Chapter conclusion

The interview questionnaire contained broad range of issues that relate to the research topic in order to gain a broad understanding of how the respondents regarded the use, adoption and implementation of market instruments within their countries in their efforts to transition to low carbon economies.

The data has reflected that though there are different ways of defining the issues, there are common themes that emerge from the responses that suggest that the countries have similar objectives that can be summarised as sustainable economic growth and responsible behaviour.

The four drivers for a country to consider the implementation of market based mechanisms in their approaches for a low carbon economy transition are: a) Reduction

of carbon emissions; b) Creation of new markets and local production, c) Resource protection and d) Economic transition.

The four sectors that can be subjected to market based instruments appear to be;  
a)Energy; b)Water, c)Agriculture and d) Infrastructure.

The four key instruments that have been implemented in common among the four countries are: a) Clean development mechanisms, b)Renewable energy trading schemes (green certificates), c) Emissions licences and d)fuel levies

Further analysis of literature against findings in this chapter are reflected in chapter 6 where common elements and interlinkages were used to develop an ideal model for South Africa to consider in making decisions of the ideal mix of market based mechanisms to prioritise.

## 6 Chapter 6: Discussion of Research Results

### 6.1 Introduction

This chapter provides a discussion of the findings of this research in light of the theory presented in chapter 2. The discussion is structured according to research questions and objectives outlined in Chapters 3 and 1 respectively. In this chapter the theory base is linked to the specific elements contained in the data as outlined in chapter 5 to provide a meaningful interpretation of the concept of market based instruments for a low carbon economy transition in Brazil, China, India and South Africa.

The interpretation of the research results is based on the researcher's analysis and based on the broad nature of this subject matter, the research results can be further interpreted in subsequent research projects. This section did not cover all results presented in chapter 5 but rather focused on those results considered pertinent in answering the research questions.

### 6.2 Research Sample

According to Sounders & Lewis (2012) "a structured interview is one that uses a questionnaire where each person is asked a standard set of questions in the same order" (Saunders & Lewis, 2012, p. 141), therefore a structured interview in the form of a questionnaire was therefore used as the most suitable method for use in this study. Data was collected from fourteen respondents who are experts in the area. While some questions were country specific and aimed at providing objective information, other questions were subjective in nature and aimed at gathering insight on personal perceptions.

The research questionnaire was sent online through the use of the survey monkey electronic software. According to Sounders & Lewis (2012) questionnaires can be distributed face to face, by telephone, by hand, by post and by web. Therefore based on the wide geographic location of the potential respondents a web based distribution approach was conducted and results were analysed using the software to draw commonalities and relationships between the different responses.

### 6.3 Research Question One

Status of implementing market based instruments for a low carbon economy transition in South Africa, China, India and Brazil?

#### 6.3.1 *Transitioning to a Low Carbon Economy*

Most respondents have associated the phrase ‘low carbon economy’ with economic growth, industrial innovation, sustainable development and green economy. Respondents regard economic growth, carbon emission reductions and resource protection as objectives of a low carbon economy. This finding is supported by UNEP (2011), OECD (2011) & Stern (2009) indicated that that a green economy, green growth and/or low carbon economy terms were used to relate to one overarching principle, being the enhancement of environmentally sustainable practices in economies to reduce carbon emission, protect natural resources while making significant contribution to development objectives such as employment creation, poverty reduction, local industry creation and creation of new market.

Responses given by respondents from India and China reflect a combination of technological innovation and the use of international carbon reduction pressures to gather economic benefits. Zhang (2010) analysed China’s low carbon transition plans and asserted that China’s carbon reduction efforts were to make a significant impact on global efforts to reduce carbon emissions while at the same time placing China at the forefront of carbon reduction technology innovation and market creation. India has also demonstrated its prioritisation of impacting positively on global carbon emission reductions through its significant percentage implementation of CDM projects as demonstrated by Fenhan (2007).

South African respondents did not have strong assertions on the economic growth component of a low carbon economy and this is contrary to the country’s economic growth policy framework outlined in a document called “The New Growth Path” that was adopted by its Cabinet in 2011, the policy lists a green economy as one of the five drivers of economic growth (EDD, 2011). Nader (2009) went further by asserting that economic growth remained and will remain the key priority of all countries and that since this growth was increasingly being measured by country

effectiveness of protecting its natural resources and reducing its carbon emissions, that it was inevitable for countries to start adopting market related carbon reduction policies. It is therefore in any country's best interest to be an early starter in integrating market based instruments in their low carbon economy plans.

### 6.3.2 *Adopting Market based instruments in a Low Carbon Economy Transition*

Respondents from all the four countries had a common appreciation of the carbon emission reduction and environmental protection benefits arising from the implementation of market based instruments, this commonality was supported by Nader (2009) and the Stockholm Environment Institute (2011), both authors underscored the resource protection and carbon emission benefits of market based instruments and asserted that the carbon markets were not able to be successful on their own and that the prices on fossil fuels needed to be raised further, either through taxes or a tradable permit systems.

Three common categories were extracted from the most common words that the respondents used to explain what market mechanisms for a low carbon economy transitions were all about, the themes were; a) Measures of pollution control and environmental protection; b) Best practice through market forces and industry creation and c) Measures to enhance sustainable development and behaviour change. Though not disputing the three elements Farinelli et al (2005) added a fourth component and that was the reduction in command and control mechanisms and the introduction of economic instruments that would take care of externalities thereby reducing the need for command and control measures that are often expensive due to litigation costs and time consuming.

Though respondents seemed optimistic about the implementation of market based instruments as a way of using market forces to internalise environmental externalities, Zhang (2011) warned that measures such as a uniform, across-the-board tax could have unacceptable equity implications because poor communities might be worse impacted by environmental taxation or on a macro level if market instruments are implemented by a country unilaterally, such requirements might

have a negative impact on a trade partner country that might not have implemented such mechanisms. Therefore, it might be most beneficial for a country to pursue implementation of national mechanisms that are within globally agreed frameworks.

This paper argued that market based instruments needed to be considered in conjunction with other policy instruments to judge whether they were an appropriate tool to drive a transition to a low carbon economy for a country such as South Africa (Farinelli, et al., 2005) (Ambec & Lanoie, 2008) (Cerin, 2006). One of the obstacles to international action on climate change has been the concern that if only a few countries introduce a price on carbon emissions they will place their industries at a competitive disadvantage. Other countries with lower carbon prices, or none at all, would have lower costs of production and could win an increased share of world markets (Zhang, 2011).

### 6.3.3 *Policy Approaches in South Africa, India, Brazil & China*

From the literature review in chapter 2, none of the authors has proposed a model or set of market based instruments that need to be adopted by a country. This leads to a conclusion that there can never be a blueprint for adoption of market based instruments for countries to effectively transition to green economies. All respondents also indicated the availability of low carbon economy policies and or frameworks that differ from one country to the other, South Africa and Brazil both have national climate change response policy, India has adopted the national action plan on climate change while China has adopted the low carbon strategies.

While there are lessons to be learnt from each other, one country's combination of market instruments cannot be similar to the next country mainly because a range of country specific characteristics that needs to be taken into consideration. In the case of China Zhang (2010) assessed China's efforts towards energy saving and pollutants reductions, the use of renewable energy and the country's well acclaimed participation in clean development mechanism to reduce its carbon emissions and concluded by recommending policy actions that integrated a range of market based mechanisms.

In India, Benecke (2009) investigated concerns over the efficient working of the CDM, its distributional quality, its effectiveness in meeting broader societal goals and its impacts on sustainable development, he then proposed the strengthening of a seemingly weak hierarchical architecture and minimum civil society involvement that presented fatal flaws to future implementation of market mechanism. While in Brazil, Ellis, Baker, & Lemma (2009) pointed out the unique nature of the country as the world's largest tropical country in its carbon emissions profile that is dominated by land-use change activities rather than the burning of fossil fuels. This, he asserted would require the introduction of a different set of mechanisms that will focus on land use activities and natural resource protection.

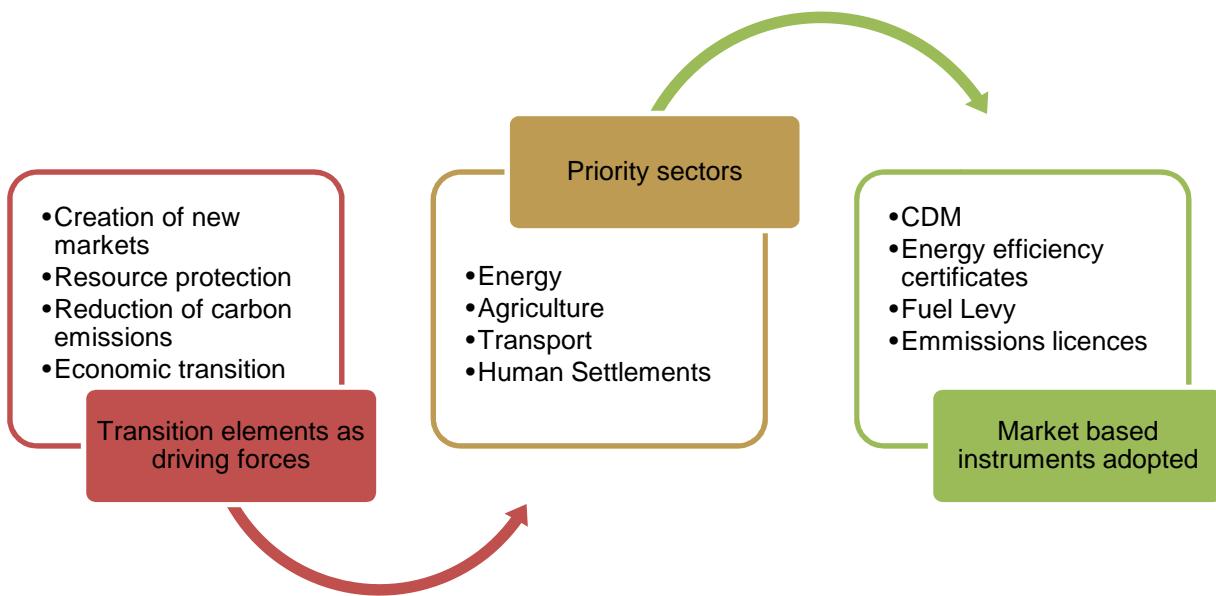
In the case of South Africa, while considering the country's development challenges Winkler & Marquand (2009) examined ways in which the alternative conceptions of a development path in South Africa could be achieved which included firstly the energy efficiency potential in the short term, the longer term changes in the energy fuel mix which would prove extremely difficult considering the country's high reliance on mineral resources and thirdly the more dynamic transformation of the economic structure which would contain strong elements of market mechanisms.

#### **6.4 Research Question 2:**

What are the factors informing adoption of market based instruments in transitioning to a low carbon economy?

The second research question was aimed at determining whether market based instruments contributed to green innovation economic growth. Extracting from the research findings as depicted in figures 5, 8 and 9 a model on the interrelationship between drivers, sectors and instruments was developed as reflected in figure 10. The model demonstrate the interrelations where one or more transitional drivers would inform key sectors for intervention which in turn informs the suit of market based instruments for a country.

**Figure 10: Model on interrelations between drivers, Sectors & Instruments**



This interrelationship was partly implied by Nader (2009) who argued that economic growth remained the key priority of all countries and that such growth was increasingly being measured by country effectiveness of protecting its natural resources and reducing its carbon emissions. Nader (2009) continued to assert that this drive for growth on the backdrop of resource efficiency had led to an inevitable drive for countries to adopt market based carbon reduction policies. The results below are discussed using the model presented in figure 10 that reflects the logical link and effectively provides answers to research question 2 that seeks to establish factors that leads to the adoption of market based instruments for transitioning to a low carbon economy.

#### 6.4.1 Driving forces

Four common elements considered as important driving forces towards the adoption of market base instruments were found to be a) creation of new markets, b) resource protection, c) reduction of carbon emissions and d) Economic transition. The carbon reduction driver was emphasised by Drexhage & Wooders (2009) as having to play a large role in the global effort to address climate change under the UNFCCC.

While the four elements above were a common selection for Brazil, India, China and South Africa, it was found that there were slight differences between the countries on the prioritisation of these elements.

Brazil respondents selected resource protection and reduction of carbon emission feature as top two elements that could drive the country's adoption of market based instruments as part of their low carbon economy transition. This prioritisation was supported by de Gouvello (2010) who asserted that Brazil's low carbon policy framework was all encompassing and aimed at reducing the country's carbon emissions while ensuring the resilience of its natural resources.

China respondents prioritised reduction of carbon emissions and economic transition as the top two elements driving the adoption of market based instruments as part of their low carbon economy transition. According to Flavin (2008), Zhan (2010) as well as Jiang, Sun, & Liu (2010), based on its increasing energy needs and large infrastructure programmes, China has no other option but to substantially engage in carbon emission reduction programmes while being mindful of its economic development objectives. This reviewed literature provides an acceptable theoretical basis to the high priority rating of carbon emission reductions and economic transition provided by respondents.

Both India and South Africa responses bear similar issues as top two priorities, being creation of new markets and local production. Both countries are energy intensive and largely rely on fossil fuel energy. According to Winkler & Marquand (2009) the high fossil fuel based energy intensity for South Africa mean that carbon emission reduction efforts becomes a major challenge especially when considering the country's development challenges. The high ranking for creation of new markets has therefore been linked with the need for the country to create more employment opportunities in an effort to reduce the high income inequality. The suggestion by van Heerden et al (2006) of creating a potential triple dividend in a) decreasing emissions, b) increasing GDP, and c) decreasing poverty when any one of the environmental taxes was recycled through a reduction in food prices provided a viable approach for consideration in the country's low carbon policy approach.

There was no literature found to substantiate why India respondents prioritised creation of new markets and local production. However, India's carbon reduction approach has focused on local projects and programmes for registration as CDM projects thereby benefiting from global carbon credits. This approach placed the country very high on global CDM rankings with 26.5% of the CDM project market share worldwide (Fenhann, 2007). India's success in the global carbon market through their CDM projects might be attributed to the respondent's prioritisation of creation of new markets and local production as a way of ensuring continued success in this area by even exploring new sectors like forestry, as observed by Benecke (2009) that there was a visible lack of forestry projects in India's carbon reduction projects that are registered under CDM despite the substantial carbon reduction potential of this sector.

#### 6.4.2 Priority Sectors

The second element of a model presented in figure 10 suggest that driving forces towards the adoption of market base instruments for a country would determine the priority sectors that gets selected for application of market based instruments.

From the responses received, sectors that came up on the top 4 out of a list of 7 were; a)Energy, b)Agriculture, c)Transport and, d)Human Settlements. According to the model, each of the four sectors can effectively contribute to each of the top 4 drivers, namely a) creation of new markets, b) resource protection, c) reduction of carbon emissions and d) Economic transition. There is a need for further research that would determine the extent of and actual contribution of these sectors to the drivers.

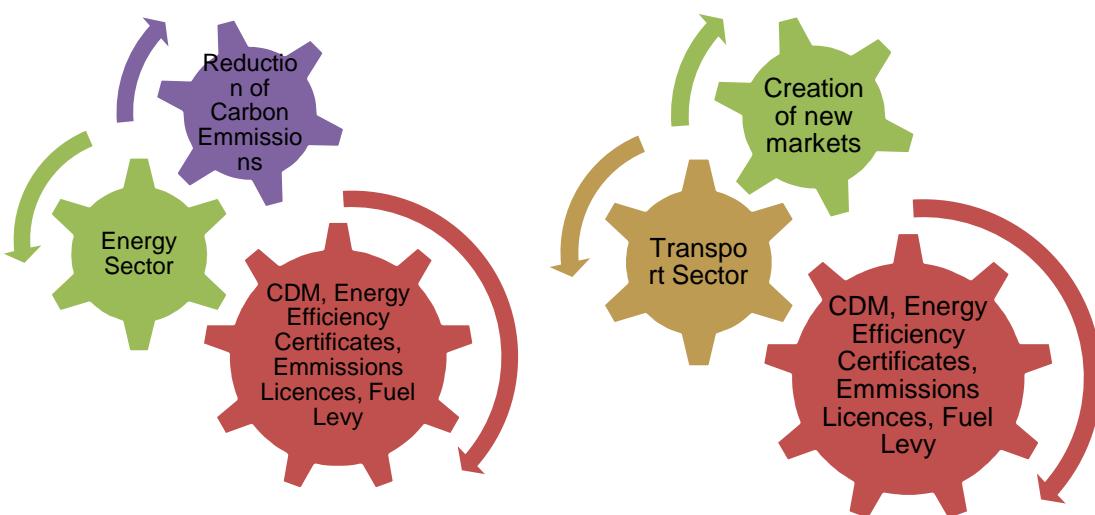
The rating and matching of sectors to driving forces is supported by an assessment made by MacKenzie (2009) that highlighted that perhaps carbon markets and other economic instruments should be made to be suitable for certain sectors of economies or mainly focus on the ultimate goal of any economy, which is to increase economic growth. Noting that any country's economic growth path and approach is different, an analysis of the data collected reflected that while energy is considered by all 4 countries as being the most important sector, there are differing levels of prioritisation between the different sectors.

#### 6.4.3 Market Based Instruments in China, India, Brazil and South Africa

The data analysed from responses given by respondents in the four countries reflected the top four market based instruments as a) CDM, b) Energy efficiency certificates, c) Fuel Levy and d) Emissions licenses. Using the model presented in figure 10, figure 11 below demonstrates how the responses on key drivers and priority sectors provides a logical fit with all of the four priority market based mechanisms under implementation in China, India, Brazil and South Africa.

Figure 11 demonstrates the interrelations where on the first diagram the driving element is considered to be the reduction of carbon emissions which would prompt a country to assess and identify their most emissions intensive sectors, in this illustration the energy sector was selected. The country would then identify the most appropriate market based mechanisms in the energy sector to effectively reduce carbon emissions. This thought process therefore completes the circle of interrelationships.

**Figure 11: Interrelations in Energy & Transport Sectors**



Similarly, the second component of the illustration models the creation of new markets as a driven force which would prompt a country to identify sector with most potential for diversification and innovation, the transport sector is used as an

illustrative example, a country would then identify areas of industrial development in alternative and efficient transport systems, this information would then enable policy makers to make decisions on the most appropriate market based instruments, including through incentives provision.

An analysis of individual responses per country reflected minor differences in the application of such instruments and this as reflected by Flavin (2008) and de Gouvello (2010) India, China and South Africa's low carbon transition needs to focus on varying levels of reduction of fossil fuel based energy and innovative infrastructure development while Brazil's low carbon economy transition needs to focus on land use change activities.

### **Implementation in India**

India respondents have highlighted the implementation of CDM, fuel levy, energy efficiency certificates and emissions licences. Respondents indicated that such instruments are necessary in inducing responsible behaviour through avoidance of excessive costs or eagerness for financial gains from credits generated through market instruments. The concern of behaviour change and participation of society in India waste also flagged by Benecke (2009) who warned that minimum civil society involvement in the implementation of carbon market mechanisms could present a fatal flaw in implementation.

### **Implementation in South Africa**

South Africa respondents agreed that such instruments can be enablers of a low carbon economy transition. The responses outlined characteristics that they felt should accompany the implementation of market based instruments and these included measures to encourage best behaviour through incentives, platform for innovation and local manufacturing capacity, participation of all role players with regard to investments and that market based instruments needed to be implemented alongside other instruments and not as stand-alone interventions. South Africa seem to have taken a blanket approach in adopting a range of instruments including fuel levy, emissions licences, energy efficiency licences, CDM, carbon tax, carbon budgets and renewable energy feed in tariffs. The other

shortcoming of this research project is that respondents were not asked to indicate the level of effectiveness of these instruments. Though research has been conducted on the effectiveness of CDM (Seroka, 2009), it is also necessary to conduct more research on the effectiveness of a range of other market based instruments.

### **Implementation in China**

China has implemented CDM, energy efficiency certificates and emissions licences and respondents have highlighted that such instruments were beneficial in encouraging competition and innovation towards cleaner processes. Respondents further indicate that market based instruments could be regarded as enablers if they were able to create the right incentive framework for low carbon economy transition and that such instruments were not to be implemented in isolation. From the literature reviewed, Farinelli et al (2005) asserted that better environmental performance by organisations can be associated with lower regulatory costs when considering costs associated with litigation in cases of non-compliance and potential fines or even higher environmental taxes.

### **Implementation in Brazil**

Brazil has implemented CDM, Energy efficiency certificates and fuel levy and respondent from Brazil noted that such instruments can enable a transition through their effective use in the reduction of command and control approaches of managing environmental pollution and rather encourage voluntary action by industry.

## **6.5 Research Question Three**

What lessons can South Africa take in the implementation of market base instruments for a low carbon economy transition?

To effectively answer the third research question, the six thinking hats of de Bono provided an appropriate model to summarise key elements arising from the literature and the questionnaire responses. Table 7 below provide a summary of the key issues and the discussion that follows provides an elaboration of these factors (van

Assen, van den Berg, & Pietersma, 2009).

**Table 7: Lessons for South Africa using the six thinking hats of de Bono, adapted from (van Assen, van den Berg, & Pietersma, 2009, p. 228)**

Hats	Focus	Considerations for execution
White	Information & facts	What kind of information was available on low carbon economy, economic and financial instruments
Red	Feelings & Perceptions	What was the level of commitment to the issues at hand
Black	Downsides & pitfalls	An analysis of the difficulties, risks and problems associated with the introduction and implementation of market based instruments.
Yellow	Advantages, optimism & opportunities	What were the good elements of market based instruments in a transition to a low carbon economy and what opportunities did they provide for sustained growth?
Green	Possibilities, new ideas & creativity	What were the possibilities for replicating market based instruments in South Africa? Was there a possibility of changing and/or adapting systems to suit the South African context?
Blue	Communication and summary of conclusions	What were the key intervention areas

Most respondents reflected the need to consider market based instruments as part of a broader low carbon policy approach rather than as a standalone intervention. Nader (2009) provided the theory base for this assertion by analysing how governments could institute targeted investment, regulations and policies to effectively create frameworks for transitioning to low carbon economies. This therefore means that while market based instruments are good in advancing innovation and growth as discussed under subsection 6.1 above, each country needs to consider its own special circumstances and determine a suitable mix of policy interventions that would complement market based instruments.

Respondents were requested to indicate the types of mechanisms implemented in their countries and from the data gathered, it appears that South Africa seems to have taken a blanket approach in adopting a number of instruments, however it is difficult to extract from the data gathered whether or not adoption translates into effective implementation of such instruments. However from research conducted by Seroka (2009) on successes in CDM implementation it became evident that while India, China and Brazil registered success in the implementation of CDM projects

and therefore yielded financial benefits from trading their carbon credits, South Africa has however lagged behind these and other developing countries and failed to utilise its potential to yield any impact worth benefit from the carbon markets. Therefore recording CDM as one of the market based instruments adopted by the country does not translate into success in its implementation.

Carbon market characteristics in India reflected that there were two features that characterised the country's relative success in the carbon markets. These according to Benecke (2009) included a), non state actors involvement in the implementation of programmes and therefore managing them in a profit oriented manner as business units and b) the combination of driving factors and sectors that facilitated growth of the carbon market and the overall orientation of carbon governance was directed toward Indian welfare and prosperity objectives. A lesson for South Africa to take could be to clearly define a combination of elements that could drive implementation of each market mechanism under consideration.

All respondents agreed that market based instruments were effective in advancing to low carbon economies and two of the respondents cautioned on the need for effective implementation of such instruments to ultimately arrive at positive benefits. De Guevello (2010) confirmed this by asserting that countries that pursued low carbon development trajectories were more likely to benefit from competitive advantages such as foreign direct investment, technological innovation, low cost production of goods and services and transfer of financial resources through carbon markets.

However Ambec & Lenoie (2008) argued that environmental regulatory requirements often redirect attention of business leaders from key business activities and that at times introduction of resource efficiency measures could increase the cost of production and material. They asserted that the actual benefits were to be gathered from through financial and economic gains achieved in other areas such as improved customer loyalty, increase in demand of products due to increasing citizen awareness on limitations of the natural environment, increased energy efficiency and reduced disposal costs. This therefore suggests that the effective application of market based instruments in conjunction with other policy instruments could be instrumental in yielding both the short term benefits that De Guevello (2010) was

relating to and also the longer term benefits that Ambec & Lenoie (2008) were referring to.

China respondents highlighted that three market based instruments were under implementation in China, and have both noted the benefit of such instruments in advancing the country's low carbon future while ensuring economic development and innovation. The data collected from respondents is supported in the literature review by conclusions made by Jian, Sun & Liu (2010) that it was possible for China to implement a carbon tax as part of the country's strategic approach to reducing their carbon emissions and improving their energy savings. The authors have however qualified their assertion of carbon tax viability by emphasising that any carbon tax rate was to be initiated from their low point scenario in order to avoid sizeable impact on the country's economy.

Zhang (2011) provided an international angle to this argument by pointing out that one of the obstacles to international action on climate change was a concern that if only a few countries introduced a price on carbon emissions they will place their industries at a competitive disadvantage because countries with lower carbon prices, or none at all, would have lower costs of production and could win an increased share of world markets. South Africa in its 2011 carbon tax discussion paper (National Treasury, 2009) adopted a high point carbon reduction scenario to determine its carbon tax rates. It can therefore be concluded that a country needs to have a clear objective that would determine the stringency of market based mechanisms being put in place to avoid unintended negative impacts on overall economic outlook.

As discussed by Economy (2006) and Shuwen (2004), China's total emission control policy focuses on annual emissions caps among the country's provinces where such caps are then translated into municipal and industrial based on their emissions contributions caps resulted in the piloting of local carbon trading markets with a potential of allowing industry and organisations to choose the most appropriate methods of emission reductions and avoiding the imposition of stringent measures on those with lesser emissions profiles. Zhang (2011) asserted where national mechanisms like the carbon tax are put in place, the area of coverage becomes a challenge because costs of reducing carbon emissions differ significantly among

emissions sources across provinces and sectors. Therefore it can be concluded that a deeper consideration of regional/provincial differences in economic activity and vulnerability as well as sector circumstances would be necessary when considering a blanket approach in implementing a particular market based instrument.

## 6.6 Chapter Conclusion

This chapter has analysed the interview results in light of the theory base outlined in chapter 2 obtained through a questionnaire attached as appendix 1. The objective of the chapter was to answer the research questions by firstly demonstrating the current status of implementing market based instruments for a low carbon economy transition in four of the five BRICS member states, i.e. South Africa, China, India and Brazil. Secondly, the chapter provided a model to demonstrate factors informing adoption of market based instruments in transitioning to a low carbon economy and finally highlighted key lessons that South Africa can take forward in the implementation of market based instruments for the country's low carbon economy transition.

The results have unveiled a range of topical issues that will benefit from further research and the small number of respondents allowed for focused analysis of expert opinions. The themes that evolved from the data and literature have added to the understanding of the subject. Given the current dynamic nature of the global climate change debates and the renewed realisation of its impacts on economic activities, the theory base is still at its infancy.

## 7. Chapter 7: Conclusion

### 7.1 Introduction

The scientific base for climate change has been established by scientists and the anthropogenic contribution is clear. Given the overwhelming science behind climate change and its impacts on sustainable development, governments throughout the world are considering and implementing a range of mechanisms aimed at mitigating the causes of climate change and adapting to its impacts. Carbon emissions are seen as by-products of successful production activities, and at face value requirements to curb these emissions seem to be contrary to traditional economic growth beliefs and market forces. Carbon emissions have therefore been regarded as external factors to mainstream market and economic considerations, better known as externalities.

Carbon emissions by Brazil, China, India and South Africa exceed the world average and these four countries under increasing pressure to significantly reduce their carbon emissions. The adoption and implementation of market based instruments to correct the externality factor of carbon emission while creating financial incentives for best practice have been a subject of discussions and research throughout the world. This chapter presents highlights of the key findings of this research that aimed to explore the application and selection of market based instruments in transitioning to a low carbon economy in selected BRICS countries.

### 7.2 Key Findings

The first key finding is that decisions to adopt market based instruments are underlined by government priorities and can differ from one country to the other based on national priorities and circumstances. This research has however revealed four broad categories of objectives that are common among the four countries. These categories are:

- a) Market instruments being used as measures of pollution control and environmental protection

- b) Market based instruments being implemented to stimulate the creation of new industrial sectors that focus on green goods and services
- c) Implementation as measures to enhance sustainable development and behaviour change
- d) The reduction of command and control mechanisms by introducing alternatives that would take care of externalities.

The objective that a country has informs the specific factors that determines the number of instruments and stringency level that a country will adopt. This point was reflected by a number of respondents who pointed out the importance of national economic growth priorities that were not to be compromised by stringent pricing of carbon; this had led to certain countries adopting carbon pricing measures that were based on their low point scenarios. There was also a clear link between broad objectives that a country had and the specific driving forces that informed adoption of instruments.

A second key finding was the existence of a direct link between factors driving decisions for market instruments; prioritised sectors for implementation and the combination of instruments that subsequently gets adopted. A model presented on figure 10 in chapter 6 was developed based on the data collected. The model on interrelations between drivers, Sectors & Instruments reflects that a set of transitional drivers inform key sectors that would be subjected to market mechanisms which in turn would inform a suit of market based instruments for implementation in a given country.

The third key finding is that the appropriate combinations of market based instruments in any country will needs to be firmly rooted in an understanding of the specific development characteristics of that country, including the country's international carbon emission reduction commitments. There is therefore no single blueprint for transition to a low carbon economy; however there are important lessons to be learnt from other countries on approaches and processes. This therefore suggests that the effective application of market based instruments in conjunction with other policy instruments and considerations could be instrumental in yielding both the short term benefits that De Guevello (2010) was relating to and also the longer term benefits that Ambec & Lenoie (2008) discussed.

### 7.3 Lessons for South Africa

The literature reviewed and data collected in this research confirmed the importance of market based instruments as part of a low carbon economy transition plan for any country. South African respondents seemed to agree on the importance of market based instruments and mentioned the need for proper implementation and integration with other policy instruments. The one concerning factor that was found in this research is that while China seemed to be cautious on how market based instruments would impact on economic activity and opted to set their carbon pricing measures on the basis of their low point emissions reduction scenario, South Africa has focused on the high point scenario in the LTMS, the required by science scenario.

The literature and research results does not reflect glaring differences in the number of market based instruments adopted by South Africa, China, India and Brazil. Therefore the lessons that can be gathered for South Africa are related to decision making approaches and prioritisation. South Africa should therefore consider its own special circumstances and determine a suitable mix of policy interventions that would complement market based instruments.

CDM as an international market based mechanism that was implemented by the four countries explored in this study has yielded different results with South Africa lagging behind Brazil, India and China. A lesson for South Africa to take would be in stimulating the interest of private sector in the identification and implementation through the easing of institutional and procedural requirements.

The two characteristics that have worked in India which South Africa could take lessons from include: a) non state actors involvement in the implementation of programmes and therefore managing them in a profit oriented manner as business units and b) the combination of driving factors and sectors that facilitated growth of the carbon market and the overall orientation of carbon governance to be directed towards South Africa's development objectives, which is mainly reducing the income inequality and poverty eradication.

A lesson that South Africa can take from Brazil's approach by fully leveraging on competitive advantages such as foreign direct investment, technological innovation, low cost production of goods and services and transfer of financial resources through carbon markets, the relatively low take up of CDM projects remains a concern.

The research found that effective application of market based instruments in conjunction with other policy instruments could be instrumental in yielding both the short term benefits for countries. South Africa should therefore introduce market based instruments as part of an integrated low carbon strategy that contains other regulatory provisions that would provide incentives for behaviour change and innovation.

To avoid unintended negative impact on industrial growth and economic growth, South Africa can learn from China by adjusting the carbon pricing approach towards a lower emissions reduction scenario that will also ensure that the country does its fare share in terms of international efforts to reduce carbon emissions.

#### **7.4 Recommendations to Stakeholders**

The results of this research are meant to provide useful insight to different stakeholder groupings in South Africa as they tackle the complex issues of a low carbon economy transition.

Government stakeholders should review the approach taken in making policy decisions on the kind of market based instruments being introduced and consider using the model on interrelations between driving forces and sectors to arrive at the most appropriate mechanism. Secondly the use of De Bono's six thinking hats will ensure that all critical dimensions of strategic decision making are taken into consideration.

Industry stakeholders can use this research to get an understanding of the importance of market based instruments and identify areas where they can simplify processes towards implementation of instruments that would on the one hand benefit

businesses and on the other hand make a significant dent of the country's carbon emission reduction trajectory.

## 7.5 Managerial Implications

The findings of this research bear implications for managers in all sector of the economy. More specifically for business managers because carbon emissions are intrinsically linked to business processes. South Africa is an energy intensive country and this research has demonstrated that most of the country's energy is generated from fossil fuels. A low carbon economy policy that integrates market based instruments would imply significant changes in business processes and accounting processes because the costs of carbon will have to be integrated in company finances and planning.

This research has also demonstrated that market based instruments could be beneficial to economic growth through the promotion of technological innovation, provision of financial incentives for best practices and enhanced competitiveness. Managers will need to think of ways in which they can leverage on these benefits for growth of their companies.

## 7.6 Recommendations for Further Research

This research explored whether market based instruments were considered as significant for a low carbon economy transition in Brazil, China, India and South Africa. The study could not establish the extent and effectiveness of implementation of the different types of market based instruments. It is therefore recommended that a further study be conducted that would determine the effectiveness and actual contribution to economic growth in the countries examined in this research.

The research found that special national circumstances dictate the rate and level of adoption of market based instruments and also points out that these circumstances are different from one country to the next. This is a significant finding that could be

subject of further research to compare the different circumstances from one country to the next and establish commonalities and differences.

The literature review revealed that there is increasing pressure in the UNFCCC for Brazil, China, India and South Africa as advanced developing countries to be subjected to carbon emission reduction commitments that are different from other developing countries based on these countries share of global carbon emissions and economic status. This research selected these countries based on that special characterisation and explored their status of implementing market based instruments from a perspective of national low carbon policies. Further research to compare national interests with international interests and whether or not domestically based instruments are more effective or less effective than international market based instruments would be a valuable addition to the body of knowledge in this area.

## 7.7 Concluding Statements

This final chapter has provided answers to the main research problem of understanding the implementation of market based instruments for low carbon economy transition in Brazil, China, India and South Africa. Lessons for South Africa based on the research findings were outlined. Recommendations on how government and industry stakeholders should consider the findings of this research were made and lessons for further research based on limitations of this study and findings that required further probing.

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## 9. Appendices

### 9.1 Appendix 1: Research Questionnaire

Dear Participant

I am conducting research on the role of economic and financial instruments in the transition to a green/low carbon economy by exploring trends and approaches of the BRICS countries with an intention of gathering lessons that might be suitable for South Africa. To that end, you are kindly requested to click on this link. <https://www.surveymonkey.com/s/GreenEconPolicies> and complete the interview questionnaire. This will provide insight into the approaches taken by your country, and should take less than 30 minutes of your time. Please note that, where necessary we may require a short follow up discussion with you to clarify elements arising from this questionnaire than might require further clarity. Your participation is voluntary and you can withdraw at anytime without penalty. All data will be kept confidential and if you have any concerns or specific requirements on how we should manage your data and on any other issue related to this research please contact me or my supervisor. Our details are provided below:

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**1. Which of the four countries below does your response to this questionnaire relate to?**

- South Africa
- India
- Brazil
- China

Other (please specify)

**2. Please indicate the sector that you belong to**

- Government
- Research/ Academic Institution
- International Agency
- Business/Private Sector
- NGO

Other (please specify)

**3. In less than 10 lines, please provide your country or institution's understanding/definition of green/low carbon economy or green growth**



4. In less than 10 lines, please provide your country or institution's understanding of economic and financial instruments (i.e. market related instruments that can either be financial – tariffs and taxes or economic – tradable certificates) in the context of sustainable growth/development?



5. Has your country/organisation adopted green/low carbon economy policies and/or frameworks?

Yes

No

If yes, briefly mention key policies & If no, kindly provide brief explanation



6. In order of importance, rate the following elements that you would regard as significant for a green/low carbon economy/growth transition/approach

 Resource Protection



Employment Creation



Reduction of Carbon Emissions



Creation of New Markets & local production



Economic Transition



Decoupling



Sustainable Cities & Local Government Action



Climate Resilience

**7. Which of the following market mechanisms has your country/ organisation adopted and/or implemented or are in the process of developing?**

- Energy Efficiency Certificate Trading Scheme (White Certificates)
- Renewable Energy Generated Energy Trading Schemes (Green Certificates)
- Carbon Tax
- Renewable Energy Feed In Tariff (REFIT)
- Clean Development Mechanisms
- Fuel Levy
- Emissions licences



- Carbon Budgets

Others (please specify)

**8. From your selection in Question 7 above, choose 3 that you regard as most effective in a green/low carbon economy context.**

Mechanism 1

Mechanism 2

Mechanism 3

**9. From the list of sectors below, select 5 sectors that you regard as most important as part of your Country's green/low carbon economy action**

- Energy
- Agriculture
- Transport
- Human Settlements (Housing)
- Water

- Biodiversity Conservation (including indigenous forests)
- Commercial Forestry
- Oceans and Coasts
- Waste Management
- Infrastructure
- Minerals and Mining

Other (please specify)

**10. In your opinion, do you regard economic and financial instruments as enablers of a green/low carbon economy/growth trajectory? please elaborate**



**11. Please add any other related information that was not covered in the questionnaire and you feel will enrich the content of the research project**

