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# Climate Change: Risks and Opportunities for the South African Economy

## An Assessment of Mitigation Response Measures




Author: Camco and TIPS



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# Executive Summary

Climate change has moved from an issue of environmental concern to an issue of commercial significance in the period of a few decades. The potential impacts of climate change on economies, both positive and negative, are now far-ranging in their scope. In addition, the challenge of addressing climate change has only just begun, with local and global mitigation responses expected to amplify and extend their reach as time progresses.

In an attempt to unpack the implications for the South African economy, this document assesses current and potential impacts from climate change for the country's major economic sectors. Emphasis is placed not on direct physical impacts from climate change, such as increased temperatures and reduced water availability, but on the secondary impacts of climate change. These secondary impacts relate to local, national, regional and global responses to climate change, and how this range of responses influences trade, investment and economic performance.

The analysis contained in this report is focused on providing a framework and overview for evaluating the economic implications of climate change for South Africa. A further objective of the report is to act as a precursor and supportive tool to the development of more detailed climate change analysis for key sectors and industries.

**Section 2** of this document provides an outline of the South African economy at present. It demonstrates that over a sustained period South Africa has shifted to a predominantly tertiary economy, with 55% of all economic output and the majority of employment derived from service related industries. The relatively poor performance of 'Agriculture, Forestry and Fishing' and 'Mining and Quarrying' is one of the main reasons that the primary sector's contribution to Gross Domestic Product (GDP) has shrunk over the past decade.

Prior to the economic recession, South Africa enjoyed a period of sustained economic growth, with annual GDP growth rates averaging 5.4% from 1999 to 2008. The economy, particularly the Manufacturing sector, was hit hard by the economic downturn, with an estimated 900 000 people losing their jobs in 2009. Despite these challenges, economic growth is expected to recover in 2010 and beyond, with GDP estimated to reach a moderate growth rate of 2.3% in 2010 and approaching 3.6% in 2012, offering cautious optimism for a slow but steady economic recovery in the country

Although exports have increased steadily, South Africa has experienced a trade deficit since 2003, with the deficit now standing at R84 Billion, and is expected to increase further as the country's substantial infrastructure development programmes continue to be implemented.

**Section 3** of the document provides a theoretical overview of the secondary risks and opportunities from climate change. These impacts are anticipated to play an increasing role in influencing global and national decision-making, from key players in the public, non-governmental and private sector.

In addition to presenting economic challenges, this section of the report outlines a number of economic opportunities brought about by the shift to a low carbon economy and society, including the ability to work in parallel with objectives related to economic growth, job creation, energy security and social development.

**Section 4** of the report analyses the risks opportunities for the South Africa economy in more detail, with an emphasis on major economic sectors in the country. It is found that the implications of climate change vary substantially between and within sectors, with most sectors displaying a range of potential threats and benefits.

On the whole, the **Agriculture, Forestry and Fishing** sector could benefit significantly from both national and global climate change measures, including through the promotion of organic farming, managed biofuel development, improved fire control, biomass based power generation

and the promotion of land based carbon offset programmes. Substantial opportunities for supporting labour intensive production in an increasingly capital intensive sector are also evident. This includes significant job creation opportunities for unskilled and semi-skilled workers in the country. However, key risks to the sector, most notably concerns over food miles and the larger carbon footprint of the major forestry companies in the sector, will need to be effectively managed.

The **Mining and Quarrying** sector is at considerable risk from the secondary impacts of climate change. The most pertinent of these risks relates to regulation, including the potential introduction of carbon taxation in the country, and the manner in which this will impact on energy intensive mining companies. It is important that parity on climate change matters is maintained in relation to key competitor countries such as Canada, the USA, Russia and Australia at a minimum.

Despite these challenges, industry opportunities in platinum, uranium and copper are available, whilst coal exports are unlikely to be negatively impacted in the short to medium-term. The widespread adoption of energy efficiency measures is a key intervention in this sector, and is arguably essential to the continued competitiveness of companies in this industry, in the face of rising electricity prices from coal-based power generation and expectations for oil prices to reach stabilisation levels approaching $100 a barrel by 2020, with the global economic recovery (IEA, 2009).

The **Manufacturing** sector is at substantial risk from climate change on a variety of fronts, from heightened regulatory concerns through to extensive supply chain, investor and reputational risks. Proactive screening and risk management is critical to ensure that competitiveness relative to other producer nations is maintained, whilst ensuring that the development of any sector-based climate change agreements for cement, iron and steel provide meaningful opportunities for South African industries.

The sector is also characterised by substantial economic opportunities, including through the production of energy efficient machinery and equipment, the domestic assembly of public transport equipment and the development of renewable energy technologies, including thin-film solar PV, wind power, concentrating solar power and solar water heaters. The work of upstream industries such as chemicals and metals can also play an important role in the realisation of low carbon solutions.

A number of opportunities are therefore presented to support domestic manufacturing content in South Africa, an outcome that remains a key objective of government's industrial policy. Enhanced domestic manufacturing output can also be supported through relevant state-led procurement efforts.

Nevertheless, climate change poses additional challenges to the make-up and emphasis of the this sector – key concerns relate to the ability of the sector to invest in efficient technologies and develop sufficient skills to support value addition and product diversification, linked to changing global preferences and an emphasis on low carbon alternatives.

In the **Utilities** sector, the national electricity utility, Eskom, is at marked regulatory risk from climate change, including through mandatory power efficiency requirements, Carbon Capture and Storage (CCS) requirements and the pricing of carbon emissions. Key investor concerns are also evident in this industry, with the country's current power generation plan recently placed under scrutiny by lenders. In a non-competitive electricity market, end users of electricity are at considerable risk of carbon pricing being passed down by the national utility, in the form of higher electricity prices, and remedial measures would be required to address inflationary pressures and social equity concerns.

The combination of commercially viable renewable energy technologies and energy efficiency has the potential to reduce overall electricity prices within a decade relative to conventional practices. Renewable energy and energy efficiency also offer benefits for labour intensive

growth in an industry currently characterised by high capital intensity. Additional benefits relate to improved air quality, enhanced energy security, reduced power station investment requirements, and opportunities to attract new forms of international investment, whilst supporting enhanced carbon competitiveness for a range of South African businesses.

The **Construction** sector faces climate risk through the introduction of more stringent building standards and increased prices for raw materials such as cement and timber. However, the net impact on the sector is likely to be positive, with significant commercial opportunities presented in the development of low carbon technologies, including renewable energy and public transport, and the installation of efficient materials such as insulation.

Large-scale national economic benefits can be achieved through heightened building stock efficiency, including residential consumer gains, reduced commercial operational costs, heightened buffers against rising electricity prices and reduced peak electricity demand. Industry competitiveness is also supported through keeping pace with major global trends in the sector towards efficient building practices. Opportunities are therefore presented for sustained growth in this labour intensive sector of the economy through climate change mitigation.

Within the **Trade, Catering and Accommodation Services** sector, the ***retailing industry*** faces various risks from climate change, including potential regulatory measures concerned with the mandatory reporting of emissions, potential emission caps and mandatory energy efficiency targets. Supply chain issues are also key, as retailers may be faced with higher prices for raw materials and increased shipping and freight costs for imported goods.

Nevertheless, the widespread adoption of efficiency measures in transport, logistics and buildings offers substantial opportunities to shield companies from heightened energy prices, and to strengthen new or existing customer relationships. Opportunities also exist to support the sale of locally manufactured and low carbon goods in the country, including organic produce, whilst adapting retailing activities to address changes in societal preferences.

Concerted action is required in the South African ***tourism industry*** to address both regulatory and market related risks from climate change, given the country's geographical location and carbon intensive economy. Risks include heightened travel fares from the European Union (EU) Directive on Aviation, and growing emphasis on low carbon travel in developed countries, including increasing regional travel within Europe and its surrounds.

Innovative solutions are required to provide support for low carbon destinations, enhanced travel and accommodation efficiencies and accessible carbon offsets, as part of wider efforts to grow the ecotourism and experiential tourism market in South Africa. Measures are also required to address other tourism related threats in the country, such as safety and security, an underdeveloped ground transport network, road traffic accidents and tourism related skills shortages, as part of a holistic approach to maintaining global competitiveness.

Within the **Transport, Storage and Communication** sector, the ***communications industry*** is at moderate risk of mandatory emissions reporting, energy efficiency targets and increased electricity costs through carbon pricing. However, this industry is likely to be a net winner from climate change through efforts to promote Information and Communication Technology (ICT) related climate solutions. Key opportunities include software tools, videoconferencing, the deployment of efficient digital infrastructure, sophisticated grid management technologies and teleconferencing facilities.

The national ***aviation industry*** is at considerable risk from climate change through the enforcement of the EU Directive on Aviation. Whilst the Directive supports longer-term efficiencies in aviation, it entails additional operational costs for airline operators and could play a role in redirecting air traffic flows. There are emerging risks in the maritime industry as well, with the International Maritime Organization (IMO) currently investigating emission reduction options in this sector. It is likely that the EU will incorporate the maritime industry within the

European Union Emissions Trading Scheme, (EU ETS), if the IMO is unable to implement a viable emission reduction programme for shipping by 2012.

Aside from the substantial challenges outlined, large-scale opportunities are evident in the introduction of heightened vehicle efficiency standards and rollout of mass ***public transport*** in the country, particularly in the implementation of Bus Rapid Transit (BRT) systems. These transport measures offer significant secondary benefits and result in direct economic gains for South Africa. The development of a labour intensive bus assembly industry in South Africa, linked to planned or existing BRT systems, is also a distinct commercial opportunity.

The **Financial, Insurance, Real Estate and Business Services** sector is at some risk from the secondary impacts of climate change, including concerns related to emissions reporting requirements, energy efficiency targets and increased electricity prices through carbon pricing. However, the sector is fairly well advanced in climate change issues and has a number of companies voluntarily reporting to the Carbon Disclosure Project (CDP). In addition, improved efficiency measures in the commercial sector, whilst requiring an upfront cost, are likely to yield strong cost savings over the medium-term.

A potentially far greater threat relates to climate change risk within company investment portfolios. Effective portfolio and project screening, and the incorporation of climate factors within risk management systems, is required to address major obstacles.

Significant opportunities are offered in this sector to support the development of an advanced knowledge based economy in South Africa, drawing on the country's well established banking and finance industries. Areas of opportunity include carbon markets and trading, including potential global sector-based trading schemes, energy management, climate change science, policy and research, as well as a host of professional services.

**Section 5** considers key elements of an effective climate change response for South Africa. It argues that, given the range of potential implications for the economy, a proactive response to climate change is needed on the part of the public and private sector.

As global mitigation measures intensify, it is reasonable to expect that the cost of carbon will be increasingly internalised within markets, with carbon intensive market players facing increasing formal or informal competitiveness constraints, including through supply chains, investor and finance concerns and certain reputational losses, as well as a failure to keep pace with technological innovation.

Positioned globally, South Africa's economy is currently poorly placed to address a number of these concerns, given our strong dependence on fossil fuels and high levels of energy intensity per economic output. South Africa's climate competitiveness, although improving, remains amongst the lowest of the G20 group of nations.

As a result of these concerns, business is required to play an instrumental role in developing and implementing climate policy, in a manner that goes beyond a process of engagement. Given the global nature of the climate challenge and the global nature of response measures, a concerted business drive on climate change is desirable, in collaboration with government, to ensure that South African companies thrive in a carbon constrained future.

Proactive engagement and management of climate change issues by the private sector is desirable over and above concerns related to changes in the national regulatory landscape. For many sectors of the economy, significant threats and opportunities to business lie outside the realm of national regulatory mechanisms, in the form of global supply chains, investor relations, reputational issues and the growing demand for low carbon goods and services. All of the factors listed have gathered significant momentum irrespective of calls for domestic policy action. As such, climate change should be viewed not just as a regulatory issue, but as a commercial issue shaping pricing, market equilibriums and the competitiveness of industries.

Section 5 further argues that national regulatory measures cannot be seen in isolation, and it is critical that South Africa's mitigation response be developed in tandem with influencing both international governmental and non-governmental action on climate change, to ensure that relative parity is retained with key competitor nations in Asia and the developed world. National regulatory action must be supported by appropriate interventions at the international scale to support a fair and coherent South African response.

The energy sector, and energy planning more specifically, is identified as a key area in which climate change mitigation planning and integration are required.

Finally, Table 6 outlines some of the salient features of the risks of inaction on climate change in comparison to the benefits of action for South Africa. The analysis suggests that the benefits of action and risks of inaction are both pronounced, supporting mitigation efforts, whilst the economic and commercial risks of business as usual growth have been underexplored. The analysis further implies that concerns over the transition costs associated with moves towards a low carbon economy will need to be assessed against new commercial constraints incurred as a result of business as usual practices.

**Section 6** of the report considers aspects of a potential way forward for the country. Table 7 and 8 consider potential response measures to address key risks and exploit key opportunities respectively.

It is argued that 3 key elements are required as part of a comprehensive climate change response namely:

1. Private sector leadership and engagement
2. The establishment of a clear and consistent policy framework, and
3. The development of sector-based climate change strategies and plans

In addition to supporting existing policy development procedures, it is suggested that effective business action on climate change requires a number of complementary measures, including:

- The establishment of a national Business Support Unit on climate change, linked to existing private sector forums
- The movement of climate change onto the company executive level, and
- Regular and formalised communication channels between business, government, labour and civil society on climate change

From a national policy perspective, the development of the National Climate Change Response Policy is underway, underpinned by the national emission reduction target, and National Treasury has been extensively involved in evaluating the use of carbon pricing in the economy. This policy development process raises important issues for consideration, including:

- The need for a consistent policy direction, including integration between key government departments and different spheres of government
- Benefits to be derived from the phasing-in of climate regulations
- Requirements for short-term planning to match the country's long-term climate vision
- The need to support wider industry competitiveness, including encouraging flexibility in the achievement of mitigation objectives

Increasing governmental and non-governmental action on climate change, including the progression of domestic climate policy, calls for increasing sector based responses. The development of sector-based mitigation plans that manage risk, exploit opportunity and establish cross sectoral partnerships where required, will need to consider both regulatory and non-regulatory challenges from climate change, as key sectors of the economy seek to thrive in dynamic environments.

**In conclusion**, efforts to maintain short and medium-term growth can no longer ignore the implications of climate change for business and the economy more broadly. Many of the commercial implications of climate change are already being experienced in developing countries such as South Africa, driving private sector innovation but also creating new areas of economic vulnerability.

At the same time, a number of climate liabilities have the ability to be reoriented into opportunities to enhance competitiveness, access external support and deliver new products and services. A number of pro-climate initiatives are also of significant value in promoting sustainable development in South Africa. This includes through substantial job creation, poverty alleviation, energy security and economic growth benefits in the Agriculture, Manufacturing, Electricity, Construction and various Services sectors.

Areas of significant opportunity for the encouragement of domestic manufacturing content can be found in the promotion of energy efficient equipment and machinery, the development of renewable energy technologies, as well as public transport infrastructure and equipment. Areas of significant opportunity for labour intensive growth, including in support of jobs for unskilled and semi-skilled workers, can be found in organic produce, organic cotton production, managed biofuel development, enhanced fire control, the promotion of energy efficient buildings, the construction of public transport and renewable energy infrastructure, renewable energy manufacture, as well as recycling programmes. There are also substantial economic opportunities for high skill and high wage employment in the tertiary sector through the development of carbon markets and a host of professional services.

Irrespective of national or global commitments to mitigation efforts, key elements of the climate challenge will remain, and key opportunities will be open to the country. Proactive responses across the private and public sector are required to effectively address climate change in South Africa. Successful management of this global challenge will require short-term pragmatism and longer-term planning, linking business, government, labour, NGOs and the research community in support of low carbon growth.

# 1 Introduction

> "Over the long term we will redefine our competitive advantage and structurally transform the economy by shifting from an energy-intensive to a climate-friendly path as part of a pro-growth, pro-development and pro-jobs strategy."
>
> - South African Climate Change Summit 2009: Conference Statement

## 1.1 Background

Climate change is now recognised as having significant potential impacts on the development and prosperity of nations.

Much of this attention is focused on the physical impacts of climate change on agricultural production, changes in weather patterns and an increased propensity of extreme weather events. South Africa is by no means immune to these adverse effects, with numerous local and international studies outlining risks for the country and African continent as a whole (see Midgley et al., 2007; IPCC, 2007). This report acknowledges the significant ramifications that direct climate change impacts could have on the South African economy, brought about by:

- An increase in air temperature of between 1℃ to 3 ℃ over the next three to five decades
- An expected increase in evapotranspiration of between by 5 to 15% by 2050 for Southern Africa, with concerns for available water resources in the country
- Challenges for agricultural production in both the summer and winter rainfall areas by mid-century, with particular concern for the maintenance of rural livelihoods
- Changes in the territorial range and prevalence of a variety of vector borne diseases such as malaria and schistosomiasis (bilharzia), as well as a potential increase in the spread of food and water borne diseases
- An increase in the frequency and intensity of extreme weather events such as flooding and wild fire, with heightened requirements for effective disaster management (Midgley et al., 2007)

Readers wishing to obtain a greater understanding of predicted physical impacts for South Africa are advised to consult recent publications in this regard (Schulze, 2005; Midgley et al., 2007; Walker and Schulze, 2008; Benhin, 2008).

However, equally important are the 'secondary' impacts of climate change for national economies. These secondary impacts relate to local, national, regional and global responses to the climate challenge, and how this range of responses influences trade, investment and the competitiveness of nations.

These secondary or indirect impacts, related to areas such as climate change regulation, changes in consumer preferences and the development of the global carbon market, are arguably as significant as the physical impacts of climate change. As some have argued, climate change is characterised by two key dimensions: the environmental-climatic dimension, which is concerned with physical risks, and the regulatory-market economy dimension, which focuses on the indirect implications of climate change (Deutsche Bank Research, 2007).

This study therefore focuses on understanding and unpacking the secondary impacts of climate change, referred to collectively in this report as 'mitigation response measures', as a relatively unexplored area for South Africa. The document has two key objectives, namely to:

1. Support the identification and management of climate change related risks throughout the South African economy, in order to ensure industrial competitiveness, economic growth and market access
2. Help chart a course for the country in which effective climate change opportunities are recognised, evaluated and implemented

The announcement of a national emission reduction target[1] by President Jacob Zuma in December 2009, and the country's further commitments to this target outlined in its submission to the Copenhagen Accord, highlights the significant structural shifts in the economy that could be brought by a coherent South African response to climate change. Many of these changes also offer substantial opportunities for socio-economic advancement in South Africa, including benefits for energy security, employment creation and poverty alleviation. The consideration of these opportunities therefore requires further attention and scrutiny.

South Africa is both an energy and carbon intensive economy, characterised by a reliance on coal-based power generation and limited access to effective public transport and low carbon freight. However, just as the country is exposed to a number of potential carbon related liabilities, so the opportunities to access international support for infrastructure investment and improved efficiencies have never been greater.

Effectively positioned, the South African economy is capable of weathering any severe 'climatic' storms, whilst maximising on commercial opportunities and new markets.

## 1.2 Scope of Work

The scope of this study is focused upon the secondary impacts of climate change brought about by local, national, regional and international responses to this global challenge. The term 'responses' is used in a broad sense to include policy shifts, changes in legislative conditions, the adoption of various formal and informal plans, the implementation of measures, changes in sentiment etc. These secondary impacts bring about a range of risks and opportunities for the public and private sector, a topic that is discussed in detail in Section 3 below.

Specifically excluded from this study is consideration of physical impacts from climate change. Nevertheless, it is clearly acknowledged that physical risks from climate change could have strong significance for the country, and that both observed and predicted impacts could have an important bearing on the national economy. It is also recognised that appropriate responses to the adaptation challenge could offer certain economic opportunities, through, for example, job creation in adaptation related programmes or activities.

Finally, it should be noted that the analysis contained in this report is focused on providing a framework and overview for evaluating the economic implications of climate change for South Africa. The objective of the report is therefore not to provide an exhaustive assessment, but rather to act as a precursor and supportive tool to the development of more detailed climate change analysis for key sectors or industries in South Africa.

[1] *In the lead up to the Copenhagen Climate Summit, South Africa announced an emission reduction target made up of 'a deviation below the current emissions baseline of around 34% by 2020 and by around 42% by 2025.This level of effort enables South Africa's emissions to peak between 2020 and 2025, plateau for approximately a decade and decline in absolute terms thereafter.' (The Presidency, 6 December 2009). This target is conditional, however, on a fair, ambitious and effective international climate change agreement being reached, and on the country receiving finance, technology transfer and capacity building support from the international community, particularly from developed countries.*

## 1.3 Document Structure

This document is structured as follows:

| | |
|---|---|
| **Section 2** | **National Context: Outline of the South African Economy**<br>▪ Provides a brief outline of the economy, including key trends and recent developments |
| **Section 3** | **Climate Change: Overview of Risks and Opportunities**<br>▪ Provides a summary of the secondary risks and opportunities brought about climate change, as contextual background for the remainder of the report |
| **Section 4** | **Risks and Opportunities for the South African Economy**<br>▪ Considers the risks and opportunities for each sector of the South African economy in more detail, outlining key areas in which responses are required and commercial opportunities are present |
| **Section 5** | **Key Areas for Consideration**<br>▪ Drawing on Sections 3 and 4, this section outlines a number of key issues to be considered and debated in the framing of a holistic climate change response |
| **Section 6** | **Envisaging a Way Forward for South Africa**<br>▪ Provides input towards the development of a low carbon growth plan for South Africa that minimises risks and harnesses economic opportunities |
| **Section 7** | **Conclusion**<br>▪ Provides an overall conclusion to the study |

# 2 National Context: Outline of the South African Economy

> "The economics of climate change is fundamentally an 'externality' story. So far – or at least until recently – polluters, particularly emitters of greenhouse gases, have not had to pay for the damage they have caused. Hence, they have had no economic incentive to limit them. However, to the extent that the science of greenhouse gases comes to be accepted as broadly correct, social and political pressure will likely build to internalize this externality, one way or another."
>
> - Lehman Brothers (2007)

## 2.1 Overview

This section of the report provides an overview of the South African economy, drawing on data obtained primarily from the Quantec Online Database for the period 1999 to 2008. Certain analysis may therefore not capture the further implications of the recent global economic recession for the economy from 2009 onwards.

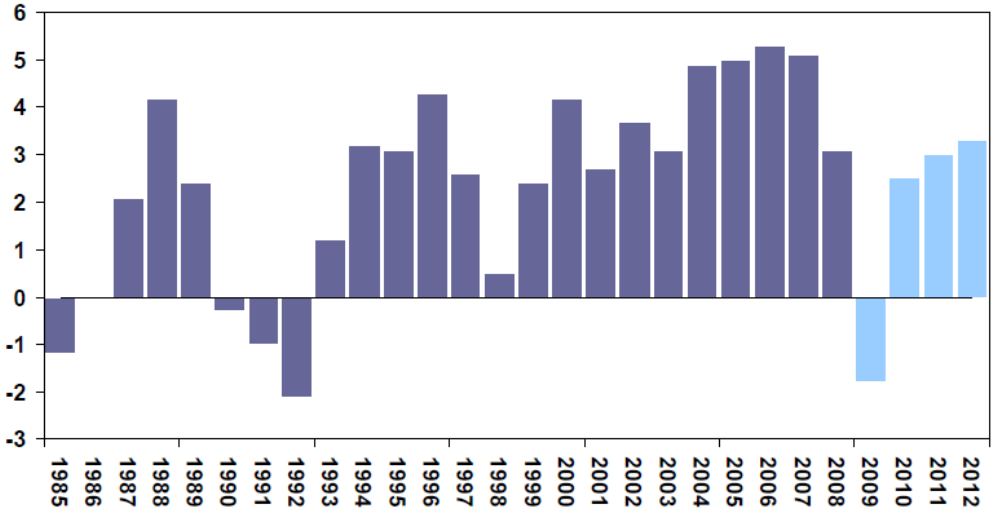
South Africa has enjoyed a period of sustained economic growth in recent years, with the annual growth rate of total Gross Domestic Product (GDP) averaging 5.4% from 1999 to 2008. Employment levels also benefitted from a record 32 consecutive quarters of positive growth: in the period 2004 to 2007, it is estimated that approximately 1.4 million jobs were created in the formal and informal sector, although unemployment levels remained high at 25.5% (IDC, 2007).

Despite these meaningful gains, South Africa has been marked by the recent international economic crisis. South Africa's GDP fell down markedly in the third quarter of 2008 (to only grow at 0.2%) to become negative in the fourth quarter of 2008. This slowdown continued into 2009, with the economy contracting by 1.8% in comparison to 2008 levels (StatsSA, 2010).

This contraction of economic activities has witnessed a sharp reduction in manufacturing output, in line with weaker domestic and foreign demand, and responses by manufacturers to reduce output even further than the fall in demand through cutting back on their inventories. Employment trends experienced under the economic crisis are also worrying. Overall employment in the South African economy decreased by 2% in the first half of 2009, representing a loss of 267 000 jobs. It is estimated that as many as 900 000 people in South Africa may have lost their jobs in 2009 (National Treasury, 2010). Less-skilled younger Africans have been those particularly affected by the crisis and resultant declines in employment. Finally, concerns remain over increasing inequality in the country, in the context of large portions of the population still affected by poor service delivery and a lack of access to basic services.

Despite these challenges, economic growth is expected to recover in 2010 and beyond, with GDP estimated to reach a moderate growth rate of 2.3% in 2010 and approaching 3.6% in 2012, offering cautious optimism for a slow but steady economic recovery in the country (National Treasury, 2010). This prediction of national economic growth trends is also supported by a number of private sector economists, as depicted, for example, in Figure 1 below.

**Figure 1: South Africa GDP Annual Growth Rate (1985 – 2008) and Projected GDP Growth (2010-2012)**

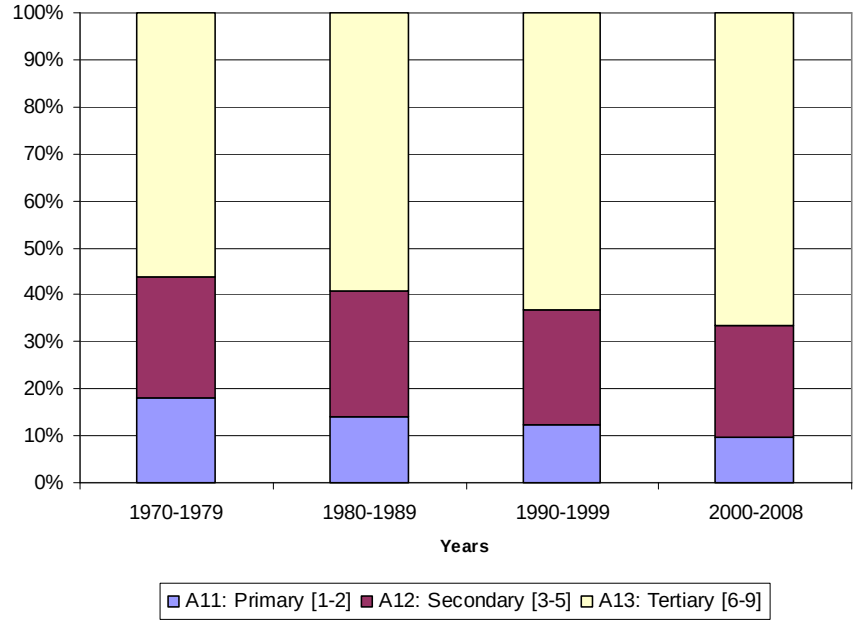



Source: STANLIB (2009)

## 2.2 Economic Output by Sector

South Africa has undergone a restructuring of its economy over a long-time horizon. This has been in favour of the tertiary sector over both the secondary (e.g. Manufacturing) and primary sectors (Agriculture, Forestry & Fishing, Mining and Quarrying). The expansion of the tertiary sector has coincided with a notable contraction of the primary sector since 1970, as reflected in Figure 2 below:

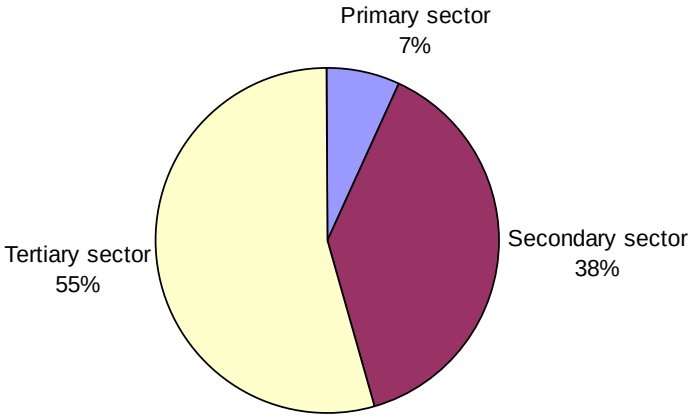
**Figure 2: Average Share of Value Added at Basic Prices by Main Economic Sectors**




Source: Calculated using data from Quantec Standardised Industry Database

Continuing with the trend depicted in Figure 2 above, as of the end of 2008 the tertiary sector accounted for 55% of GDP, the secondary sector 38%, and the primary sector 7% of national output:

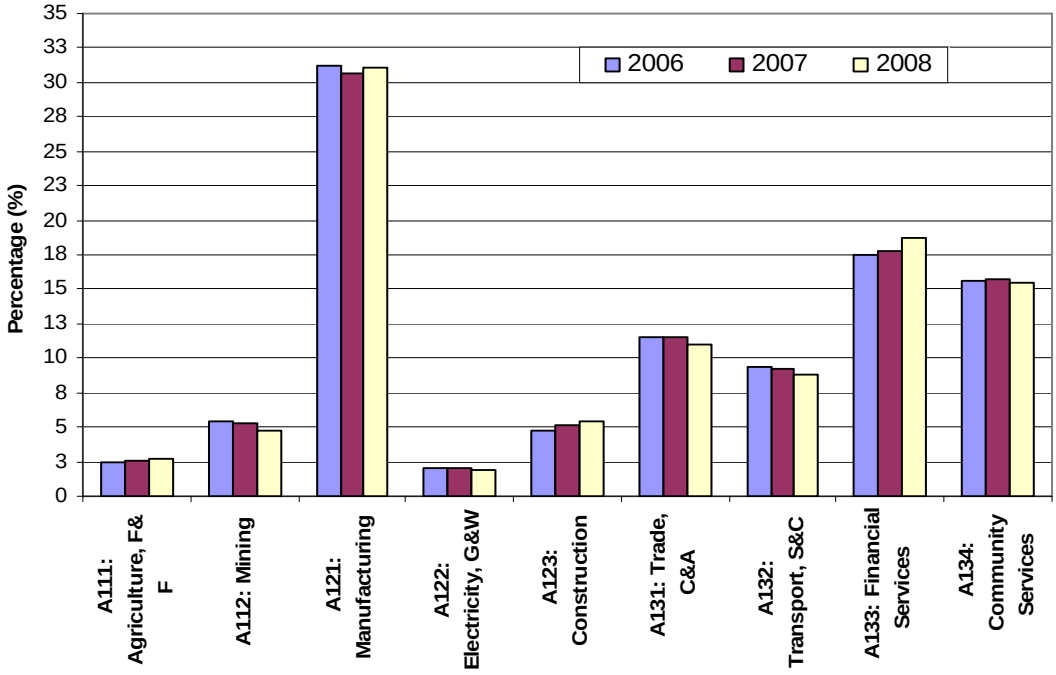
**Figure 3: Sector Contribution to GDP in 2008 at SIC 2-digit level – at 2005 Constant Prices**




Source: Quantec Online Database 2010 (http://www.quantec.co.za/)

A more detailed breakdown of relative contributions to GDP by sector for the period 2006 to 2008 is provided below:

**Figure 4: Sector Contribution to GDP at SIC 3-digit level (2006-2008) - at 2005 Constant Prices**




Note: F & F - Forestry and Fishing; G & W - Gas and Water; C & A - Catering and Accommodation; S & C - Storage and Communication

Source: Quantec Online Database 2010

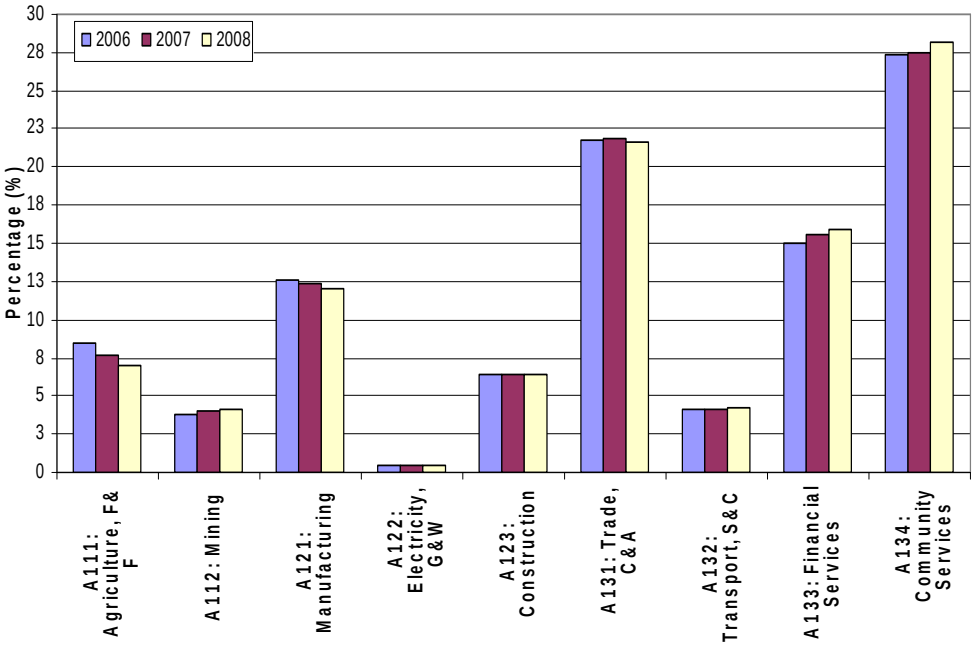
The relatively poor performance of Agriculture, Forestry and Fishing, as well as Mining and Quarrying, is one of the main reasons the primary sector's contribution to GDP has shrunk. Gold mining production has fallen by over 6% since 1999.

The Manufacturing sector is the single largest contributor to GDP with over 30% of the country's' output produced in this sector from 2006 to 2008. Financial and Community Services both contribute to over 15% of GDP output. Trade, Catering and Accommodation Services; Transport, Storage and Communication; Financial Services as well as Community Services, all located within the tertiary sector, together accounted for 54% of GDP in 2008.

## 2.3 Employment by Sector

Employment in South Africa is dominated by the tertiary sector (Figure 5). Community Services (which includes government services) is one of the main absorbers of the labour force. The wholesale and retail industries, which fall under Trade, Catering and Accommodation Services, contribute 11% of South Africa's total employment. Agriculture is also an important employer, supporting rural development and providing relatively labour intensive economic output.

**Figure 5: Sector Contribution to Employment at SIC 3-digit level (2006-2008) - at 2005 Constant Prices**




Source: Quantec Online Database 2010

## 2.4 Breakdown of National Exports

South Africa's largest exports are mineral products, precious metals and base metals, followed by machinery and vehicles. These sectors are also amongst the highest growing export sectors in South Africa, which once again includes machinery and vehicles (Table 1).

**Table 1: South Africa's Exports at Chapter Level - Share and Average Annual Growth Rates (%)**

| Sectors at Chapter level | Share of SA Total Exports (%) | | Sector average annual growth rates of export (%) | |
|---|---|---|---|---|
| | 1999 | 2008 | 1999-2003 | 2004-2008 |
| C01: Live animals, animal products | 1.4 | 0.8 | 18.7 | 11.6 |
| C02: Vegetable products | 4.0 | 3.5 | 14.5 | 18.4 |
| C03: Animal or vegetable fats | 0.2 | 0.2 | 4.7 | 34.4 |
| C04: Prepared foodstuffs | 3.7 | 2.7 | 16.7 | 13.5 |
| C05: Mineral products | 13.3 | 18.7 | 14.8 | 34.0 |
| C06: Chemical Products | 6.0 | 6.4 | 14.4 | 20.9 |
| C07: Plastics & Rubber Products | 1.7 | 1.6 | 20.0 | 16.6 |
| C08: Raw hides & skins | 0.7 | 0.2 | 5.8 | 0.2 |
| C09: Wood & articles of wood | 1.1 | 0.5 | 20.0 | -1.5 |
| C10: Pulp & Paper | 2.9 | 1.9 | 9.4 | 17.5 |
| C11: Textiles & textile articles | 2.1 | 0.8 | 19.2 | 3.3 |
| C12: Footwear | 0.1 | 0.1 | 17.6 | 12.2 |
| C13: Articles of stone | 0.7 | 0.3 | 14.9 | 5.3 |
| C14: Precious Metals | 21.8 | 23.0 | 14.6 | 18.5 |
| C15: Base metals | 15.0 | 18.2 | 15.8 | 19.9 |
| C16: Machinery | 6.6 | 9.4 | 22.6 | 27.6 |
| C17: Vehicles | 6.9 | 10.2 | 23.2 | 24.8 |
| C18: Scientific Equipment | 0.4 | 0.5 | 21.4 | 22.7 |
| C19: Arms & ammunition | 0.0 | - | 0.0 | 0.0 |
| C20: Misc. manufactured articles | 1.8 | 0.8 | 15.4 | 3.7 |
| C21: Works of art | 0.1 | 0.1 | 9.2 | 23.5 |
| C22: Other unclassified goods | 9.4 | 0.0 | -66.6 | -6.7 |
| C23: Special classification | 0.0 | 0.0 | 5.9 | 92.8 |

Source: Quantec Online Database 2010

## 2.5 Breakdown of National Imports

As can be seen in the table below, South Africa's largest imports are machinery, vehicles, chemical products and mineral products (Table 2).

**Table 2: South Africa's Imports at Chapter Level - Share and Average Annual Growth Rates (%)**

| Sectors at Chapter level | Share of SA Total Imports (%) | | Sector average annual growth rates of import (%) | |
|---|---|---|---|---|
| | 1999 | 2008 | 1999-2003 | 2004-2008 |
| C01: Live animals, animal products | 0.7 | 0.7 | 12.0 | 22.6 |
| C02: Vegetable products | 2.0 | 1.7 | 15.3 | 27.2 |
| C03: Animal or vegetable fats | 0.9 | 0.9 | 15.1 | 32.4 |
| C04: Prepared foodstuffs | 2.1 | 2.1 | 14.5 | 28.5 |
| C05: Mineral products | 10.5 | 23.9 | 19.1 | 39.8 |
| C06: Chemical Products | 11.5 | 9.0 | 13.4 | 22.9 |
| C07: Plastics & Rubber Products | 4.1 | 3.4 | 15.4 | 21.4 |
| C08: Raw hides & skins | 0.6 | 0.3 | 8.9 | 13.7 |
| C09: Wood & articles of wood | 0.6 | 0.4 | 16.9 | 15.7 |
| C10: Pulp & Paper | 2.3 | 1.5 | 11.5 | 21.7 |
| C11: Textiles & textile articles | 3.4 | 2.3 | 14.4 | 13.7 |
| C12: Footwear | 0.8 | 0.7 | 17.4 | 17.9 |
| C13: Articles of stone | 1.5 | 1.2 | 11.9 | 25.7 |
| C14: Precious Metals | 2.4 | 1.3 | 7.7 | 14.6 |
| C15: Base metals | 4.3 | 5.0 | 16.1 | 31.7 |
| C16: Machinery & mechanical appliances | 31.1 | 24.8 | 13.2 | 23.0 |
| C17: Vehicles | 7.3 | 9.9 | 29.7 | 16.0 |
| C18: Scientific Equipment | 4.0 | 2.6 | 14.4 | 16.1 |
| C19: Arms & ammunition | 0.0 | 0.0 | 0.0 | 0.0 |
| C20: Miscellaneous manufactured articles | 1.6 | 1.4 | 11.4 | 23.4 |
| C21: Works of art | 0.0 | 0.1 | 32.2 | 22.6 |
| C22: Other unclassified goods | 0.1 | 0.0 | 28.0 | -0.3 |
| C23: Special classification | 8.1 | 6.7 | 21.3 | 16.2 |

Source: Quantec Online Database 2010

## 2.6 Balance of Payments

Although exports have increased steadily, South Africa has been experiencing a trade deficit since 2003, with this deficit reaching a significant R84 Billion by the end of 2008 (Table 3).

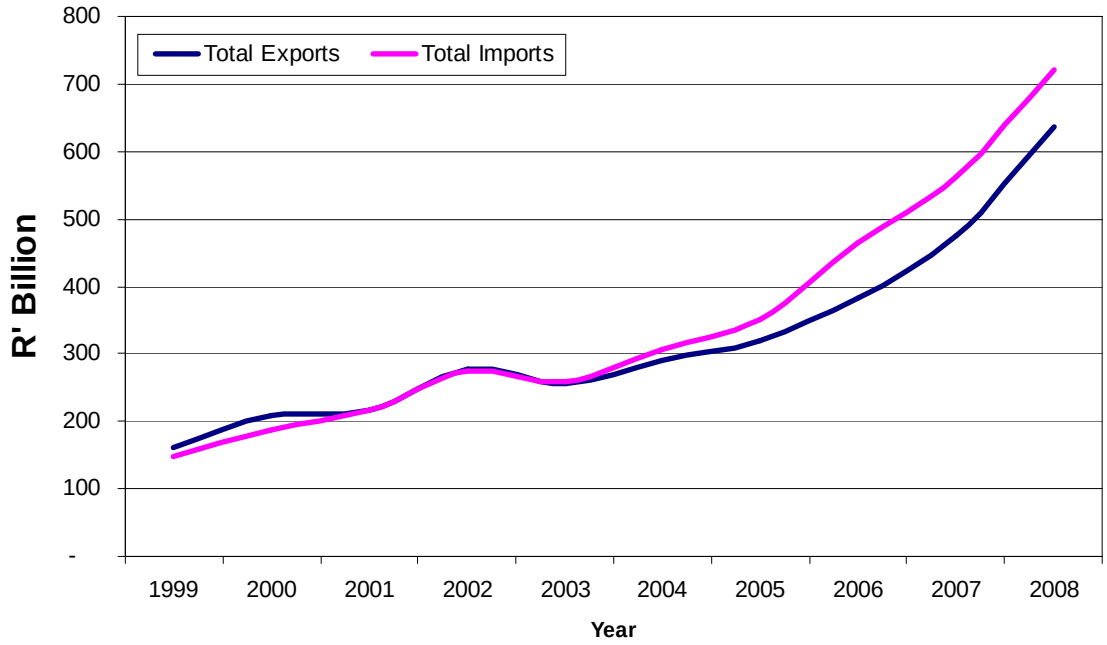
**Table 3: South Africa's Total Imports and Exports from 1999 to 2008 - R' Billion at constant prices**

| Trade Flow | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Exports | 162 | 208 | 215 | 278 | 256 | 291 | 320 | 383 | 474 | 637 |
| Total Imports | 147 | 188 | 215 | 274 | 258 | 306 | 351 | 465 | 563 | 721 |
| **Total Trade[2]** | **309** | **396** | **431** | **552** | **514** | **598** | **671** | **848** | **1,037** | **1,358** |
| **Trade Balance[3]** | **14** | **20** | **-0** | **4** | **-3** | **-15** | **-30** | **-81** | **-88** | **-84** |

Source: Quantec Online Database 2010

This declining balance of payments trend is depicted in Figure 6 below:

**Figure 6: South Africa's Total Imports and Exports from 1999 to 2008 - R' Billion**




Source: Quantec Online Database 2010

More recently, since the onset of the economic recession, exports have struggled to accelerate given the strengthening of the Rand and sluggish global demand. However, from a balance of payments perspective, this has been somewhat counteracted by lowered demand for imports as a result of reduced domestic demand. In 2010 the trade balance is expected to decline only slightly from its current position; however, this trade deficit is expected to deteriorate more significantly as South Africa's infrastructure development programmes continue apace, driving an accelerated demand for imports.

Please note that comprehensive reviews of each of the major economic sectors in South Africa, completed as part of the research for this study, are available for download at the project website: www.climateriskandopportunity.co.za. A total of eighteen economic sectors are evaluated, ranging from the Construction sector to Textiles and Clothing.

[2] *Total Trade = Total Exports plus Total Imports*
[3] *Trade Balance = Total Exports minus Total Imports*

# 3 Climate Change: Overview of Risks and Opportunities

> "The far-reaching effects of climate change on business become clearer when you start to think about the different kinds of risk—most of which can be transformed into opportunities—and how they could affect the value of your company."
>
> - Harvard Business Review (2007)

The secondary risks and opportunities from climate change can be summarised within a number of categories. Despite their categorisation, each of the risks and opportunities share a common element: they are the result of social, economic and political responses designed to help address the climate challenge. In other words, the categories discussed below outline the implications of a worldwide concern over anthropogenic (man-made) climate change, and reflect attempts by society to reduce this threat to ecosystems and human livelihoods. It should be noted, however, that these responses are not necessarily without unintended consequences, and are often supported by other, non-climate, related objectives, an issue that is discussed in greater detail in the remainder of this document.

Each of the major secondary risk and opportunity categories from climate change are considered in turn below:

**Table 4: Secondary Risks from Climate Change**

| Risk Categories | |
|---|---|
| **Legal and Regulatory** | The most commonly cited climate risk is concerned with the introduction of regulations and legislation to address climate change. The scope of this regulatory change is wide-ranging and operates at various geographical levels:<br>**International / Regional Level**<br>▪ International emissions caps placed on specific countries, including developed countries and more advanced developing countries<br>▪ The introduction of sector-based emission caps or intensity targets for carbon intensive sectors on a global basis. Relevant sectors affected include iron and steel, power generation and cement<br>▪ The introduction of sector-based emission caps or intensity targets at a regional (e.g. European Union) level<br>▪ Any other climate related regulation requiring countries or institutions to report or reduce their emissions<br>**National Level**<br>▪ Measures requiring institutions and firms to engage in mandatory reporting of emissions<br>▪ The setting of national emission reduction targets with associated compliance requirements devolved to the industry and company level<br>▪ Compliance mechanisms can include the use of economic instruments such as 'cap and trade' emissions trading schemes or carbon taxes, as a means for pricing carbon in the economy and |

| Risk Categories | |
|---|---|
| | thereby promoting emission reductions<br>▪ The introduction of sector-based emission caps or intensity targets at a national level<br>▪ The implementation of additional regulatory measures relating to building codes, the mandatory introduction of low carbon technologies, the implementation of minimum efficiency standards for electrical equipment, vehicle emission standards, industry energy efficiency targets etc. Regulatory reform is an ongoing development in this category<br>▪ Requirements to explicitly consider the climate change impacts of an infrastructure development as part of the Environmental Impact Assessment (EIA) process<br>▪ Potentially reduced foreign direct investment or national investment due to regulatory measures or compliance costs introduced to address climate change. Other factors influencing investment such as labour costs and productivity, political stability and available infrastructure are also key in this regard<br>**Provincial / Local Level**<br>▪ The implementation of any of the above national measures in areas of provincial or municipal authority. Examples include within transportation, electrical and waste services<br>It should be borne in mind that regulations enacted in one country or region can and often do have an important bearing on other countries. A good example of a regional regulation with global reach is the EU Directive on Aviation, a measure designed to address aviation emissions that affects all countries flying to EU based airports.<br>Regulatory risk from climate change can increase energy and raw material prices, result in further reporting requirements, deter investment in certain technologies, raise operating costs and promote commercial concerns for energy and carbon intensive industries. |
| **Trade and Market Access** | Issues related to potential trade barriers and shifts in commercial markets from climate change are an evolving area of climate interest. Key risk areas include:<br>▪ Changes in consumer preferences away from carbon intensive products and services, reducing the market for certain suppliers and industries. Changes in demand and pricing are critical in this respect<br>▪ Reduced global demand for particular fossil fuel technologies and resources, including coal and oil energy supplies<br>▪ The introduction of climate change specifications for goods imported into specific countries, including the imposition of taxation on imports through border tax adjustments (BTAs). This risk encompasses various trade related barriers that may be developed in response to climate concerns<br>▪ The promotion of 'local' tourism, particularly within developed country markets, with the potential to impact on tourism demand in other countries. This risk applies particularly to developing countries that rely to a considerable extent on tourism based earnings |

| Risk Categories | |
|---|---|
| | ▪ An increased cost for certain imported goods as a result of climate initiatives implemented in trading partner countries. This change in price is related to the carbon content of specific goods and has the ability to impact the trade balance and host companies directly<br>▪ Continued exposure to high fuel costs, such as rising oil prices, in the absence of a concerted effort to reduce national energy and fuel demand. At risk are crude oil and/or refined petroleum product importers and sectors that rely heavily on such inputs |
| **Country Level Investment** | Country-level investment risk from climate change is reported here as a specific area of risk related to:<br>▪ Insufficient national investment in skills and competencies to support low carbon industries and initiatives<br>▪ Threats of NGO boycotts, protests and other civic action deterring investments in fossil fuel technologies and related infrastructure<br>▪ Costs of Research and Development (R&D) programmes into fossil fuel alternatives and related technology demonstration<br>▪ The introduction of potentially costly financial commitments under a future carbon regulatory regime for long-lived capital assets. This applies particularly to fossil fuel infrastructure |
| **Supply Chain** | Supply chain issues are an important area of climate risk. Of key concern is that carbon related costs can be passed down by suppliers, increasing operational costs for particular sectors. Companies downstream of carbon intensive production are especially at risk.<br>In addition, a number of companies across the globe are involved in activities to 'green' their supply chains in an effort to reduce their own carbon footprint. These efforts could have wide-ranging implications in terms of added costs to the companies themselves, as well as concerns for upstream and downstream industries, as discussed below:<br>**Upstream**<br>▪ Suppliers to companies may be required to report on their emissions, reduce their emissions, or indeed, fall out of favour with current or potential clients<br>▪ Arguably the most widely publicised activity in this area concerns product 'food miles' or 'air miles'. Retailer or industry association led action (particularly within developed countries) to reduce emissions related to the transport and packaging of goods can have potentially significant impacts on certain industries and export led businesses located at distance from markets<br>**Downstream**<br>▪ Downstream sectors may be required by companies greening their supply chains to re-use, recover or recycle finished products as part of wider initiatives to reduce emissions in the life cycle of products. Companies greening their supply chains may also need to take an active and direct role in the reutilisation and effective disposal of their products<br>It is important to note the geographical distribution of supply chains. Climate regulation in different countries and regions of the world can |

| Risk Categories | |
|---|---|
| | have an important bearing on costs associated with goods imported by countries without any such legislation. In essence, the presence of global supply chains requires a global perspective on all facets of climate related risk. |
| **Investor** | A growing body of banks and investors are increasingly concerned about the climate change liabilities associated with companies' activities and investments. The most well-known initiative in this regard is the investor led Carbon Disclosure Project (CDP), which was launched in 2000. The CDP requests companies across the globe to report on their greenhouse gas (GHG) emissions and outline the measures they are adopting to address their carbon liabilities.<br><br>Investor risk on climate change has become a more active area, made up of the following elements:<br><br>**For Companies:**<br><br>▪ Increasing requirements to engage in non-financial reporting on climate change issues (e.g. the CDP)<br><br>▪ Challenges to organisations in terms of shareholder attitudes and the rise of shareholder activism on climate change. This includes the filing of shareholder resolutions demanding that specific actions be taken on climate change[4]<br><br>▪ The discounting of share prices for companies poorly placed to compete in a carbon constrained economy, an activity that has already been undertaken by certain investors<br><br>▪ Changes in bank lending patterns. This includes the screening of potential projects for carbon related liabilities. The Carbon Principles, focused specifically on evaluating fossil fuel investment in the United States, and adopted by a number of leading multinational financing institutions, provides a good example of this type of activity<br><br>▪ The cost of capital associated within carbon intensive investments is an additional area of risk, and an area that could become more prominent in the future<br><br>▪ Sufficient attraction of investment for climate exposed companies or projects. Financial exposure from climate change could impact company cash flows, affecting their ability to raise capital, manage debt and impacting credit and investment ratings<br><br>▪ Capital investment requirements may also increase for companies implementing emission reduction projects, which could generate excessive wheeling concerns if investors are not effectively briefed<br><br>**For Investors:**<br><br>▪ Relative changes in share prices across and within different sectors as the cost of carbon is further priced into economies, and project evaluation processes, offering risks for companies and shareholders |

[4] *"More than two dozen climate-related resolutions were filed with companies in the 2004 to 2005 period, triple the number from 2000 to 2001." (Harvard Business Review, 2007 p3). In 2008, a record 54 climate resolutions were field by shareholders (Pew Center, 2009).*

| Risk Categories | |
|---|---|
| | characterised by high carbon intensity<br>▪ Risks to investors within carbon intensive projects and activities in the context of a changing market or regulatory environment |
| **Reputational** | An increasingly visible area of climate risk relates to heightened reputational (brand) risks for institutions that do not address, or are perceived to be taking insufficient action, to address climate change. This risk category encompasses the following:<br>▪ Scrutiny can be placed over an organisation's carbon footprint, as well as less direct activities through their supply chain or lending practices<br>▪ Failure to address carbon liabilities can deter investors, reduce an organisation's ability to attract skilled professionals, discourage consumers, result in negative brand effects and, in more extreme cases, lead to damaging public demonstrations, media coverage and activism campaigns. All of these effects can impact on a company's market share and shareholder value<br>▪ Reputational risks tend to be highest in environmentally and ethically sensitive markets, sectors in which brand loyalty is a key value-driver, and industries with a direct customer interface |
| **Litigation** | ▪ An emerging area of climate risk lies in potential legal action against large emitting companies or entities that fail to adequately address their contribution to climate change<br>▪ Spurred on by high profile cases within the United States, the potential for legal action is a concern in certain jurisdictions and can be expected to increase in severity in the medium to long-term. Areas of focus include energy utilities, aviation and the oil and gas sector, with litigation often viewed as a precursor to regulation of these sectors<br>▪ This risk category includes potential claims brought forward by shareholders for gross climate related neglect on the part of companies and senior executives |

It is anticipated that the risks identified above will grow in severity and extent as the full effects of human induced climate change are played out. As important as the risks outlined above, however, will be the risks of inaction on climate change, which could leave a number of industries, sectors and countries exposed. This issue is considered in more depth in Section 5 below.

In addition to the risks discussed above, a number of opportunities are presented by the shift to a low carbon economy and society. Many of these opportunities are able to work in parallel with objectives related to economic growth, employment creation, energy security and social development. An outline of major opportunities is provided below:

**Table 5: Secondary Opportunities from Climate Change**

| Opportunity Categories | |
|---|---|
| **New Markets & Industries** | ▪ The rise of new low-carbon technologies, products, services and industries that have yet to be developed or commercialised<br>▪ Includes the potential for certain countries and firms to act as market leaders in these technologies nationally and internationally |
| **Growth of Existing Markets / Development of Labour Intensive Industries** | ▪ The development or maturation of existing markets in low-carbon technologies, products, services and industries<br>▪ A host of products and industries ranging from energy efficient equipment, low-carbon packaging and renewable energy have seen significant growth in response to growing awareness of the global imperative to reduce GHG emissions. Other notable areas of opportunity include combined heat and power (cogeneration), clean coal technologies, low emission vehicles and green IT<br>▪ Support for low carbon technologies also offers opportunities for labour intensive economic growth through enhanced manufacturing production in renewable energy and public transport technologies, the promotion of energy savings activities and through organic farming practices in agriculture, amongst others<br>▪ In certain cases developing countries are also able to source financial support for the development of nascent low carbon industries. This includes grants provided by international donor organisations and soft loans supplied by financing institutions<br>▪ Considerable scope for growth exists in the services sector, where organisations that offer low-carbon alternatives and solutions can also enjoy competitive advantage and increased market share<br>▪ Taken as a whole, the major economic benefits incorporated under this opportunity category include opportunities in the manufacture, distribution, retail, export, financing and maintenance of low carbon goods and services |
| **Carbon Markets** | ▪ Based on the establishment of tradable environmental commodities such as carbon credits and emission allowances, the value of the global carbon market has increased markedly in a short period of time, reaching $136 Billion in 2009 (Point Carbon, 2009). In the financial services market, traded carbon volumes have grown faster than any other mainstream commodity<br>▪ This market includes the sale and trade of carbon credits under the Kyoto Protocol as well the potential sale of emission reductions under the voluntary carbon market<br>▪ The rise of the European Union Emissions Trading Scheme (EU ETS), the largest emissions trading scheme in the world, the maturation of the Clean Development Mechanism (CDM) and the emergence of new carbon trading schemes in North America, has generated substantial opportunities for countries and organisations to access new revenue streams and technologies in exchange for engaging in emission reduction projects<br>▪ Global and regional carbon markets have established a new sub- |

| Opportunity Categories | |
|---|---|
| | sector in the financial services industry which encompasses carbon asset traders, clean energy conventional and venture capital funds and carbon brokerage services, in conjunction with emission reduction project developers<br>▪ Community based projects can also link into voluntary carbon markets. The production of carbon offsets has seen new sources of revenue linked to land restoration programmes, forestry conservation projects, community housing and the application of small-scale renewable energy technologies, providing opportunities for localised employment creation and income generation. Projects are based on the sequestration of carbon through land management programmes, or through the avoidance of emissions from fossil fuel combustion<br>▪ New mechanisms to leverage financing and support for emission reduction in energy intensive sectors across the global economy are currently under consideration within international climate change agreements. These new financing mechanisms include opportunities for particular sectors in developing countries to trade excess emissions reductions achieved below an agreed upon baseline level, and to engage in 'best practice' agreements. This approach supports the development of sector-based carbon markets, which are likely to gain momentum over the medium-term<br>▪ Opportunities also exist for particular sectors, industries, companies and traders to benefit from the introduction of a domestic emissions cap and trade scheme, including through the sale or trading of surplus credits. Under such a scenario, trading of credits with other emitters at a regional and global level could also potentially be implemented in the short to medium-term |
| **Trade and Market Access** | The opportunities evident within this category include:<br>▪ The potential rendering of certain national exports as more competitive, as a result of lower production costs from a less carbon regulated domestic environment. This assumes, however, that corrective measures are not taken by trading partners to level the playing field (through, for example, the use of border tax adjustments) and that these exports are unaffected by other risks related to consumer preferences, retailer action, branding etc<br>▪ The promotion of low carbon tourism attractions, tours and accommodation to assist in capturing the growing 'experiential' and eco-tourism market. This includes opportunities to provide visitors the means to offset their emissions as part of travel packages<br>▪ Opportunities for product or service differentiation based on climate friendly approaches<br>▪ Reduced refined and crude oil requirements through enhanced vehicle efficiency measures, public transportation, rail-based freight and other energy demand measures in the transport sector<br>▪ Opportunities for companies to gain an early mover advantage through the early recognition and response to changes in markets for products and services |

| Opportunity Categories | |
|---|---|
| **Country Level Investment, Finance & Technology Transfer** | Climate related opportunities in this category include:<br>▪ The promotion of energy intensive industries in less carbon regulated domestic environments. This is provided that key climate risk categories for these countries or industries are effectively navigated, as discussed above<br>▪ Technology transfer can occur through the implementation of compliance based or voluntary carbon credit projects, international technology support mechanisms and bilateral agreements. Technology transfer is a key element of the multilateral climate change agreements, and opportunities could be realised under the Copenhagen Accord or subsequent agreement for developing countries to acquire this type of support<br>▪ Financial assistance in the realisation of clean energy solutions and other forms of low carbon development are an important potential source of support for Nationally Appropriate Mitigation Actions (NAMAs) undertaken by developing countries<br>▪ National R&D programmes have the potential to result in the development of patents, licences, and other forms of intellectual property, as well as support product differentiation and enhanced industrial efficiencies |
| **Professional Services** | ▪ This category relates to a range of environmental and professional services provided to all sectors of the economy. Areas of service rendering include in the facilitation, management, development and monitoring of low carbon solutions, including legal, technical, financial, tax-related and strategic assistance |
| **Human Settlements, Spatial Planning and Urban Development** | The development of low carbon cities has the potential to support a variety of additional socio-economic objectives, including:<br>▪ The attraction of skilled professionals to cities characterised by enhanced transport systems, convenient and integrated mixed land use and an eco-friendly image<br>▪ The establishment of improved public and non-motorised transport systems (bus and rail; pedestrian and bicycle) with benefits for eased traffic congestion, reductions in local air pollution, enhanced trip affordability and convenience for ordinary citizens, as well as improved tourist access. Substantial benefits can also be achieved in the trade balance of countries importing crude oil or refined petroleum products<br>▪ Increased property values in areas supported by mixed land use and effective public transport systems<br>▪ The promotion of green and low energy buildings with benefits for employee wellness and productivity<br>▪ The development of efficient housing through the use of higher thermal mass construction and insulation, resulting in improved health and reductions in energy poverty for low-income households |
| **Reputational** | Reputational gains, enhanced brand image and market differentiation can be achieved for organisations through the:<br>▪ Production or promotion of low or zero carbon products & services |

| Opportunity Categories | |
|---|---|
| | ▪ Establishment, reporting and marketing of their climate change credentials<br>Support towards the achievement of a company's' Corporate Social Responsibility (CSR) objectives can also be realised through such initiatives. |
| **Investor** | This category encompasses various facets, including:<br>**For Companies:**<br>▪ Opportunities to improve access to capital, obtain capital at lower rates, or attract new investors based on a company's emission reduction initiatives or programmes. A range of investors from private equity to hedge funds are now active in the clean technology space, in addition to socially responsible investors[5]<br>▪ Existing investor relations can also be enhanced through the open disclosure and management of carbon related liabilities with shareholders<br>**For Investors and Financial Services Providers:**<br>▪ Opportunities exist for financial institutions to develop investment products that factor in climate change related risks in portfolio evaluations<br>▪ Investors that effectively foresee changes in asset prices under carbon regulation have the potential to derive benefit and advantage from climate change |
| **Risk Management, Efficiencies & Competitiveness** | Efforts to address climate change can result in a variety of additional benefits ranging from the local to national scale. These areas of potential improvement include:<br>▪ Enhanced commercial and industrial competitiveness through the introduction of efficiency measures, improved production methods, as well as lessened exposure to fuel and energy price fluctuations<br>▪ Improved power generation efficiencies resulting in reduced input requirements; this can be coupled with improvements in grid technologies and electrical infrastructure to reduce transmission losses and support the use of smart grids<br>▪ The use of climate concerns as an effective tool to support operational efficiencies in a manner that engages staff in positive action<br>▪ Enhanced risk and financial management practices, including improved evaluation of capital projects through consideration of carbon cost and risk factors<br>▪ Greenhouse gas emission abatement can also often support other environmental objectives including reduced local air pollution, lowered waste volumes and improved waste management, with benefits for local health and landfill services, and various forms of environmental compliance |

[5] *"Clean technology, particularly energy-related, has become the fastest-growing sector in venture capital (VC) and private equity (PE), and is now the fifth-largest sector for VC in the United States" (Climate Group, 2007 p42).*

# 4 Risks and Opportunities for the South African Economy

> "Climate change regulation may impact the following Group businesses directly or indirectly: Bidtravel and Bidserv's aviation services businesses due to a possible increase in aviation fuel or flight taxation; Bidfreight with its dependence on international ocean shipping; Bidauto as motor retail sales mix and volume changes due to possible future regulation penalising high emissions vehicles; and Bidpaper Plus as paper costs increase due to pressures on the paper and pulp industry to reduce their carbon intensity."
>
> - The Bidvest Group, Carbon Disclosure Project 2009

The section below considers the current and potential implications of climate change for the South African economy, from both a secondary risks and opportunities perspective. A sector based approach is followed in order to link with existing work to promote climate response measures in key national sectors, and work undertaken globally to identify and evaluate the consequences of climate change for particular industries.

It should be noted that in the interest of brevity this analysis does not discuss all foreseeable or potential implications for a particular sector, but rather, focuses on areas of immediate threat and opportunity, as well as areas considered of key importance both now and in the future.

The analysis that follows considers the following sectors[6] in South Africa:

| No. | Sector |
|---|---|
| **Primary Sector** | |
| 1. | Agriculture, Forestry and Fishing |
| 2. | Mining & Quarrying |
| **Secondary Sector** | |
| 3. | Manufacturing |
| 4. | Utilities (Electricity, Gas and Water) |
| 5. | Construction |
| **Tertiary Sector** | |
| 6. | Trade, Catering and Accommodation Services |
| 7. | Transport, Storage and Communication |
| 8. | Financial, Insurance, Real Estate and Business Services |

[6] *The sector classification system employed in this analysis is based on Level 3 of the Quantec Standardised Industrial Classification (SIC). The analysis excludes the 'Community, Social and Personal Services' sector.*

# Agriculture, Forestry and Fishing

| | |
|---|---|
| **Sector Overview:** | ▪ A key sector in government's quest to halve unemployment and eradicate poverty by 2014<br>▪ Contribution to total GDP has declined as South Africa has diversified production to other areas<br>▪ Total employment declined since the mid-1990s, raising concerns for the employment of many impoverished people, particularly black women<br>▪ Cereals and grains are key crops, occupying more than 60% of area under cultivation. Corn, the country's most important crop, is a dietary staple, source of livestock feed and an export crop. Corn production reached its second highest level in 2008 at 12.7 million tons<br>▪ Key exports include wine, citrus fruit, grapes, apples, pears, quinces and sugar<br>▪ Key imports include rice, wheat, soya-beans, palm oil, undenatured ethyl alcohol and fish products<br>▪ The UK, Netherlands, Germany, Mozambique and United States are major export destinations<br>▪ Sector achieved its greatest ever trade surplus of R11.2 Billion in 2008<br>▪ Exports grew annually by 9.5% between 2000 and 2008<br>▪ Agriculture and forestry's net contribution to South Africa's greenhouse gas (GHG) emissions is 4.7% (2000 baseline) |

| Risks | | Opportunities | |
|---|---|---|---|
| **Regulatory** | Agricultural industries in South Africa are unlikely to face sectoral emissions targets in the foreseeable future, either through international or national measures. However, 2 emission sources are of importance:<br>i. Enteric fermentation by livestock, which results in the release of methane through animal belching. This contributes 4.4% to national emissions, and<br>ii. Indirect emissions of nitrous oxide ($N_2O$) from managed soils in the form of fertilisers, contributing 4% to national emissions<br>As single activities these areas contribute a significant portion to national emissions. Options exist to alleviate enteric fermentation through the increased use of feedlots or through supplying livestock with dietary additives. However, reducing emissions in enteric | The major industry opportunities from climate change in this sector relate to the development of:<br>i. Organic farming<br>ii. Biofuels<br>iii. Biomass power and heat generation<br>*Organic farming:*<br>The cultivation of organic produce, although requiring substantial requirements for certification, offers a number of benefits for farmers and wider communities. Aside from broader environmental benefits and estimated carbon emission reductions of between 48 to 68%, organic produce:<br>▪ Is associated with a considerable price premium and significantly expanding consumer demand in Europe | **Growth of Existing Markets & Industries** |

| Risks | Opportunities |
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| fermentation could come at a considerable economic cost, estimated recently at R325 million per annum for increased feedlot use (Taviv et al., 2007).<br><br>Efficient fertiliser practices, low input farming and organic agriculture are the main alternatives to excessive fertiliser use. Addressing $N_2O$ emission in this sector offers more attractive options, discussed under the 'Opportunities' category.<br><br>Despite these risk related activities, the agricultural industry is unlikely to face regulatory sanction on climate change given its role in food production and rural development. Key emission sources are therefore unlikely to be targeted for emission reductions in the short to medium-term. However, indirect impacts, such as through raised electricity prices and fuel costs from climate change regulation, could have a significant bearing on this sector unless appropriate mitigation measures are employed. This could include reduced viability for agricultural production areas located at large distances from markets.<br><br>In the forestry industry, two key emitters are present, Sappi and Mondi, with reported emissions of 6.9 million tonnes and 6 million tonnes respectively, placing them amongst the highest corporate emitters in the country (CDP, 2009). Despite efforts to promote paper recycling and other environmental measures, both companies face potentially significant financial risk from the implementation of carbon pricing in the national economy (either through carbon taxation or a domestic cap and trade scheme). This financial risk starts at R695 million and R600 million per annum respectively for a preliminary R100/tonne carbon tax.<br><br>Increased operational costs for the forestry sector through carbon taxation could also impact on pulp and paper exports (commodities that make up close to 2% of | and North America, both of which are key national trading partners<br>▪ Offers a significant potential export opportunity for developing countries, especially in light of consumer concerns over product food miles<br>▪ Promotes reduced operational costs over the longer-term in comparison to conventional farming methods in which yields progressively decline resulting in increased input requirements<br>▪ Is associated with labour intensive farming methods, requiring on average 30% more labour than conventional farming (UNEP, 2009)<br><br>The expansion of organic farming in South Africa thus offers an opportunity to support smallholder, community and large-scale farming in a manner supportive of rural development. Labour intensive farming methods can also assist in combating currently declining employment levels in this sector. This includes offering vitally needed jobs for unskilled and semi-skilled workers.<br><br>*Biofuels:*<br><br>The development of biofuels represents a potentially sizeable commercial opportunity in South Africa. Much of this market remains untapped, and despite concerns over competition with food production and rising food prices, areas of opportunity remain, including in the use of waste vegetable oils and surplus sugarcane production.<br><br>Within viable areas, the development of biofuels offers additional commercial benefits, namely:<br>▪ Substantial employment generation opportunities through labour intensive production methods<br>▪ The procurement of higher prices for farmers producing bioenergy products<br><br>Despite restricted licensing conditions, it is estimated that |

| Risks | | Opportunities | |
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| | national exports and which could experience good growth in the foreseeable future) by rendering these exports less competitive in relation to emerging paper producers such as China and India. | the current national biofuels target could generate 25 000 jobs and generate R1.7 Billion in balance of payments savings (DME, 2007). Finally, substantial opportunities are presented to support the commercialisation of biofuels within the SADC region, as part of a regional biofuel development strategy.<br>*Biomass power and heat generation:*<br>A variety of biomass sources have been assessed for their commercial viability in power generation in South Africa (DME, 2004b). This assessment highlights the considerable potential of sugarcane bagasse for power generation export to the national grid, estimated at 2 100 GWh or in the region of 260MW of biomass based power.<br>Whilst offering additional support for energy security objectives, the development of bagasse power generation can also be financed through a Renewable Energy Feed-In Tariff (REFIT), offering improved certainty for investors and opportunities for international funding assistance.<br>Opportunities should also be explored in the development of biomass based power generation in the burning of alien trees and vegetation, particularly wattle. The spread of alien vegetation remains an important area of concern in South Africa, addressed at this stage through the Working for Water (WfW) programme. Opportunities may exist to complement the WfW initiative through biomass based power generation where this biomass is not better employed in secondary industries such as furniture and craft manufacture.<br>A number of opportunities also exist to provide biomass resources such as soya husks and other agricultural residues as boiler inputs for heat generation in industrial applications. This fuel switching activity reduces company emissions and is often a cost saving measure in relation to existing inputs used such as coal. | |

| Risks | | Opportunities | |
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| | | Finally, the promotion of improved manure management in livestock and poultry feedlots can support the development of organic fertiliser ('kraal manure') which can be sold as a commodity and reduce both methane and nitrous oxide emissions. It is estimated that an 80% adoption of this practice in feedlots would result in reduced emissions of approximately 1 million tonnes per annum and an annual saving of R19.6 million relative to business as usual (Taviv R. et al., 2007).<br><br>Concerns related to the widespread adoption of agricultural methane (biogas) projects for South Africa are noted (Taviv R. et al., 2007). Biogas projects will also need to address potential socio-cultural acceptance issues in the implementation of rural waste to energy projects, however, opportunities for localised power generation and employment can be harnessed if these issues are addressed. | |
| **Trade and Market Access** | Shifts in consumer preferences away from the purchasing of carbon intensive products are of important concern in this sector. This is particularly the case for South Africa given that:<br>▪ The majority of our agricultural exports are destined for more environmentally sensitive EU and US consumer markets, and require long distance shipping or air freight<br>▪ The requirement for long distance air freight has been used as a crude (and often inaccurate) indicator for certain consumers of the relative carbon footprint associated with products. This situation has in turn helped promote consumer support for buying local' in the UK and Europe, with obvious prejudice for imported goods<br>▪ Agricultural products such as fruit and wine have a direct consumer interface, are a key export | The growth of the voluntary carbon in recent decades has served to highlight the opportunities available in the global carbon market for smaller, community based projects. A number of land use management and forestry initiatives across the globe have benefitted from this form of carbon finance, supported through the growing market for carbon offsets.<br><br>Whilst South Africa's offset opportunities are more limited in large-scale afforestation and reforestation programmes, considerable opportunity exists to access carbon finance for carbon sequestration in tree planting, thicket restoration and wooded savannah (bushveld) thickening.<br><br>For example, initiatives are already underway in the country that provide employment and support rural livelihoods through the development of voluntary carbon credits through indigenous tree planting. | **Carbon Markets** |

| Risks | | Opportunities | |
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| | commodity for the agricultural sector<br>Effective measures are required to ensure a balanced assessment of the 'air miles' associated with food and other products. This includes requirements to support the life cycle analysis of product emissions, as opposed to relying on air freight as a proxy, and the consideration of overall sustainable development objectives. | | |
| **Supply Chain** | Arguably the most significant climate risk to this sector lies in retailer and industry association led action to green global supply chains. Thus whilst attention is placed on potential trade barriers through regulations and international agreements, retailers and others have moved ahead with both influencing and responding to consumer choice on climate change in key South African export countries. This raises important concerns for South African market access and growth in key destination markets. The work of Tescos, Marks and Spencer and other retailers to carbon label goods, reduce their reliance on air freighted produce and other measures could all act to prejudice South African exports for environmentally conscious consumers.<br>Industry associations may also have their own commercial interest in supporting climate change mitigation efforts. For example, the Waste and Resources Action Programme (WRAP) in the UK, an initiative supported by British Glass, supports the bulk shipping of wine to Britain to reduce transportation related emissions. However, this activity also stands to provide commercial benefit to British Glass, as they will provide for the required bottling of bulk shipments entering the UK.<br>Finally, a number of domestic retailers are taking action to lower the carbon footprint of their supply chains, with a strong emphasis on farming related activities. Companies and industries that rely to a considerable | Activities with a climate change benefit in the agricultural and forestry sector that support broader competitiveness and cost reduction include:<br>▪ The specification of improved efficiencies for industrial equipment such as pumps and motors. This has the potential to reduce fuel or electricity consumption requirements for a variety of users ranging from commercial farmers to plantation managers. Vulnerability to price volatility is also lessened through this activity<br>▪ Enhanced crop productivity, an activity that also assists in the enhanced storage of carbon within soils<br>▪ Efficient fertiliser use. Precision farming, for example, is increasingly being employed as a cost saving measure by farmers in developed countries through reducing the amount of fertiliser required as an input. Nevertheless, it is acknowledged that fertiliser use per hectare is relatively low in South Africa, with the result that the uptake of this technology may be more limited than in the United States, for example<br>In addition, activities to support fire control and savannah thickening are regarded as having overall economic benefits for the country, resulting in net emission reductions of 9.5 million tonnes and cost savings of R196 million per annum (Taviv R. et al., 2007). Significant fire suppression is possible in South Africa, reducing the loss of life and damage to infrastructure, whilst supporting savannah thickening without risk of ecological damage. | **Risk Management, Efficiencies & Competitiveness** |

| Risks | | Opportunities | |
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| | extent on more proactive clients such as Woolworths and Pick n Pay stand to lose out if they are unable to adapt their methods, and /or deliver the energy and carbon savings requested of them. | Fire suppression efforts can also be used in supporting job creation, most notably within Fire Protection Associations or the Working on Fire (WoF) initiative under the Expanded Public Works Programme (EPWP). | |
| **Reputational** | Ecological concerns have achieved greater priority in the forestry sector in recent years, such as through the Forest Stewardship Council (FSC), and reputational losses could be experienced for South African companies in this industry if appropriate measures are not taken to reduce carbon emissions as part of ongoing environmental stewardship. | Opportunities exist in the agricultural sector to benefit from financial support and technology transfer in support of more advanced and costly mitigation measures including enteric fermentation, conservation farming, reduced tillage and no tillage farming practices, as well as agricultural methane projects. | **Country Level Investment & Technology Transfer** |
| **Investor** | Investor risk is also of concern in the forestry sector, where both Mondi and Sappi are listed on domestic and international stock exchanges (the London Stock Exchange (LSE) and New York Stock Exchange (NYSE) respectively). Heightened shareholder pressure both domestically and internationally could occur if the financial and other climate risks associated with each entity are not adequately addressed. | | |

| **Summary:** | Taken as a whole, the agricultural sector could benefit significantly from both national and global climate change measures, including through the promotion of organic farming, managed biofuel development, improved fire control, biomass based power generation and the promotion of land based carbon offset programmes.<br><br>Substantial opportunities for supporting labour intensive production in an increasingly capital intensive sector are also evident. This includes significant opportunities for employment creation for unskilled and semi-skilled workers in the country. However, key risks to the sector, most notably concerns over food miles and the larger carbon footprint of the major forestry companies in the sector, will need to be effectively managed. |
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## Mining & Quarrying

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| **Sector Overview:** | ▪ Sector's contribution to GDP has fallen gradually from 20% in the 1960s to 6.8% from 2000 to 2008<br>▪ Despite stagnant production, mining remains an important source of employment in South Africa. Approximately 2.7% of the economically active population is employed in the mineral industry (Minerals Bureau, 2002). However, direct employment in the sector has been on a gradual decrease for the past two decades<br>▪ South Africa produces about 59 different minerals from 1115 mines and quarries, although gold, diamonds, coal and platinum play the greatest role in the current economy<br>▪ Gold's position as the most important export commodity in the country has diminished compared to the rise in production of Platinum Group Metals (PGMs)<br>▪ Platinum, gold and coal combined accounted for 62% of total mining product exports in 2008.<br>▪ South Africa's dominant imported mineral commodity is crude oil which amounted to 68% of all mineral imports in 2008<br>▪ China continues to be a leader in the demand for mining and quarrying products globally. It is estimated that China is likely to account for over 30% of world demand by 2010 and more than 40% by 2020. Trade relations with China are key for South Africa's Mining and Quarrying sector to sustain future demand for mineral exports<br>▪ South Africa's mineral resource base and the expected demand growth from highly populated emerging economies will continue to have a decisive impact on the country's economic future, if constraints facing the sector are overcome. New investment potential remains strong in this sector (GCIS, 2008)<br>▪ Mining companies dominate the Energy Intensive User Group (EIUG) of South Africa, the members of which all consume more than 100 GWh of electricity per annum |

| Risks | | Opportunities | |
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| **Regulatory** | The mining sector is at strong risk from climate change regulation, particularly in light of the emission reduction target adopted by South Africa in January 2010.<br>The high carbon intensity associated with South Africa's electricity grid and the energy intensive nature of many mining operations, places this sector at significant risk of emission caps, intensity targets or carbon taxation. The sector has already faced certain cost pressures from the 2c/kwh carbon tax on non-renewable electricity implemented in July 2009, a tax that is a fraction of any | A number of mining related industries stand to benefit from a heightened national and global climate change response, most notably in platinum, uranium and copper, as discussed below:<br>▪ For the platinum industry, an area of significant opportunity lies in the use of platinum as an input into the manufacture of fuel cells. It is anticipated that platinum companies could benefit significantly from the growth of fuel cell demand associated with hydrogen energy (DST, 2007) | **Growth of Existing Markets & Industries** |

| Risks | Opportunities |
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| potential escalating carbon tax regime in South Africa.<br><br>Many companies in this sector are already voluntarily reporting on emissions through the Carbon Disclosure Project (CDP). At present, 11 of the top 20 national emitters reporting emissions via the CDP are found within the mining sector, serving to emphasise the carbon risk associated with this sector (CDP, 2009).<br><br>Emission reduction actions on the part of the sector are likely to be implemented via an emission reduction target or carbon intensity target devolved to industry. A global sector based approach is less likely, as proposed sectoral agreements have tended to focus to date on iron and steel, power generation and cement.<br><br>As a first step, industries in this sector will almost certainly be required to report on their emissions on a mandatory basis to government, following the finalisation of the South African Climate Change Response Policy at the end of 2010.<br><br>Another key area in which the sector could be affected by regulations is in the passing of mandatory energy efficiency measures or targets. Such regulations are already being considered by Eskom and the National Energy Regulator of South Africa (NERSA) for energy security purposes through the Power Conservation Programme (PCP). The regulatory framework for the introduction of the PCP is still in the process of being put in place. Even if the PCP is not implemented, it is likely that mandatory industrial energy efficiency targets, with a strong bearing on the mining sector, will be implemented in due course. Energy efficiency measures have to date, with the exception of required cuts during the 2008 electricity crisis, been on a voluntary basis through the Energy Efficiency Accord.<br><br>An additional area of concern for the sector lies in the | ▪ Uranium reserves are plentiful in South Africa and the national uranium industry could capitalise on a sustained drive towards nuclear energy in the country, or through regulatory measures that render nuclear power more cost competitive with fossil fuel technologies. Nevertheless, the status of the development of both conventional nuclear energy and the Pebble Bed Modular Reactor (PBMR) remain uncertain at present in South Africa<br>▪ Copper is an important input into the development of energy efficient equipment ranging from electrical motors to power cables and transformers. Gains could be experienced for this more modest mining sector in the country, given that the country is ranked 14th in terms of global copper reserves, but only 17th in terms of global production (Chamber of Mines of South Africa, 2009)<br><br>For diversified mining companies active in areas such as uranium, copper and platinum, as well as more risk prone areas such as coal, opportunities therefore also exist to balance commercial risk with opportunity, and to shift production emphasis with changes in global demand. |

| Risks | | Opportunities | |
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| | significant fugitive methane emissions associated with underground coal mining in South Africa. In 2000, fugitive Coal Bed Methane (CBM) emissions accounted for approximately 8% of all national emissions, a considerable amount for a single activity (DEAT, 2009). Whilst CBM represents a potential energy source in a country largely devoid of natural gas reserves, methane concentrations have tended to be too low to support commercial uptake (Kornelius et al., 2007). Technological issues and commercialisation costs thus place uncertainty over the use of CBM for fuel combustion or power generation in any considerable scale in the short to medium-term. Mitigation costs are high at an estimated R346 per tonne (DEAT, 2007b).<br><br>Initial findings also suggest that capturing methane emissions from gold and platinum mines is not technically or economically feasible at present, although further research is required (Kornelius et al., 2007).<br><br>Finally, the multinational nature of many leading mining houses in South Africa implies the potential exposure of these entities to regulatory risk in other parts of the world. This is most notable for South African mining companies with operations in the USA and Australia, countries in which domestic 'cap and trade' schemes for greenhouse gases are being considered, although implementation remains stalled in both instances. | | |
| **Trade and Market Access** | Whilst South Africa is a leading exporter of platinum and gold, the country is also the fifth largest exporter of coal globally (World Coal Institute, 2008). This raises concerns that the demand for this export commodity could be reduced in the future as shifts away from fossil fuel energy supplies gather apace as part of global mitigation actions.<br><br>Trends in the global coal market tend to allay fears in this regard, however. In the midst of heightened concern over | An important area of opportunity presented by the development of global mechanisms to support climate change mitigation lies in support for the extraction and use of Coal Bed Methane. The development of CBM in South Africa, through the provision of financial and technical assistance, offers the opportunity to improve local natural gas supplies, promote technological advancement, enhance energy security and reduce | **Country Level Investment, Finance & Technology Transfer** |

| Risks | | Opportunities | |
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| | climate change, coal consumption grew by 3.1% in 2008 and coal remained the fastest growing primary energy source globally for the sixth consecutive year (BP, 2009). Driven by strong consumer demand in the Asia Pacific region, concerns for national exports seem unfounded in the medium-term, particularly as it is anticipated that much of South Africa's future coal export demand will be located in Asia, and not Europe as is presently the case (Mining Weekly, 28 January 2010).<br><br>In the long run, and in the absence of affordable technologies for Carbon, Capture and Storage (CCS), global demand for coal could experience decline, with an impact on the South African export market. | national emissions. | |
| **Country Level Investment** | Climate change regulation and carbon pricing has the strong potential to raise the marginal cost of production amongst mining companies in South Africa. For both gold and coal mining companies, who face considerable competition from abroad from the likes of Canada, Australia, the USA and Russia, as well as developing countries such as Indonesia, China, Peru and Papua New Guinea, issues of international competitiveness are of key importance.<br><br>Significantly heightened marginal production costs could result in concerns for mining oriented foreign investment in the country and led to increased regional or overseas investment drives by South African mining houses relative to domestic investment. Many South African mining companies have existing mining operations in Australasia, South America and Sub-Saharan Africa as part of global expansion programmes, however, with these operations supporting overall company revenues. It is imperative that issues of potential carbon leakage are addressed through ensuring that climate change parity is maintained with developed countries producers in the USA, Canada, Russia and Australia at a minimum, as part of the | The promotion of enhanced energy efficiency is arguably the largest climate related opportunity in the South African mining sector. Escalating electricity prices provided to Eskom over a three year period highlight the increasing financial cost associated with traditional electricity consumption in the country. Industrial energy efficiency has been consistently identified as a measure capable of achieving positive economic returns for the economy whilst supporting energy security objectives and climate mitigation efforts. Net overall economy wide savings from industrial energy efficiency have been estimated at R3.2 Billion per annum (Hughes et al., 2007).<br><br>Reducing the energy intensity of the national mining sector is arguably a key intervention required to maintain the competitiveness and profitability of this industry, particularly as global leaders in the mining industry adopt energy efficient practices (Lehman Brothers, 2007b).<br><br>Energy price risks brought on by a marked increase in oil prices with the restoration of global demand poses an additional risk for domestic mining companies. Efficiency | **Risk Management, Efficiencies & Competitiveness** |

| Risks | | Opportunities | |
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| | international climate negotiations process.<br><br>For platinum producers this area is of less concern given the dominant status of platinum producers in South Africa in the global platinum market. Nevertheless, developments should be monitored in this regard. | measures can play an important role in managing fluctuations and price increases in both electricity and liquid fuels.<br><br>Key industrial energy efficiency improvements related to improved lighting, compressed air, motors, thermal efficiency, steam system efficiency and Heating, Ventilation and Air Conditioning (HVAC) are all of strong relevance to the mining sector. Additional efficiency gains in mine design and extraction processes can also be achieved. | |
| **Investor** | Investor related risks of disclosure and accounting for company wide carbon liabilities is an emerging area of risk for a number of South African mining companies listed on international stock exchanges and with international shareholders. Providing disclosure, addressing regulatory concerns and supporting emission reduction targets are likely to be the major areas addressed in this regard. | The demand for capital equipment and services to support improved efficiency measures in mining can be expected to increase in response to higher energy prices and/or mandatory targets brought about by climate regulation. | **Supply Chain** |
| **Supply Chain** | Heightened costs associated with coal mining activities through carbon regulation can be expected to increase the marginal cost of production and coal prices more generally. The impact of heightened coal prices will have ripple effects into a variety of sectors including industrial facilities, however, increased coal input costs will also be experienced in coal based power generation, and all things being equal, drive upward pressure on electricity prices.<br><br>It should be noted, however, that coal prices are expected to increase in the country over the next few decades regardless of regulatory changes, given less accessible seams. Rising coal prices therefore supports the promotion of energy efficiency measures to reduce price related risk.<br><br>Finally, decreased mining investment domestically in the face of climate change regulation could also affect a | | |

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| | number of suppliers to the national mining industry, which range from material and equipment suppliers to professional service providers. | | |

| Summary: | The South Africa mining sector is at considerable risk from the secondary impacts of climate change. The most pertinent of these risks relates to regulation, including the potential introduction of carbon taxation in the country, and the manner in which this will impact on energy intensive mining companies. It is important that parity on climate change matters is maintained with key competitor countries such as Canada, the USA, Russia and Australia at a minimum.<br><br>Despite these challenges, industry opportunities in platinum, uranium and copper are available, whilst coal exports are unlikely to be negatively impacted in the short to medium term. The widespread adoption of energy efficiency measures is a key intervention in this sector, and is arguably essential to the continued competitiveness of companies in this industry, in the face of rising electricity prices from coal based power generation and expectations for oil prices to reach stabilisation levels approaching $100 a barrel by 2020, with the global economic recovery (IEA, 2009). |
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# Manufacturing

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| **Sector Overview:** | ▪ A critical sector of the South African economy that has contributed approximately a third of GDP from 1999 to 2008<br>▪ Contains a variety of important sub-sectors namely food and beverages; textiles and clothing; wood and paper; petroleum products, chemicals and plastics; other non-metallic mineral products (glass and cement); metals and metal products; electrical machinery and apparatus, as well as transport equipment<br>▪ The slowing down in the country's economic growth with the global recession can be attributed mainly to the poor performance of Manufacturing in this period. This poor performance is linked to a depleted export market for manufactured goods and weak demand for durable consumer goods<br>▪ Investment to develop additional capacity in the sector is required to create further employment opportunities. The latter is important as Manufacturing employment has declined persistently from the early 1990s onwards<br>▪ A few sectors drive the performance of the Manufacturing sector. These include the production of motor vehicles, parts and accessories; basic chemicals; basic iron and steel and other chemicals. Motor vehicles, parts and accessories has more than doubled its operations since 1994 and this can be attributed to the Motor Industry Development Programme (MIDP). The other sub-sector that has shown significant growth is basic chemicals, whose share of total manufacturing grew to over 13% in 2008<br>▪ Textiles and clothing, as well as machinery and equipment, have shown the most notable declines in their shares of total manufacturing<br>▪ Skills shortages are one of the main factors hindering the sector's ability to adjust, innovate and expand. With a relatively low level of highly skilled employees, the ability to produce technologically advanced goods that require high value addition and provide greater returns is limited. Manufacturing diversification is also constrained through this feature<br>▪ South Africa's imports of goods and services for manufacturing activities have increased relatively faster than exports since 2000. The Manufacturing trade balance deficit has thus expanded widely from R36 billion in 2000 to R204 billion in 2008 |

| Risks | | Opportunities | |
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| **Regulatory** | A number of industries in the Manufacturing sector are at considerable regulatory risk from climate change. Major areas of risk include mandatory reporting of emissions, energy efficiency targets and emission reduction limits. The sector is characterised by a variety of energy intensive companies, including some of the most carbon intensive in the country.<br>*Petroleum Products, Chemicals and Plastics* | A number of industries in South Africa could receive added impetus and support through climate change mitigation efforts. These industries include:<br>*Transport Equipment*<br>The development of the Medium and Heavy Commercial Vehicle (MHCV) industry, including domestic bus manufacture linked to improved public transport, remains an area of potential commercial | **Growth of Existing Markets & Industries** |

| Risks | | Opportunities | |
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| | Aside from Eskom, the coal-to-liquids (CTL) provider Sasol is the single largest producer of emissions in the country. Sasol's emissions, dominated by direct process emissions, amounted to 72.7 million tons for 2009, or approximately 17% of total national emissions relative to the 2000 baseline. Carbon pricing risks for this company are clearly immense, and raise concerns over the extent to which this entity can be exposed to carbon regulation in the near future.<br><br>Sasol recognises the considerable challenges posed by climate change for its business operations, and has begun diversification into renewable energy and biofuels, and is investigating the employment of Carbon Capture and Storage (CCS). Other areas of potential opportunity could include Combined Cycle Gas Turbine (CCGT) power generation and potential entrances into the hydrogen economy through syngas production.<br><br>Other industries in this sub-sector are also at significant potential risk from climate change legislation.<br><br>The production of chemicals is a carbon intensive activity and major players such as Afrox, AECI and Air Products South Africa, all of whom are members of the Energy Intensive Users Group of South Africa (EIUG), could face significant emission reduction targets under South Africa's National Climate Change Response Policy. As intensive users, these companies also face significant potential impacts through increased electricity prices linked to carbon pricing.<br><br>Whilst the demand for chemicals is generally price inelastic, with the result that increased pricing could be passed onto customers, there are potential concerns for the competitiveness of South African chemical manufacturers vis-à-vis other chemical manufacturing companies if parity with competitor nations is not achieved.<br><br>Whilst there may therefore be some benefits to a global | viability in South Africa. See discussion under 'the Transport, Storage and Communication' sector.<br><br>In addition, support for large-scale wind power and concentrating solar power (CSP) in South Africa could provide a significant boost for domestic manufacturing production, drawing on the country's established automotive sector. Examples of components for renewable energy technologies that can be produced within existing industries include gearboxes, steel frames and pylons, fibreglass forms, coatings and motors. There are also commercial opportunities for the domestic manufacture of wind turbine blades and heliostats.<br><br>*Petroleum Products, Chemicals and Plastics*<br><br>Whilst requiring considerable investment and skills development, the chemicals industry can be used to support the development of a variety of low carbon technologies, including:<br><br>▪ Fuel cells<br>▪ Light emitting diode (LED) lighting<br>▪ Plastics applications in automobile manufacture<br>▪ Wind turbine technologies<br>▪ Building insulation materials<br>▪ Solar photovoltaic (PV) cells<br><br>*Electrical Machinery & Apparatus*<br><br>This industry has substantial potential to benefit from the promotion of energy efficient technologies, including efficient pumps, motors, turbines, variable speed drives and lighting, as well as a range of efficient Information and Communication Technologies (ICT) and energy control equipment. Growth | |

| Risks | Opportunities |
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| agreement to reduce emissions in the chemicals industry, under such an arrangement South Africa could find itself prejudiced in relation to chemical manufacturers in Europe, for example, given that carbon quotas are already in place for European chemical manufacturers.<br><br>*Wood and Paper*<br><br>As significant emitters and energy intensive users, pulp and paper companies in South Africa such as Mondi and Sappi are at considerable regulatory risk from climate change, as discussed under the 'Agriculture, Forestry and Fishing' sector analysis.<br><br>In addition, it is worth noting that South Africa faces increasing global competition in the export of wood, pulp and paper products, particularly from mills in China and India, highlighting potential competitiveness risks from climate related legislation implemented at a national level. The pursuit of climate related uniformity with emerging manufacturers in Asia is thus desirable to support wider economic competitiveness.<br><br>*Metals and Metal Products*<br><br>This section focuses on aluminium, as well as iron and steel production. See also 'Mining and Quarrying' above for a discussion of additional metals.<br><br>Aluminium:<br><br>The production of primary aluminium, including the smelting of alumina to form aluminium, is a highly energy intensive process. At a minimum, 15 Megawatt Hours (MWh) of electricity is required to produce a ton of aluminium.<br><br>South Africa has promoted comparative advantage in low industrial electricity prices and reliable supply as part of the development of the aluminium smelting industry in the country. | opportunities are also evident in efficient heating and cooling systems and the insulation industry.<br><br>Major electrical companies have also moved into renewable energy as a key growth area, and are able to provide solutions in the reduction of transmission and distribution losses in electrical grids, as well as support clean coal technologies such as Integrated Gasification Combined Cycle (IGCC) and CCS.<br><br>Domestic solar water heater manufacture remains an important potential economic opportunity in the country, linked to a wider industry of retailers and installers, and the promotion of employment for semi-skilled workers.<br><br>*Metals and Metal Products*<br><br>Substantial energy savings can be achieved through the enhanced use of recycled aluminium, a process that uses approximately 5% of the electricity required to produce primary aluminium.<br><br>The increased use of recycled aluminium also supports domestic recycling schemes and local job creation opportunities. Aluminium can be expected to retain overall demand under climate change through the expansion of recycling efforts and heightened applications in vehicle manufacture.<br><br>Opportunities for additional metals including copper, uranium and platinum are discussed under the 'Mining and Quarrying' section above.<br><br>*Clothing and Textiles*<br><br>As a sector under strain from competition from Asia, particularly China, the textiles industry cannot afford to increase any of its operational costs, including electricity costs. However, the promotion of an organic clothing and textiles industry in the country offers the |

| Risks | | Opportunities | |
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| | The primary aluminium production industry in South Africa is therefore at significant risk from climate regulation in the form of emission reduction limits and raised electricity prices. However, it should be noted that aluminium companies have generally entered into long-term electricity supply contracts with Eskom for uninterrupted power at agreed upon prices. As such, the potential exists for increased pressures on electricity prices through carbon regulation to be borne by Eskom, and in turn, passed down onto consumers and cross subsidised.<br><br>Carbon pricing and industry emission targets can be expected to slow or retard investment in the national aluminium production industry, although current concerns regarding the insufficient electricity reserve margin has already prevented Rio Tinto Alcan from investing in a new aluminium smelting project at Coega (Rio Tinto Alcan, 15 October 2009).<br><br>Iron and Steel:<br><br>Many companies within the EIUG are situated in the iron and steel industries, including some of the highest reporting emitters in the country, such as ArcelorMittal South Africa. This sub-sector of the economy is therefore at significant risk from national climate regulation. It is highly likely that this sector will have to adopt stringent targets if the national emission reduction objectives are to be achieved, along with the cement, mining, power generation, forestry and CTL industries.<br><br>In addition to national regulatory risks, iron and steel producers are at considerable global regulatory risk through the establishment of sector-based agreements for reduced emissions in iron and steel, implemented at an international scale. Whilst such initiatives could offer certain opportunities for the industry, including in the form of sector emissions trading, developments in international climate negotiations | opportunity to produce premium brands in areas where countries such as China will find it more difficult to compete.<br><br>The promotion of local purchasing, linked to socially and environmentally accredited products, could also help retain employment and competitiveness in an industry that is currently unable to compete in the low cost market. Targeted energy efficiency measures and support to this industry could also assist to reduce the carbon footprint of locally produced textiles and clothing, whilst protecting industries from rising electricity prices.<br><br>*Pulp and Paper*<br><br>Certain opportunities exist in the pulp and paper industry to support biomass based power generation. However, wood chips and pulp and paper are currently excluded from the national Renewable Energy Feed-In Tariff (REFIT), and would require some form of financial assistance to achieve market access. A Cogeneration Feed-In Tariff (Cofit) is currently under consideration by the National Energy Regulator of South Africa (NERSA) and could provide the necessary support for exported power generation in this industry. | |

| Risks | | Opportunities | |
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| | need to be monitored closely in this regard.<br><br>Finally, a related risk for steel is that tighter vehicle emission standards and fuel economy efforts, including in the EU, can be expected to further drive the demand for increased aluminium usage in vehicles in comparison to steel, given the ability of aluminium to support lighter vehicle design.<br><br>*Non-Metallic Mineral Products (Cement and Glass)*<br><br>The South African cement industry is at both national and regional risk from climate change regulation. Companies such as Pretoria Portland Cement (PPC) the country's largest cement producer, ranks within the top 6 emitters currently reporting under the CDP, with a total emissions footprint of approximately 6 million tons of $CO_2e$, with much of this contained in process related emissions.<br><br>As with iron and steel, cement has been targeted by the EU and others for inclusion within future sector-based emission reduction programmes, which could place global sector-based caps on emissions in this industry. On the other hand, the introduction of carbon pricing in South Africa could place competitiveness concerns on domestic cement production *unless* globally defined agreements are reached on reducing cement emissions.<br><br>Glass manufacture is also an energy intensive process and glass companies could face sizeable risk in the form of raised electricity prices through carbon pricing. Mandatory reporting of emissions and stipulated energy efficiency targets, as for many industries in the Manufacturing sector, are also likely under a concerted national climate change response.<br><br>*Food and Beverages*<br><br>Emissions in the domestic food and beverages sector can be substantial, with SABMiller placed within the top 15 emitters reporting voluntarily to the CDP. Risks here include carbon pricing and raised fossil fuel and electricity prices. | | |

| Risks | | Opportunities | |
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| | *Major Exports and Imports*<br><br>Finally, a variety of manufactured products for export, including pulp and paper products, prepared foodstuffs, mineral products, chemicals, base metals and precious metals could face increasing costs for air freight and/or ocean shipping through the enacted EU Directive on Aviation and moves to bring maritime emissions into international climate reduction efforts. Much will depend in this regard on the robustness of aviation and maritime emissions trading markets, in determining the price for emission allowances.<br><br>Corresponding issues could also be experienced for an increased cost of imports, impacting the overall balance of payments. See analysis of the 'Transport, Storage and Communication' sector for further detail on current and proposed measures to curb aviation and maritime emissions. | | |
| **Trade and Market Access** | Potential exists for a Border Tax Adjustment (BTA) to be placed on South African cement, iron and steel if an effective carbon pricing regime is not implemented in South Africa. This threat is most applicable from the EU at present. Whilst the United States is also a major steel and cement manufacturer and concerned regarding carbon leakage, it is unlikely that appropriate legislation to impose a BTA will be passed in the near future in the US, although medium to long-term risks remain.<br><br>The ability to produce vehicles that comply with increasingly stringent fuel economy and emission standards can be expected to form part of the continuation of the motor vehicle manufacturing industry in South Africa. Increasingly stringent standards in the European Union, including escalating limitations on $CO_2$ emissions, will prevent the sale of vehicles in the EU unless imported vehicles can achieve these emission reduction standards. Ultimately, the influence of climate change and enhanced fuel and emission | Major areas of economic opportunity exist in the promotion of emerging low carbon technologies in South Africa. Key areas include the use of Platinum Group Metals (PGMs) as a catalyst for fuel cells, the capturing of hydrogen during syngas production, the development of electric vehicles, and thin-film solar Photovoltaic (PV) power.<br><br>Optimal Energy has recently produced the Joule, South Africa's first fully electric multi-purpose urban passenger vehicle. A zero-emissions vehicle, the Joule uses lithium-ion batteries to power the car. According to Optimal Energy, the Joule's maximum speed is 135kmph, accelerating from 0kmph to 60kmph in less than five seconds. It takes around seven hours to charge the battery pack for a range of 300km, using a normal 220V home outlet.<br><br>The Joule has already been displayed at the Paris Motor Show with considerable success, and the | **New Markets & Industries** |

| Risks | | | Opportunities |
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| | standards will hamper the competitiveness of the country's automotive sector unless adjustments are made. The automotive sector is in a difficult position, however, as the cost for compliance and the achievement of harmonisation with global vehicle standards will be derived at considerable financial cost.<br><br>An increased emphasis on teleworking, car pooling and public and non-motorised transport both nationally and internationally could also slow the growth of new vehicle sales and usage, with associated impacts on maintenance and replacement requirements. | Department of Science and Technology (DST)'s Innovation Fund has provided R50 million towards the Joule's roll-out. Optimal Energy anticipate to start production towards the end of 2012, with plans to ramp up rapidly to 50 000 cars a year. Around 5% to 10% of these will go to the local market, with the rest earmarked for the UK and EU (Engelbrecht, 2010).<br><br>The University of Johannesburg has also been at the forefront of solar power research and development, with the establishment of the world's first thin-film solar module technology. Following completion of a pilot pant in Germany, it is anticipated that the country's solar manufacturing plant will be operational in Paarl in approximately two and a half years (Engineering News, 20 November 2009). The plant is expected to be able to produce 40MW of modules per annum.<br><br>The project is a public private partnership between, amongst others, the Central Energy Fund, National Empowerment Fund, Sasol and the University of Johannesburg. The European Investment Bank has already agreed to invest €40-million in the Paarl based production facility (Engineering News, 12 October 2009). | |
| **Supply Chain** | *Food and Beverages*<br><br>Concerns regarding product food miles, and associated attempts to reduce the carbon footprint of imported goods, particularly food and beverages, poses supply chain risks for material suppliers in these industries.<br><br>Both glass and polyethylene terephthalateplastic (PET) manufacturers have been placed under increasing scrutiny as attempts are made to reduce the carbon content associated with packaging materials.<br><br>The proactive response of the fruit and wine sector in South Africa underlies the strong commercial need to reduce | Considerable potential exists for technology transfer to support the implementation of CCS in the Sasol synfuels programme. This is currently considered the most cost effective area for carbon capture in South Africa, given more readily accessible $CO_2$ concentrations available within the Sasol production process (UKTI, 2008). | **Country Level Investment, Finance & Technology Transfer** |

| Risks | | | Opportunities |
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| | carbon emissions across the life cycle of exported beverages and foodstuffs, from farmed produce through to product manufacture, packing and distribution. Effective responses are required to address key areas of the supply chain including issues related to agricultural inputs, refrigerated road transport, the promotion of vehicle efficiency and modal freight shifts from road to rail.<br><br>*Transport Equipment*<br><br>Motor vehicle manufacture could face increasing costs through higher prices for supplies of steel, aluminium, glass, rubber and plastics as a result of climate regulation.<br><br>*Petroleum Products, Chemicals and Plastics*<br><br>Significantly reduced demand growth for refined petroleum products and coal-to-liquids fuels could lead to slowed demand in these industries, although it should be noted that substantial overall economic gains are anticipated from improved vehicle efficiency standards and public transportation.<br><br>Chemicals and plastics manufacture could see operational costs rise as the price of key fossil fuel inputs, such as crude oil, experience price increases under climate change. | | |
| **Country Level Investment** | Concerns are raised regarding future investment in the aluminium smelting industry in South Africa in the context of climate change. Strong regulatory responses and the imposition of carbon pricing is likely to deter new investment, driving investments to less regulated environments or countries characterised by a reliance on hydropower or nuclear energy .<br><br>Nevertheless, with a constrained electricity reserve margin, carbon intensive grid and escalating electricity prices, future investments in this industry are already uncertain at present. Competitiveness losses in comparison to counties with low carbon electricity are likely to take place unless widespread | | |

| Risks | | Opportunities | |
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| | aluminium recycling is implemented. | | |
| **Investor** | Significant investor related risk is located in the development of new primary aluminium smelting facilities and coal-to-liquids facilities in the country, in the absence of a thorough assessment of climate change regulatory and pricing risks.<br><br>The achievement of the national climate change target can be expected to require the use of CCS in future CTL plants, factors that would need to be carefully considered in feasibility assessments and financial estimates. | | |
| **Reputational** | Reputational concerns from climate change can be high in a number of industries within the Manufacturing sector. Companies with a high emission footprint, such as Sasol, have already been placed under intensive scrutiny over their environmental performance and have embarked on efforts to diversify their economic activities. Climate change poses an additional area of reputational risk that, if left unattended, could result in substantial media coverage, potential environmental advocacy and heightened investor concerns.<br><br>Brand integrity is also important in the food and beverages sector, given the strong customer interface and ability of consumers to rapidly alter purchasing decisions. Backsberg's efforts to become the first carbon neutral wine estate in South Africa highlights the potential brand and marketing benefits that can be associated with mitigation efforts, whilst retaining value for premium brands.<br><br>Publishing houses and the print media could also face certain reputational issues in South Africa for failure to address their carbon footprint. A number of periodicals and newspapers in developed countries have embarked on efforts to measure and reduce their carbon footprint to enhance customer relationships. | | |

| Summary: | The Manufacturing sector is at substantial risk from climate change on a variety of fronts, from heightened regulatory concerns through to extensive supply chain, investor and reputational risks. Proactive screening and risk management is critical to ensure that competitiveness relative to other producer nations is maintained, whilst ensuring that the development of any sector-based climate change agreements for cement, iron and steel provide meaningful opportunities for South African industries.<br><br>The sector is also characterised by substantial economic opportunities, including through the production of energy efficient machinery and equipment, the domestic assembly of public transport equipment and the development of renewable energy technologies, including thin-film solar PV, wind power, concentrating solar power and solar water heaters. The work of upstream industries such as chemicals and metals can also play an important role in the realisation of low carbon solutions.<br><br>A number of opportunities are therefore presented to support domestic manufacturing content in South Africa, an outcome that remains a key objective of government's industrial policy. Enhanced domestic manufacturing output can also be supported through relevant state-led procurement efforts.<br><br>Nevertheless, climate change poses additional challenges to the make-up and emphasis of the this sector – key concerns relate to the ability of the sector to invest in efficient technologies and develop sufficient skills to support value addition and product diversification, linked to changing global preferences and an emphasis on low carbon alternatives. |
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## Utilities (Electricity, Gas & Water)

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| **Sector Overview:** | ▪ The Utilities sector contributed just above 2% of GDP in 2008, from a peak of 3.1% in 1995<br>▪ Value addition in this sector since the 1970s has been dominated by the water services industry<br>▪ Eskom, a corporatised utility, produces 96% of all electricity in the country. 95% of all Eskom electricity sales are also within South Africa, with the remaining 5% sold to SADC countries (Eskom, 2009)<br>▪ Coal is relied upon to produce 93% of the country's electricity, with nuclear (5%), pumped storage (1.4%) and hydro (0.4%) making up the balance (NERSA, 2007)<br>▪ Following a period of inadequate infrastructure investment and load shedding in 2008, Eskom has embarked on an electricity capacity expansion plan amounting to R300 billion over five years. The first unit of the Medupi Coal-Fired Power Station is expected to come on line in 2012, and the first unit of the Kusile Coal-Fired Power Station in 2013<br>▪ The national electrification process (universal access by 2012) and free basic electricity can be expected to place increasing pressure on the country's electricity reserve margin<br>▪ The proposed 6 Regional Electricity Distributors (REDs) remain under discussion<br>▪ Employment in the electricity, gas and steam industry has declined from a high of almost 80 000 in the mid-1980s to reach just over 40 000 in 2008, with a period of moderate growth taking place between 2004 and 2008<br>▪ Since 1994 access to water supply infrastructure has improved in terms of population reach. At present 88% of the population has access to a basic level of service (DWAF, 2008)<br>▪ Currently 2.4 million people are without access to a basic level of water supply; a further 3.3 million people have access to a water supply but the water obtained does not meet the basic services standard |

| Risks | | Opportunities | |
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| **Regulatory** | The focus of this analysis will be placed on the electricity industry, given its key role in climate concerns.<br>The government owned utility, Eskom, is at severe regulatory risk from climate change, including at a national and international level. According to the CDP Report for 2008, Eskom's greenhouse gas emissions amounted to 223 million tons, or approximately 51% of South Africa's total emissions for the 2000 year baseline (CDP, 2008). As per the latest national GHG inventory, | The expansion of the renewable energy industry in South Africa represents a significant economic opportunity in the electricity industry. Globally, renewable energy has undergone exponential growth, with the industry moving from providing 160GW of power in 2004 (or four times South Africa's current electricity capacity) to 280GW in 2008 (REN21, 2009). In 2008, investments in renewables eclipsed those for fossil fuels for the first time, with much of the investment being undertaken by China and India. | **Growth of Existing Markets & Industries** |

| Risks | | Opportunities | |
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| | sub-bituminous coal for electricity production made up 39% of all national emissions in 2000 (DEAT, 2009b). Carbon intensive electricity production also has a key role to play in the relative carbon footprint of companies and exports in South Africa, a matter discussed in more detail in Section 5 and 6 of this document.<br><br>Aside from expected mandatory reporting of their emissions and targets for power generation efficiency, the Department of Environmental Affairs (DEA) has indicated that Eskom will need to render all new power stations built to be Carbon, Capture and Storage (CCS) ready, which could add an additional cost constraint on the utility.<br><br>However, by far the greatest risk to this industry lies in the introduction of carbon pricing in the economy, given the high emission factor associated with South African electricity. The cost of implementing such pricing could be financially crippling for Eskom, although with a lack of effective competition in the electricity market, it is expected that carbon related costs would be passed onto consumers, with significant downstream economic impacts. Carbon pricing within electricity is a complex area that is undergoing extensive evaluation, given that excluding Eskom completely from such initiatives will avoid the majority of the country's emissions and fail to address electricity related emissions for the majority of South African businesses.<br><br>In addition to a national regulatory risk of an emissions cap or carbon pricing mechanism, potential also exists for Eskom to be placed within a global sector-based agreement in the medium to long-term, which could include emissions caps and financial penalties. Whether such an activity takes place will depend much on the outcomes of future international climate negotiations and any forms of 'new agreements' which may be | The demand for renewable energy can be driven via emission reduction targets in the power sector, as well as by direct requirements that renewables make up a specific portion of the electricity supply. Currently energy legislation in South Africa provides for the potential stipulation of both renewable energy and energy efficiency targets in the national energy mix under the National Energy Act (Republic of South Africa, 2008).<br><br>South Africa is also characterised by a significant renewable energy resource in wind and solar, reasonable resources in biomass and biogas, and is far advanced in the development of a Renewable Energy Feed-In Tariff (REFIT) to support the deployment of renewables.<br><br>The realisation of a sizeable renewable energy industry could provide a variety of additional benefits including labour intensive employment creation in construction and manufacture, increased energy supply and heightened opportunities for foreign investment in renewable energy related projects.<br><br>Macro-economic analysis for government's 10 000 GWh renewable energy target has confirmed the economic benefits of achieving this target (DME, 2004a). More recently, it has been estimated that a 27% contribution of renewable energy to the electricity mix, if matched with technological learning, could result in a net cost saving of R143 per ton of $CO_2$-eq avoided (DEAT, 2007b). A more recent analysis of incorporating 15% renewables by 2020, with maximum benefits for the establishment of a local manufacturing industry through the deployment of wind and solar thermal technologies, has found that overall costs from such a programme could also be minimised. This study concludes that (Marquard et al, 2008 ii):<br><br>▪ Reaching a 15% renewable target by 2020 would increase average electricity costs in 2020 only slightly | |

| Risks | | Opportunities | |
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| | implemented to reduce emissions. Very little headway on sector-based or new agreements was made at the Copenhagen Summit, however, these issues are anticipated to gather further momentum in future negotiations.<br><br>Finally, regulatory costs related to mandatory CCS in the medium to long-term could be substantial, particularly outside of the national synfuels industry. Estimates include a cost of R67-72 per ton of $CO_2e$ sequestered for a 20 million ton capturing target by 2024 (DEAT, 2007b; DEAT, 2007d). Whilst CCS is a potentially viable technology in South Africa, it is not at an advanced stage of development and remains an expensive technology.<br><br>Costs for introducing 27% nuclear energy by 2030 could also amount to R18 per ton of $CO_2e$ avoided relative to a business as usual scenario (DEAT, 2007b). The use of imported hydroelectricity and regional gas supplies, whilst offering energy security benefits and risks, will also not be achieved without economic cost relative to a business as usual approach (ERC, 2008). | higher than the baseline scenario (around 15%)<br>▪ Combined with an energy efficiency programme, average electricity costs would in fact be lower than the baseline for most of the 2015-2020 period<br><br>The development of renewable energy technologies such as wind could also help reduce electricity prices over the long-term. NERSA estimates that wind and biomass energy will be only 54% of the price of coal-based electricity in 2030, whilst the price of concentrating solar power will be almost comparable (see Business Report, 2 November 2009).<br><br>It may be possible to employ the use of a REFIT to provide a gradually declining subsidy to renewables in the period before cost parity is achieved with other technologies. Such subsidisation, whilst having a number of socio-economic benefits, could also be internationally eligible for global climate support, either through a registered Nationally Appropriate Mitigation Action (NAMA) or through a bilateral agreement with a developed country partner.<br><br>The diversification of the South Africa's electricity mix is increasingly recognised as a viable and important step for decarbonising the national grid, reducing company related electricity emissions and supporting nascent labour intensive industries in which South Africa may be able to develop comparative advantage (see CDP, 2009; NBI, 2009).<br><br>Opportunities for methane extraction and use within power generation are offered within larger municipal landfills, many of which have viable levels of power generation capacity, as well as in certain waste water treatment plants. Water conservation measures in cities, whilst reducing national water requirements, will also correspond in reduced electricity consumption for water pumping, offering both energy and water savings. | |

| Risks | | Opportunities | |
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| | | Finally, the widespread adoption of energy efficiency measures and mandatory targets has consistently been identified as a fundamental means to promote enhanced energy security, provide net costs savings and improve industrial competitiveness in South Africa.<br><br>Residential, commercial and industrial efficiency measures have all been identified as negative cost measures in targets modelled up to 2030 (DEAT, 2007b). The introduction of Solar Water Heaters (SWHs) and insulation, for example, offers the opportunity to reduce residential peak demand, a key component in requirements for further power station development, whilst creating a local SWH and insulation industry of manufacturers, installers and retailers. Whereas traditional electricity production tends to be highly capital intensive, the promotion of energy management diverts expenditure towards comparatively more labour intensive industries, resulting in a net increase in employment despite reduced energy consumption.<br><br>The promotion of energy efficiency could also be supported by the development of a national energy efficiency trading scheme in order to reduce implementation costs even further and to drive extended efficiency measures. | |
| **Investor** | Investor risk for the development of new coal fired power stations has emerged as an area of concern globally, including for larger multinational banks and multilateral lenders. Widespread coverage of the World Bank's hesitancy to fund a portion of the Medupi Power Station as a result of climate concerns, serves to highlight the emerging investment related risks in large-scale fossil fuel infrastructure (Reuters, 7 March 2010).<br><br>Whilst *developed* countries can be expected to proceed with building their own coal fired power stations, the availability of external finance to support coal projects in | A number of opportunities for financial support and technology transfer are evident in the electricity industry. Areas of potential assistance include wind and solar energy, the REFIT, advanced energy efficiency technologies, combined heat and power (CHP), CCS and clean coal technologies such as Integrated Gasification Combined Cycle (IGCC) and supercritical and ultra-supercritical power generation.<br><br>Clean coal technologies may be implementable at manageable cost. Indeed, initial assessments of the production of 27% of electricity from clean coal | **Country Level Investment, Finance & Technology Transfer** |

| Risks | | | Opportunities |
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| | advanced developing counties could be an area of concern in the future.<br><br>It is critical that fossil fuel infrastructure projects are effectively screened, and assurance provided that financing is available, whilst ensuring that a balanced and fair agreement on fossil fuel investment is achieved between developed and developing countries. | technologies by 2030, using supercritical coal and /or IGCC coal technologies, indicate these technologies to offer a net economic saving of R4.8 per ton of $CO_2$e avoided, relative to the baseline scenario (DEAT, 2007b). | |
| **Supply Chain** | As indicated earlier, in the absence of a competitive electricity market in which low carbon energy sources are employed, it is highly likely that any carbon related costs stipulated for the national utility will be passed onto consumers. Whilst some efforts will be taken to shield poorer households, the net effect could be a significant increase in electricity prices and inflationary pressures.<br><br>The use of carbon taxation revenues in support of enhanced social grants, consumer VAT support and other such measures will need to be effectively evaluated, whilst other measures to support energy efficiency in all sectors, including power generation, will be required to reduce potential cost implications. | The socio-economic and environmental benefits from adopting low carbon technologies in electricity production are significant. These range from significantly reduced air pollution, with related benefits for the national health care system, substantially reduced water usage relative to water-cooled power stations, and enhanced energy security benefits through reduced electricity demand and diversified domestic supply.<br><br>The promotion of efficiencies in power generation is a key component of linking modern power station development in South Africa to current practices in developed countries where efficiencies of 45% can be achieved. Efficient generation will not only result in long-term energy and cost savings, but mitigate the effects of carbon pricing mechanisms. | **Risk Management, Efficiencies & Competitiveness** |
| **Reputational** | Climate change has emerged as a key area of global and national concern, and there are considerable reputational risks for utilities that do not effectively provide low carbon energy sources or are perceived to be taking insufficient action on climate change.<br><br>This risk is likely to increase over the medium term, but may be dependent on the establishment of a liberalised electricity market in which customers can shift purchasing. Investor related risks may be created in the interim, however, as discussed above. | | |

| Risks | | Opportunities | |
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| **Litigation** | Fossil fuel based power generation has been earmarked as the focal point for legal damage cases in the United States. Whilst the risk of climate change litigation is low in South Africa at present, it is not inconceivable that public or private entities may wish to take legal action against the electricity industry for failure to consider climate change related financial risks in project evaluations, or for failure to encourage a more diversified electricity mix. | | |

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| **Summary:** | The national electricity utility, Eskom, is at marked regulatory risk from climate change, including through mandatory power efficiency requirements, CCS requirements and the pricing of carbon emissions. Key investor concerns are also evident in this industry, with the country's current power generation plan recently placed under scrutiny by lenders. In a non-competitive electricity market, end users of electricity are at considerable risk of carbon pricing being passed down by the national utility, in the form of higher electricity prices, and remedial measures would be required to address inflationary pressures and social equity concerns.<br><br>The combination of commercially viable renewable energy technologies and energy efficiency has the potential to reduce overall electricity prices within a decade relative to conventional practices. Renewable energy and energy efficiency also offer benefits for labour intensive growth in an industry currently characterised by high capital intensity. Additional benefits relate to improved air quality, enhanced energy security, reduced power station investment requirements, and opportunities to attract new forms of international investment, whilst supporting enhanced carbon competitiveness for a range of South African businesses. |

# Construction

| Sector Overview: | |
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| | ▪ In 2008 the Construction sector contributed roughly 4% of GDP in South Africa, up from 2% in 2005<br>▪ Construction comprises residential buildings (houses and residential property), non-residential buildings (industrial buildings) and civil works (government infrastructure). Labour intensity in construction makes it an important sector for economic growth<br>▪ In 2008 the building sector (residential and non-residential) accounted for 59% of all construction activity compared to 41% for civil construction<br>▪ Government investment in infrastructure, stadiums and housing has helped shield the sector from the global economic crisis. A public investments programme of approximately R787bn over the three financial years to March 2012 has been announced<br>▪ Construction activities, especially of the civil or public kind (airport upgrades, roads, Gautrain, public housing etc.) are expected to expand in the foreseeable future |

| Risks | | Opportunities | |
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| **Regulatory** | The introduction of mandatory efficiency standards for buildings is considered a realistic short to medium-term option in the country. The Standard for Energy Efficient Buildings (SANS 204) remains under development, with the standard to be incorporated into the National Building Regulations and to introduce mandatory legislation for all new buildings.<br><br>More stringent building codes are considered an important component of South Africa's mitigation future (see DEA and DST, 2009).<br><br>Relevant building codes could also be introduced independently at the local municipality level, as part of ongoing energy security and climate mitigation efforts.<br><br>The introduction of efficiency standards can be expected to raise operational costs for construction activities as new materials and techniques are introduced.<br><br>Effective monitoring and enforcement, as well as the development of sufficient professional and contractor expertise, will, however, need to be addressed in | Significant potential construction related opportunities exist in the implementation of large-scale heat pump, solar water heater or insulated ceiling rollout, as part of social development and/or climate mitigation efforts.<br><br>The expansion of low carbon technologies including public transport infrastructure and renewable energy (such as wind, solar and biomass) offers additional areas for Construction sector growth. As of 2008, a total of 6 700 direct construction jobs had been created by the Bombela Concession Company for Gautrain construction (Gautrain, 24 June 2008).<br><br>Rising electricity prices and organisational attempts to reduce GHG emissions can be expected to provide support for the nascent green buildings industry in the country, and support a variety of technology and material providers, including through the use of recycled materials.<br><br>To date, a limited number of opportunities in the green building sector have been created in South Africa through the introduction of the Green Star rating tool and formation of the Green Building Council.<br><br>Finally, the extension of advisory services in energy efficiency | **Growth of Existing Markets & Industries** |

| Risks | | Opportunities | |
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| | standard implementation. | standard compliance by construction companies themselves has been identified as an area of growth opportunity for South Africa (CDP, 2009). | |
| **Supply Chain** | An area of concern in this sector relates to potentially increased cement prices as a result of the introduction of national or sector based emission caps on cement production, or through the introduction of carbon pricing.<br><br>Rising cement costs can be expected to be passed onto downstream users in construction, although these rising input costs can be expected to be passed down further to Construction sector clients.<br><br>Prices of other basic raw materials such as timber may also be increased through the implementation of carbon related costs in forestry and pulp and paper.<br><br>Related supply chain risks exist in the currently inadequate ability to secure green building materials and low carbon technologies at sufficient scale in South Africa, although this is also an opportunity for local industry development. | Mandatory energy efficiency codes for buildings to assist with the reduction of residential and commercial electrical demand, including at peak times.<br><br>Managing peak electricity demand will also significantly reduce the long-term requirement for future power station capacity requirements, with associated investment savings.<br><br>Building codes likely to provide energy cost related savings over the short to medium-term for new building stock, particularly as electricity price increases are implemented. Significant benefits to accrue to the commercial sector in the form of reduced operational costs. Reduced consumption requirements will be applied to infrastructure with an average expected lifespan of 20 to 100 years, hence large-scale savings will also be achieved over a building's lifespan.<br><br>Prospects for building plan approval under periods of constrained electricity reserve margin enhanced for energy efficient building developments.<br><br>Energy efficiency standards to assist the national Construction sector to keep pace with international construction activities and trends, which place a strong emphasis on improved efficiencies, green buildings and specialist material usage.<br><br>Commercial and residential energy efficiency have consistently been found to offer significant negative cost options for South Africa (DEAT, 2007b; ERC, 2008). Net economic gains have been found based on an estimated average cost saving of R1.6 Billion per annum in the commercial and R1.7 Billion in the residential sector (DEAT, 2007c; DEAT, 2007d). Recent modelling suggests a R1 000 saving for every 2.1 tons of carbon dioxide equivalent ($CO_2e$) | **Risk Management, Efficiencies & Competitiveness** |

| Risks | | Opportunities | |
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| | | removed via commercial efficiency and a R 1000 saving for every 2.2 tons of carbon dioxide ($CO_2$) reduced in the residential sector, under a sustainable development approach to climate mitigation (ERC, 2008). | |
| | | Energy efficiency measures such as the retrofitting of existing building stock, including within government buildings, is a strong candidate for external funding and support, with related benefits for construction activities in this area. | **Country Level Investment, Finance & Technology Transfer** |
| | | Government subsidies may also be made available to property developers and contractors that incorporate climate concerns into the design and location of their buildings. | |
| | | Opportunities are presented particularly in the voluntary carbon market in the rollout of solar water heaters, insulated ceilings and other efficiency measures within residential housing, particularly for low-income homes. | **Carbon Markets** |
| | | Other factors being equal, buildings with improved efficiency measures can be expected to attain higher future asset values due to lower long-term running costs, including in heating and cooling, whilst low carbon developments may receive heightened financial and investor backing in the context of rapidly rising electricity prices in the country. | **Investor** |

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| **Summary:** | The Construction sector faces climate risk through the introduction of more stringent building standards and increased prices for raw materials such as cement and timber. However, the net impact on the sector is likely to be strongly positive, with significant commercial opportunities presented in the development of low carbon technologies, including renewable energy and public transport, and the installation of efficient materials such as insulation.<br><br>Large-scale economic benefits can be achieved through heightened building stock efficiency, including residential consumer gains, reduced commercial operational costs, heightened buffers against rising electricity prices and reduced peak electricity demand. Industry competitiveness is also supported through keeping pace with major global trends in the sector towards efficient building practices. Opportunities are therefore presented for sustained growth in this labour intensive sector of the economy through climate change mitigation. |

## Trade, Catering and Accommodation Services

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| **Sector Overview:** | ▪ The Trade, Catering and Accommodation Services sector is the third largest in South Africa, and accounts for 14% of total GDP<br>▪ Encompasses the sub-sectors of wholesale and retail trade, as well as catering and accommodation, which includes the tourism industry<br>▪ The most labour intensive sector in South Africa, accounting for approximately 21% of total employment (StatsSA, 2009)<br>▪ Gender distribution of labour is the most equal of all sectors, with women accounting for around 49% of sector's total labour force<br>▪ Sector has been hard hit by the economic downturn, evident in a contraction in growth, marked decline in vehicle sales and decreases in employment<br>▪ Investment has increased markedly in the sector in the past decade, despite the global economic recession |

| Risks | | Opportunities | |
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| **Regulatory** | The key risk related industries in this sector are retailing and tourism, discussed separately where relevant.<br>*Retailing:*<br>Major companies in clothing, multiline and food and beverages retailing are likely to be required to take up mandatory reporting of emissions in the near future under the National Climate Change Response Policy. Emissions in this sector can be significant, with Imperial Holdings, Pick n Pay Holdings, Woolworths Holdings and Massmart Holdings placed within the top 30 emitters reporting to the CDP (CDP, 2009).<br>At present 10 of the JSE Top 100 companies are located in retailing and trade, with only 4 currently reporting emissions on a voluntary basis to the CDP.<br>In addition to reporting requirements, given the considerable emissions associated with this sector, mandatory energy efficiency targets or emission reduction targets are also a distinct regulatory possibility. | *Retailing:*<br>Opportunities exist in this sector to enhance access to environmentally conscious consumers. This includes through heightened marketing of premium brands such as organic produce based on reduced agricultural emissions.<br>The local produce industry, including the local organic industry, could receive considerable backing from efforts to support seasonal and locally procured goods in South Africa. Retailers in South Africa have already begun to work in partnership with agricultural industries to promote local organic produce. Related benefits for the economy include increased domestic demand for agricultural products and efforts to promote South African manufactured goods, although efforts will be required to keep pace with growing national demand.<br>Securing local produce will also help address concerns related to increased freight and shipping cost for imported goods as a result of climate change regulation.<br>Heightened emphasis on product reuse and recycling | **Growth of Existing Markets & Industries** |

| Risks | | Opportunities | |
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| | Readiness to address mandatory reporting, emissions caps or efficiency targets currently varies significantly within this sector. The implementation of absolute of intensity based targets could make a considerable difference in terms of impacts on relative company competitiveness, with intensity targets potentially preferable to absolute targets for early movers. Effective recognition for previous efforts ('grandfathering') could render absolute emission targets a more competitor neutral measure.<br><br>Where implemented, higher electricity and fuel prices through carbon pricing are likely to raise operational costs within this sector, particularly in cold chain supply networks, transportation, distribution centres and retail stores. Costs are likely to be passed onto consumers where possible, although efficient retailers are likely to be better placed in the medium to long-term.<br><br>Effective recycling of tax revenue from carbon taxation requires strong consideration, particularly the implementation of a food subsidy to manage carbon tax effects on social equity and wider economic performance. A food subsidy would also clearly help to reduce inflationary costs for consumers in this sector (DEAT, 2009d).<br><br>Furthermore, increased cost of shipping and air freight through carbon related constraints in the maritime sector and aviation sector can be expected to increase the cost of imported goods and raise consumer prices. This is of concern for retailers such as Pick n Pay, given an increasing need to source imported products to cater for domestic demand (see CDP, 2009; Pick n Pay, 2009).<br><br>Finally there are certain risks to the private vehicle purchasing market in the country through the provision of effective public transportation and non-motorised transport. That said, many consumers can be expected | more broadly could also encourage support for the recycling industry in South Africa, with retailers acting as important intermediaries in the recycling process. Both Pick n Pay and Woolworths, for example, have initiated recycling schemes at various stages. Recycling has the potential to support waste management, job creation and energy efficiency in the economy.<br><br>*Tourism:*<br><br>Substantial opportunities exist to expand South Africa's eco-tourism and experiential tourism markets based on an emphasis on holiday destinations, packages and itineraries with an emphasis on sustainable tourism.<br><br>The global eco-tourism market is currently growing at 15% per annum, or four times that of traditional tourism (WEF, 2009a). Daily expenditures of cultural and heritage tourists, for example, also tend to be substantially higher than for tourists on package tours (TIES, 2006).<br><br>This includes the development of eco-lodges, carbon neutral accommodation and community based tourism. There are related opportunities for hotels and accommodation to market themselves as low carbon destinations, and to support community-based carbon sequestration projects linked to ecotourism destinations as part of wider marketing efforts.<br><br>The provision of effective public transport constitutes a significant low carbon intervention that increases reliable and accessible transportation for foreign visitors and domestic travellers alike. The provision of an effective ground transport network has been identified as a current deficiency in the South African tourism market (WEF, 2009b). In particular, the development of a direct rapid rail link between airports and major cities, such as in the Gautrain initiative, has been shown to have considerable benefits for tourist access and reduced traffic congestion | |

| Risks | | | Opportunities |
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| | to purchase vehicles for their convenience factor, but utilise them less frequently, and effective public transportation will provide greatest support to low-income earners unable to purchase a private vehicle for the foreseeable future.<br><br>Rising fuel costs from carbon pricing or taxation on inefficient models is unlikely to deter vehicle purchasing, but may shift purchasing towards low emission, more efficient vehicles and hybrids. The hybrid market is however under considerable strain at present in response to safety concerns with the Toyota Prius.<br><br>*Tourism:*<br><br>Climate change legislation at the regional level could negatively impact the development of South Africa's advanced tourism industry. The key development in this regard is the EU Directive on Aviation, which is now in force and will incorporate aviation related emissions into the European Union Emissions Trading Scheme (EU ETS) from 2012. This issue is discussed in more detail below.<br><br>Finally, key tourism related emissions in South Africa are found in domestic transportation and accommodation. To the extent that carbon pricing in the economy will increase fuel and electricity prices in both these areas, so operational costs can be expected to rise for the tourism industry. | (WEF, 2009a).<br><br>Finally, low carbon facilities, such as large-scale solar thermal or solar PV power plants, wind farms, wave and tidal power generation etc., all have potential for encouraging both domestic and international tourism flows within South Africa. | |
| **Investor** | *Tourism:*<br><br>Investments in the domestic tourism industry could be affected by concerns over rising fuel prices, in part due to aviation legislation on climate change, and due to South Africa being a carbon intensive destination, both in terms of geographical location and electricity and liquid fuel consumption. | *Retailing:*<br><br>Enhanced retailing opportunities may be experienced in the sale of low emission, energy efficiency vehicles including hybrid vehicles in the short-term, and domestically manufactured electric vehicles over the medium to long-term. The Joule electric car, designed and developed in South Africa, provides evidence of South | **New Markets and Industries** |

| Risks | | Opportunities | |
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| | | Africa's commercial potential in this regard.<br><br>Sales of public transport related vehicles could also increase. | |
| **Supply Chain** | *Retailing:*<br><br>A key risk in this sector relates to carbon related costs being passed onto the retail sector within supply chains. Higher prices for products with energy intensive materials can be expected, with retailers at each end of the market segment potentially affected. Raw materials affected include cement, aluminium, glass, timber, steel and tin. | *Retailing:*<br><br>There are considerable opportunities to enhance a company's reputation and customer loyalty from shoppers through measures to reduce their organisational carbon footprint, or the footprint of retailed products.<br><br>Large retailers such as Pick n Pay and Woolworths have engaged in a variety of low carbon activities in order address changes in consumer preferences, strength customer relationships and retain brand loyalty (CDP, 2009; Pick n Pay, 2009). | **Reputational** |
| **Reputational** | *Retailing:*<br><br>Both globally and locally, reputational issues related to climate change, and ecological issues more generally, have demonstrated themselves to be increasingly pertinent in the middle and upper segment of the retailing market. Actions on the part of retailers such as Pick n Pay and Woolworths, indicate an intent to demonstrate leadership on climate issues, as part of attracting high-end or niche customers, whilst driving longer-term cost savings (CDP, 2009; Pick n Pay, 2009).<br><br>From a national country perspective, although price and brand are the critical components of consumer choice, addressing issues related to sustainability are key for retailers to attract niche market segments and maintain overall consumer loyalty. | *Retailing*<br><br>The implementation of energy efficiency drives, including within vehicle fuel efficiency, logistics planning and facilities, will assist in shielding retailers from rising electricity prices in the short term, and thereafter, from rising oil prices in the medium term, irrespective of climate change concerns.<br><br>Substantial opportunities are evident in refrigeration, efficient lighting, heat reclamation, vehicle servicing and delivery route optimisation. The use of waste oil as biodiesel is also being piloted by certain retailers and may hold commercial potential.<br><br>Whilst requiring upfront investment, efficiency measures can support significant medium and long-term energy cost savings whilst delivering to increasing customer expectations. As the example of Woolworths illustrates, the movement of their Gauteng distribution centre in 2007 to support enhanced energy efficiency, resulted in almost 10 000km less in logistics related travel per week (CDP, | **Risk Management, Efficiencies & Competitiveness** |

| Risks | | Opportunities | |
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| | | 2009).<br><br>Efforts to reduce packaging requirements, support innovation and introduce a range of low carbon goods offers additional opportunities to save on resource inputs and keep pace with growing global trends in the international, food beverages and retail market. Adapting product ranges to support changing consumer choices and preferences is an important component in maintaining a company's customer base.<br><br>*Tourism*<br><br>Competitiveness issues are also of key significance in the tourism industry, where the provision of sustainable and innovative low carbon solutions for travel are required to keep pace with growing market trends towards responsible tourism and eco-tourism. | |
| **Trade and Market Access** | *Tourism:*<br><br>Efforts to promote 'local tourism' within developed countries in a bid to reduce personal carbon emissions, the 're-regionalisation' of tourism as well as efforts to promote low carbon tourism destinations, poses a significant risk to South Africa, given the country's geographic location and carbon intensive economy.<br><br>Concerns for the domestic tourism industry are heightened, based on a number of factors:<br><br>▪ The key growth areas in tourism at present relate to experiential tourism, i.e. nature, heritage, cultural and adventure tourism, as well as eco-tourism (TIES, 2006; WEF, 2009a)<br><br>▪ Whilst South Africa's experiential and ecotourism destination rating is high, this is not matched buy our relatively poor track record in reducing GHG emissions or by our considerable distance from key tourism markets in North America, Japan and | *Retailing:*<br><br>Given heightened reputational concerns from climate change in the retailing industry, support for the local carbon offset market, such as through supporting tree planting and rural renewable energy, could be provided by this industry.<br><br>*Tourism:*<br><br>Concerns over emissions in the tourism sector from both domestic and international travellers provide ample opportunity for the development and sale of local carbon offsets under the voluntary carbon market. This is particularly the case if these offsets have a strong sustainable development component.<br><br>Effective and easily accessible high quality offsets offer the opportunity to reduce traveller concerns over holiday related climate impacts, whilst supporting a variety of community based projects. Carbon offsets are already | **Carbon Markets** |

| Risks | | Opportunities | |
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| | Europe. As such, attempts to market South Africa as an eco-friendly destination could be blemished unless climate concerns are addressed<br>▪ The EU Directive on Aviation, which extends the EU ETS to aviation, is now in force, and will implement the first emissions caps in 2012, including for South African operators. It has been estimated to increase the costs of flights in the region of 1.5 to 9 Euros per passenger return flight, although considerable uncertainties still exist in this regard (EU, 2005; Merill Lynch, 2008). Nevertheless, increased carbon regulation on aviation can be expected to increase the costs of travel over time, particularly as emissions caps under the EU Directive are further implemented<br>▪ Heightened travel costs from climate regulation could pose a risk to South African tourism given that the country relies on medium or long haul flights for over 50% of inbound air traffic, and relies extensively on long haul flights from key tourism markets (WEF, 2009b). That said, price increases are likely to effect short haul flights more dramatically, as consumers choose alternative transport means, but on the whole higher flight costs will reduce travel demand (WEF, 2009b)<br>▪ South Africa is close to being considered a critical tourism economy given that we depend heavily on long-haul travel and tourism makes up more than 5% of national GDP (WEF, 2009b)<br>Despite these challenges, there is growing international sentiment, including from the World Tourism Organization (UNWTO) that climate change concerns should not deter the use of tourism as a key revenue earner and provider of employment in developing countries, particularly Least Developed Countries (LDCs) and Small Island Developing States (SIDS), | being offered directly to foreign visitors as part of existing travel packages in South Africa and the Southern African region. | |

| Risks | | Opportunities | |
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| | especially as these countries will have to cope with significant direct impacts from climate change (UNWTO, undated). The extent to which South Africa, as a significant global emitter, is viewed in a similar light to LDCs and SIDS could play an important role in the advancement of this industry.<br>Finally, business related travel, which makes up approximately 6-7% of the South African tourism market could be impacted by growing development and use of teleconferencing facilities, and to a lesser extent, by rising ticket prices from climate regulation in aviation. | | |

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| **Summary:** | The retailing industry in South Africa faces various risks from climate change, including potential regulatory measures concerned with the mandatory reporting of emissions, potential emission caps and mandatory energy efficiency targets. Supply chain issues are also key, as retailers may be faced with higher prices for raw materials and increased shipping and freight costs for imported goods.<br>Nevertheless, the widespread adoption of efficiency measures in transport, logistics and buildings offers substantial opportunities to shield companies from heightened energy prices, and to strengthen new or existing customer relationships. Opportunities also exist to support the sale of locally manufactured and low carbon goods in the country, including organic produce, whilst adapting retailing activities to address changes in societal preferences.<br>Concerted action is required in the South African tourism industry to address both regulatory and market related risks from climate change, given the country's geographical location and carbon intensive economy. Risks include heightened travel fares from the EU Directive on Aviation, and growing emphasis on low carbon travel in developed countries, including increasing regional travel.<br>Innovative solutions are required to provide support for low carbon destinations, enhanced travel and accommodation efficiencies and accessible carbon offsets, as part of wider efforts to grow the ecotourism and experiential tourism market in South Africa. Measures are also required to address other tourism related threats in the country, such as safety and security, an underdeveloped ground transport network, road traffic accidents and tourism related skills shortages, as part of a holistic approach to maintaining global competitiveness. |

## Transport, Storage and Communication

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| **Sector Overview:** | ▪ In 2008, the communications industry accounted for approximately 5% of GDP<br>▪ Investment in mobile telecommunications has spurred a recent industry boom, supported by the shift from analogue to digital transmission by the national broadcaster<br>▪ Significant commercial opportunities are evident in communications through addressing the nation's digital requirements<br>▪ In 2008, the transport and storage industry contributed 6.5% of GDP, with the contribution rising steadily since 1992<br>▪ The movement of goods and people is critical for economic activity, and transport costs are as high as 16% of GDP in South Africa (CSIR, 2008). Shipping costs in particular determine the viability of exports and affect overall economic performance<br>▪ Investments in rail have been lagging since the early 1990s. The lack of investment in rail infrastructure has led to a dramatic increase in road corridor traffic. Rail has also declined as an urban transport mode, with minibus taxis becoming the main transport mode for the majority of urban dwellers<br>▪ Transnet has announced an R80 billion infrastructure investment plan for the period 2007-2012, with the bulk of spending on Transnet Freight Rail, in order to revitalise the general freight business (Transnet, 2007)<br>▪ The implementation of Bus Rapid Transit (BRT) systems countrywide should boost demand for transport (especially buses), in line with government's plan to develop an integrated public transport system<br>▪ Growth in transport and storage has risen dramatically since 2000, following sluggish growth since the 1970s. This sharp increase can be attributed to the World Cup announcement, road upgrades, the development of the Gautrain and the expansion of port operations |

| **Risks** | | | **Opportunities** |
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| **Regulatory** | *Communications*<br>Businesses in the communications industry can be significant emitters. For example, the MTN Group is placed within the top 30 emitters reporting to the CDP, whilst listed companies such as Altron are associated with sizeable emissions from electricity consumption (CDP, 2009).<br>Companies in this industry could be faced with mandatory reporting, energy efficiency requirements and | *Communications*<br>Significant opportunities exist in the Information and Communication Technology (ICT) industry to support the development of, amongst others:<br>▪ Energy efficient hardware components and digital infrastructure<br>▪ Energy monitoring tools and software, including in relation to smart meters | **Growth of Existing Markets & Industries** |

| Risks | | | Opportunities |
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| | potential emission reduction targets. As with the retail industry, readiness and preparedness for mandatory reporting and stipulated energy efficiency targets varies considerably from company to company.<br><br>Finally, the introduction of carbon pricing could have a reasonable bearing on the operational costs of companies in this industry, given the relatively high proportion of electricity spend in this sub-sector.<br><br>*Transport and Storage*<br><br>At a national level, it is likely that major transport related companies including South African Airways (SAA), Transnet, Trencor, Grindrod and others will be required to report on emissions, introduce energy efficiency measures and adopt emission reduction targets.<br><br>Furthermore, companies in the aviation and shipping industry are at high risk of regulatory compliance at the regional and international scale. The two key areas in this regard relate to the EU Directive on Aviation, and the gradual regulation of maritime emissions by the International Maritime Organization (IMO).<br><br>Aviation in particular, although only contributing 2-3% of global emissions, has attracted disproportionate attention and is vulnerable given the high level of GHGs emitted per kilometre travelled.<br><br>The EU Directive on Aviation is now in force and will implement the first emissions caps in 2012, including for operators such as SAA. This Directive could have a number of far reaching impacts for the South African aviation industry, including:<br><br>▪ Raising operational costs in monitoring and reporting, with financial penalties for non-compliance<br><br>▪ Resulting in direct costs in order to comply with targets set for particular countries and operators | ▪ Greenhouse gas emissions reporting and monitoring software<br><br>Such technologies can offer considerable energy and cost savings, along with sizeable emission reductions.<br><br>A number of South African companies have begun to work on promoting energy efficiency improvements for clients, including support for the development of 'green IT'. The green IT industry offers opportunities for the development, sale and maintenance of a host of new technologies to support efficient service provision.<br><br>The promotion of effective videoconferencing facilities to address company travel costs and reduce emissions is an additional area of potential growth, particularly as these facilities become more affordable to small and medium sized companies with global operations or networks.<br><br>Teleconferencing is an additional means to support low carbon communication, and South Africa may look to provide international teleconferencing call centre facilities, as part of wider support for call centre development, an area in which other developing countries have made significant gains.<br><br>Finally, support for electronic waste (e-waste) recycling, in which ICT companies can play an important intermediary function, offers benefits for energy, carbon and cost savings, whilst supporting localised job creation and SMME development.<br><br>*Transport and Storage*<br><br>In road based transport, improved light vehicle efficiency standards are considered to offer significant economic benefits, with associated reductions in fuel usage, operational costs and infrastructure requirements. Recent modelling suggests a R1 000 saving for every 0.36 tons of $CO_2e$ removed from the atmosphere, through the | |

| Risks | | | Opportunities |
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| | This could require investments in new technologies or the purchasing of emission rights. Costs may well need to be passed down onto passengers as airlines, including SAA, face increasing cost pressures (WEF, 2009b)<br>▪ Increasing fuel costs over the medium-term. Rising fuel costs are particularly important in the cost structure of long haul flights and could place commercial strain on longer routes (WEF, 2009b)<br>▪ Potentially reducing the relative importance of South Africa as a flights hub in relation to other hubs in Africa or the Middle East, given the latter's closer proximity to Europe. This could increase travel times (and overall emissions) and affect the wider airports industry<br>▪ Rewarding those companies that are financially able to generate large and new investments, in order to facilitate fleet upgrades to more efficient models<br>Many of the impacts outlined above could place increasing strain on the national carrier, and potentially on smaller operators as well. On a more positive note, by pushing for more efficient plane use, the scheme also rewards airlines that have partnerships. This is the case for SAA through its Star Alliance programme, whilst SAA also has a relatively new fleet, with benefits for improved efficiency. The current use of carbon intensive Coal-to-Liquids (CTL) as a proportion of jet fuel by SAA can be expected to pose additional challenges, however.<br>For shipping companies, related regulatory risks are also evident, although these will take a number of years to materialise.<br>The International Maritime Organization has been tasked under the Kyoto Protocol to address shipping related emissions. However, if the IMO fails to | implementation of improved vehicle standards (ERC, 2008).<br>Effective public transport also offers substantial climate benefits and has the ability to improve reliability and affordability for the 80% of South Africans currently dependent on public transport for mobility (dti, 2009).<br>As with improved vehicle efficiency, modal shifts from private to public transport are considered a negative cost option for South Africa, with R1 000 saved in the economy for every 0.17 tons of $CO_2$e avoided (ERC, 2008). The promotion of a passenger modal shift has consistently been associated with negative mitigation costs and enhanced economic development (DEAT, 2007b).<br>Substantial emission reductions can also be achieved whilst improving domestic mobility: it is estimated that the City of Johannesburg's Rea Vaya Bus Rapid Transit (BRT) system will save in the region of 1.6 million tons of $CO_2$e from its initial implementation through to 2020 (CoJ, 2008). In addition, if only 15% of car users who live within 500 metres of a Rea Vaya trunk route switch to the BRT system, it is estimated that an additional 370 148 tons of $CO_2$ could be saved per annum (CoJ, 2008).<br>The development of enhanced public transport could also have related benefits for the promotion of domestic bus manufacture, including engine components, drawing on the existing vehicle production emphasis in the country.<br>At present, an action plan for the development of the Medium and Heavy Commercial Vehicle (MHCV) industry is being formulated by the dti, to be approved in 2011, in part to capitalise on the potential for labour intensive bus manufacture in South Africa.<br>Local bus manufacture could be used to support the rollout of BRT across South Africa's major metropolitan areas, including in the current Rea Vaya programme. Apart from | |

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| | implement a timeous system to address maritime emissions, the EU will act to incorporate the maritime sector within the EU ETS, in a manner similar to that adopted for aviation.<br><br>The IMO is currently in the process of developing a work plan for reducing emissions in the sector, and is presently considering the following measures to reduce shipping related emissions (IMO, 2009):<br>▪ A mandatory limit and reporting on the Energy Efficiency Design Index and Energy Efficiency Operational Indicator for ships<br>▪ Mandatory or voluntary use of a Ship Efficiency Management Plan<br>▪ A Maritime Emissions Trading Scheme<br><br>Maritime climate regulation, enacted either via the IMO or EU, could impact South Africa's shipping industry through the following:<br>▪ Ship yards being required to implement high efficiency in ship design<br>▪ Ship owners having to invest in fleet upgrades, and implement slow steaming and other management plans to increase efficiency<br>▪ South African ports being required to administer differentiated harbour dues/fees, invest in infrastructure to provide cold ironing, or shore electricity from renewable sources while ships are berthed<br>▪ Ports may also be responsible for repossessing ships for failure to comply with environmental legislation<br><br>Regulatory risks for the maritime sector, as the experience of the aviation industry demonstrates, could be significant, and developments in this regard will need | Phase 1A of the project, locally produced buses could be employed within Rea Vaya, and made available for export (Engineering News, 23 February 2010).<br><br>The enhancement of rail based freight offers substantial benefits for the country, including reducing pressure on the national road infrastructure and easing congestion concerns, whilst lowering the carbon intensity of South African exports.<br><br>Finally, South Africa is not considered a negligible player in aerospace innovation, and opportunities may be opened up for the country in the development of advanced flight technologies and production of new aircraft parts for more efficient models. | |

| Risks | | | Opportunities |
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| | to be monitored closely.<br><br>In terms of road based travel, the introduction of carbon pricing could be expected to increase fuel costs, increasing vehicle operating costs for private users and raising the costs of road based freight. Effective tax revenue recycling will need to be considered to counter inflationary pressures in transportation.<br><br>Finally road user charges or 'congestion charges' may be employed in South Africa in the medium-term, in part to address rising GHG emissions, with the scheme having the greatest impact on single occupancy drivers in inefficient vehicles. | | |
| **Trade and Market Access** | *Transport and Storage*<br><br>The potential implications of the EU Directive on Aviation for tourism demand and business travel has been discussed in the Trade, Catering and Accommodation Services sector analysis above.<br><br>An additional area of concern is increased costs for international trade in both air freight and shipping, raising the costs of both imports and exports, and potentially affecting the balance of payments and reducing demand for certain domestic products. | *Communications*<br><br>Opportunities exist in this industry in support of leveraging on international expertise and best practice in the application of smart metering, net metering and the use of various energy and carbon monitoring software tools and approaches. | **Country Level Investment, Finance & Technology Transfer** |
| **Supply Chain** | *Communications*<br><br>Companies in this industry may be at some supply chain risk from organisations greening their supply chains and requesting their partners, including their ICT partners, to report on and reduce their emissions.<br><br>As commercial efforts in this area intensify, ICT companies that are poorly placed to reduce their emissions and/or offer efficient technologies may be prejudiced in the market place. | *Communications*<br><br>The introduction of smart metering can support a flexible and robust electricity grid, enhancing efficiencies in load management and ensuring maximum utilisation, reliability and quality of existing power supplies.<br><br>In addition, the implementation of energy efficiency measures in communications, ranging from building improvements to server infrastructure, could result in enhanced system performance, reduced exposure to electricity price increases and heighten the overall | **Risk Management, Efficiencies & Competitiveness** |

| Risks | | | Opportunities |
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| | | efficiency of this sub-sector.<br>*Transport and Storage*<br>Substantial potential exists to reduce traffic congestion and air pollution, and enhance tourist access, through effective public transport. BRT systems have the added benefit of providing a relatively low cost alternative that is able to span large areas, ideal for addressing the geographic sprawl characteristic of many South African cities.<br>Significant balance of payment savings can also be achieved through a reduction in crude oil and refined petroleum product imports, with increased employment of public transport and rail based freight.<br>Air pollution concerns in the shipping industry, including the release of oxides of Nitrogen (NOx), oxides of Sulphur (SOx) and particulates, can also be substantially countered through ship fuel efficiency measures. | |
| **Reputational** | *Transport and Storage*<br>Consumer loyalty and brand image could be at some stake within the aviation sector, which has a strong customer interface and has attracted disproportionate attention in climate change concerns.<br>Certain low cost airlines have already engaged in efforts to promote environmental responsibility as part of promoting increased competitiveness and brand loyalty in South Africa. | *Transport and Storage*<br>The development of sector-based carbon markets is likely to gain momentum over the medium-term, with both the aviation and maritime industries being potential candidates in this regard.<br>The ability of these sectors to trade surplus emission credits will be dependent on the baselines that are set, and the ability of companies and industries to met or exceed sector targets.<br>At the same time, companies may also be able to implement emission reduction activities outside of their respective sectors, within certain limitations, as a means for generating emission reduction credits in a cost effective manner. | **Carbon Markets** |

| Summary: | The communications industry is at moderate risk of mandatory emissions reporting, energy efficiency targets and increased electricity costs through carbon pricing. However, this industry is likely to be a net winner from climate change through efforts to promote ICT related climate solutions. Key opportunities include software tools, videoconferencing, the deployment of efficient digital infrastructure, sophisticated grid management technologies and teleconferencing facilities.<br><br>The national aviation sector is at considerable risk from climate change through the enforcement of the EU Directive on Aviation. Whilst the Directive supports longer-term efficiencies in aviation, it entails additional operational costs for airline operators and could play a role in redirecting air traffic flows. There are emerging risks in the maritime industry as well, with the IMO currently investigating emission reduction options in this sector. It is likely that the EU will incorporate the maritime industry within the EU ETS, if the IMO is unable to implement a viable emission reduction programme for shipping by 2012.<br><br>Aside from the substantial challenges outlined, large-scale opportunities are evident in the introduction of heightened vehicle efficiency standards and rollout of mass public transport in the country, particularly in the implementation of BRT systems. These transport measures offer significant secondary benefits and result in direct economic gains for South Africa. The development of a labour intensive bus assembly industry in South Africa, linked to planned or existing BRT systems, is also a distinct commercial opportunity. |
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## Financial, Insurance, Real Estate and Business Services

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| **Sector Overview:** | ▪ The Financial Services sector, which includes Finance, Insurance, Real Estate and Business Services, has grown steadily to account for almost one-fifth of South Africa's economic activity<br>▪ Sectoral contribution to GDP rose from 12.3% in 1990 to 17.3% in 2007. Sector growth has been three times faster than that for the secondary sector<br>▪ This growth emanates from the country's well developed and increasing deregulated Financial Services sector with sophisticated banking, bond and insurance markets<br>▪ Although the 2008 global financial crisis is likely to put a damper on domestic financial service growth, the sector is likely to retain its leading position in the economy<br>▪ Given the high wages offered in this sector, a severe downturn in Financial Services could impact on overall domestic demand, making economic recovery that much more sluggish<br>▪ The sector's role is highlighted in the National Industrial Policy Framework (NIPF) as a crucial cross-cutting intermediary in effectively allocating capital resources for industrial upgrading, productive investment and easing costs of capital for small and medium<br>▪ In 2008, 1.98 million people were employed in the Financial Services sector, 98% of which were formally employed. From the late 1980s, the rate of employment growth in Financial Services has accelerated faster than in all economic sectors as a whole, but appears closer to overall employment growth after 2003<br>▪ The sector was characterised by a net trade surplus of R13.1Billion in 2008 |

| Risks | | Opportunities | |
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| **Regulatory** | A number of players in the financial sector are characterised by significant emissions, including the Bidvest Group, Old Mutual, FirstRand and the Absa Group, all of whom are placed in the top 30 emitters reporting to the CDP (CDP, 2009). Electricity based emissions are the major area of concern for most companies in this sector.<br>Larger companies in the sector are therefore at risk from increased electricity prices through the implementation of carbon pricing and the introduction of emission reduction limits. Mandatory reporting of | The growth of the global carbon market in a relatively short period of time has demonstrated the potential commercial opportunities in the trading of environmental commodities.<br>The maturation of this market has created a host of opportunities for the financial services industry encompassing carbon asset traders, clean energy conventional and venture capital funds and carbon brokerage services, in conjunction with emission reduction project developers. Although South Africa's primary involvement in this market through the Clean Development Mechanism (CDM) has been more limited to date, the role of | **Carbon Markets** |

| Risks | | Opportunities | |
|---|---|---|---|
| | emissions and stipulated energy efficiency targets are both likely as part of compliance with emerging national climate policy.<br><br>In addition, regulatory risks are evident at the regional and international scale, dependent on the scope of activities undertaken by each company. The Bidvest Group, for example, has highlighted that their aviation and shipping related business could both be affected by global climate legislation.<br><br>As discussed in detail under the 'Transport, Storage and Communication' sector above, both the EU Directive on Aviation and moves by the IMO to regulate shipping emissions could impact companies operating in this arena. | market based mechanisms is consistently recognised as a key component to achieving cost effective and efficient greenhouse gas abatement at national, regional and global scales.<br><br>An area of particular interest relates to the development of new emissions trading mechanisms in the post 2012 framework, which could include new forms of sector based carbon markets, providing wider opportunities for South African companies and financial services groups to link into a variety of global trading schemes. | |
| **Investor** | Investor risk from climate change is a key area of concern in the Financial Services sector, and applies particularly to:<br><br>▪ Current and anticipated investments<br><br>▪ Project related screening activities<br><br>Given the potentially far reaching commercial implications of climate change, the range of actual or potential investment related risks for the finance sector are highly dependent on the investment portfolios of each investment group. As such a full assessment of the risks and opportunities discussed in this document would apply to current and prospective investments.<br><br>For companies in this sector, it is quite likely that major climate concerns could relate to investment portfolios, and not necessarily to company operations.<br><br>In addition, as the pricing of carbon within the economy is given greater scrutiny, so the issue of company level shadow prices for carbon and project climate | The rise of new technologies, most recently the exponential commercialisation of renewable energy on a global scale, has helped bring into focus the investment related opportunities present in low carbon markets.<br><br>Venture capital, but also private equity and hedge funds have begun to play an increasing role in low carbon project development and the establishment of climate change related companies. Significant commercial opportunities can also be offered in South Africa, ranging in the relative make up of risk and return, based on the establishment of an enabling investment climate, given the country's significant renewable energy resource.<br><br>Investor related products have also been commercialised in recent years that evaluate investment portfolios and screen potential projects for climate related factors, to assist companies to reduce costs and convert investment risk into opportunity. | **Investor** |

| Risks | | Opportunities | |
|---|---|---|---|
| | screening gains further importance. As for investment related decision making, it is envisaged that climate change concerns, including potential carbon pricing, are best integrated within existing risk management systems and project evaluation procedures, as an additional driver of commercial risk and value.<br><br>Currently the most notable investor related risk form climate change for the Financial Services sector would apply to investments made into long-lived fossil fuel infrastructure, particularly coal fired power stations. | | |
| | | The implementation of effective mitigation responses in South Africa offers a number of potential commercial opportunities for professional service providers, and the wider business services industry. Areas of potential service provider involvement include:<br>▪ Assistance in the establishment of greenhouse gas reporting, including monitoring and verification procedures<br>▪ Assistance in the implementation and monitoring of emission reduction activities, including opportunities for emissions trading<br>▪ Support in the procurement and facilitation of carbon offsets<br>▪ The provision of strategic advisory services on climate change, ranging from investment decision making and project screening, through to legal implications and the development of specialised climate change strategies and policies<br>There are also various employment opportunities in the services industry related to support for energy efficiency standards and green buildings in the country, including:<br>▪ Efficiency standard implementation, monitoring and enforcement | **Professional Services** |

| Risks | | Opportunities | |
|---|---|---|---|
| | | ▪ Energy auditing, savings and management<br>▪ Commercial opportunities for professionals service providers including architects, consulting engineers, legal service providers and sustainable building specialists in the rollout of low carbon developments<br>Finally, South Africa is characterised by a considerable level of experience and expertise in climate change science and policy. This is an area that is considered to have strong potential for further advancement in South Africa, including in support of both mitigation and adaptation programmes on the African continent (DST, 2008). | |
| | | Companies in this sector have the potential to enhance reputational gains through the effective management of climate change within their organisation, and to link these efforts to wider Corporate Social Responsibility (CSR) objectives.<br>Commercial opportunities can also be realised through this approach, including through the attraction of environmentally conscious consumers and improved access to capital. Such an approach has been taken by the Nedbank Group, for example, and has resulted in the bank securing loan capital from the International Finance Corporation (IFC) and further agreements with the African Development Bank, based on the company's' climate credentials (Engineering News, 25 September 2009). | **Reputational** |

| | |
|---|---|
| **Summary:** | The Financial Services sector is at some risk from the secondary impacts of climate change, including concerns related to reporting requirements, energy efficiency targets and increased electricity prices through carbon pricing. However, the sector is fairly well advanced in climate change issues and has a number of companies voluntarily reporting to the CDP. In addition, improved efficiency measures in the commercial sector, whilst requiring an upfront cost, are likely to yield strong cost savings over the medium-term. A potentially far greater threat relates to climate change risk within company investment portfolios. Effective portfolio and project screening, and the incorporation of climate factors within risk management systems, is required to address major obstacles. |

| | |
|---|---|
| | Significant opportunities are offered in this sector to support the development of an advanced knowledge based economy in South Africa, drawing on the country's well established banking and finance industries. Areas of opportunity include carbon markets and trading, including the expected development of global sector based trading schemes, energy management, climate change science, policy and research, as well as a host of professional services. |

# 5 Key Areas for Consideration

> "Exxaro Resources is building a clean energy business on regulatory opportunities arising from reactions to climate change. These include: cogeneration projects based on waste energy recovery from industrial operations, wind energy projects based on the recently announced renewable energy feed-in tariff (REFIT), and concentrated solar energy projects based on the REFIT."
>
> - Exxaro Resources, Carbon Disclosure Project 2009

This section of the report discusses key issues to be considered in the framing of an effective national response to climate change. Issues discussed here are drawn upon in the recommendations and way forward proposed in Section 6 of this document.

## 5.1 Placing National Responses in Global Context

As Section 4 of this document demonstrates, climate change presents substantial risks and opportunities for the South African economy. The nature and scale of these impacts, whether they are occurring now or are anticipated for the future, necessitates a proactive response to climate change on the part of both the public and private sector.

Proactive engagement and management of climate change issues is desirable over and above concerns related to changes in the national regulatory landscape. For many sectors of the economy, significant threats and opportunities to business lie outside the realm of national regulatory mechanisms, in the form of global supply chains, investor relations, reputational issues and the growing demand for low carbon goods and services. All of the factors listed have gathered significant momentum irrespective of calls for domestic policy action. As such, climate change should be viewed not just as a regulatory issue, but as a commercial issue shaping pricing, market equilibriums and the competitiveness of industries and national economies.

Developing a thorough understanding of future regulatory and fiscal mechanisms in South Africa is vital for assessing the implications for industry and economic development. This matter warrants the significant attention placed on it, particularly investigations into the introduction of carbon pricing in South Africa. Nevertheless, domestic measures must be placed within an international climate context that offers the potential for new emergent global winners and losers.

National regulatory measures cannot be seen in isolation, and it is critical that South Africa's mitigation response be developed in tandem with influencing both international governmental and non-governmental action on climate change, particularly in relation to developed countries. For example, carbon taxation of energy intensive industries in South Africa could result in significant competitiveness losses for the country, and may not result in meaningful gains for the global climate, unless relative parity is retained with key competitor nations in Asia and the developed world. National regulatory action must be supported by appropriate interventions at the international scale to support a fair and coherent South African response.

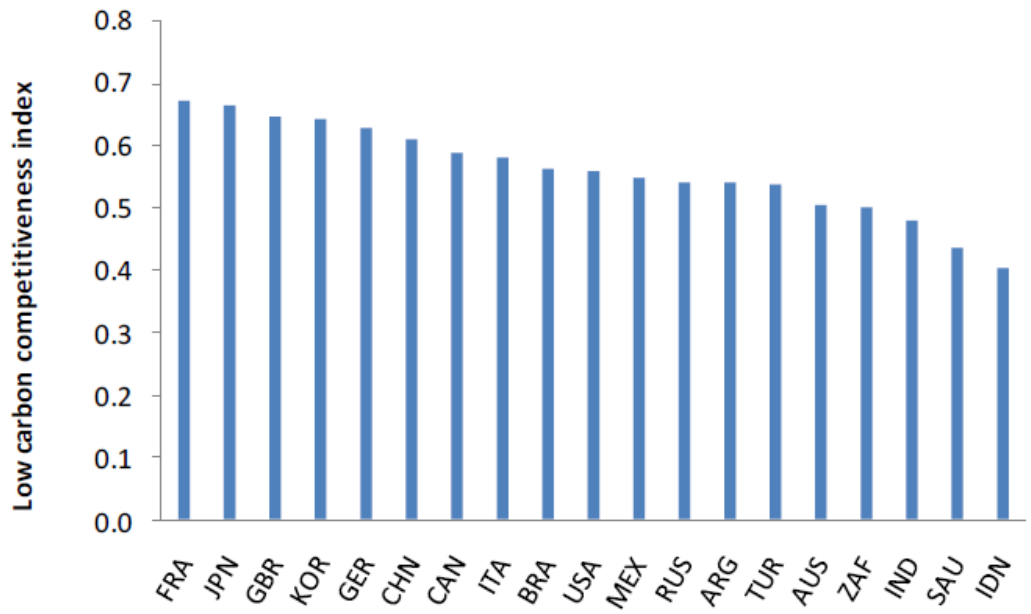
## 5.2 The Role of Business in Climate Policy

Given the interactions between national and global climate action, and the positioning of climate change as a commercial issue for industries, the role of business in mitigation efforts needs to be considered carefully.

As global mitigation measures intensify, it is reasonable to expect that the cost of carbon will be increasingly internalised within markets, with carbon intensive market players facing increasing formal or informal competitiveness constraints (Lehman Brothers, 2007b). Changes in marginal production costs for particular industries linked to regional or international climate regulation can be expected to prejudice carbon intensive companies the most, whilst these companies are also likely to be discriminated against in less formal means through supply chains, investor and finance concerns and certain reputational losses, as well as a failure to keep pace with technological innovation.

Positioned globally, South African business is currently poorly placed to address a number of these concerns, given our strong dependence on fossil fuels and high levels of energy intensity per economic output. A recent study has used the concept of 'carbon productivity', or the level of GDP produced per ton of carbon emitted, to compare the relative climate competiveness of the world's major economies. The study concludes that whilst South Africa's carbon productivity is improving, the country nevertheless ranks poorly on the global climate competitiveness index, as illustrated in Figure 7 below:

**Figure 7: The G20 Low Carbon Competitiveness Index**




Source: Climate Institute, E3G and Vivid Economics (2009)

Note: ZAF denotes South Africa

The 'most carbon intensive exports, high carbon intensity electricity and the second lowest rate of investment in physical capital' are the reasons cited for South Africa being placed 16 out of 19 countries under this index (Climate Institute and E3G, 2009 p15).

Significant effort combined with longer-term vision is thus required to improve the relative carbon competitiveness of the economy, and in the process, to decouple economic growth from emissions as countries such as Denmark, Germany and Mexico have done.

At present, nations such as South Korea, China, Russia and Argentina are all characterised by a lesser reliance on comparatively 'carbon light' service industries within their economy than South Africa (CIA, 2010). However, as shown in the figure above, these countries still rank better than South Africa in terms of GDP produced per ton of carbon emitted. Whilst certain of the G20 nations are characterised by greater tertiary sector dominance than South Africa (such as the USA, United Kingdom, France and Japan) the high carbon intensity of the South African electricity grid remains a constraining factor for climate competitiveness for all sectors of the economy, whether primary, secondary or tertiary.

Important questions are therefore raised concerning the role that business should or should not play in climate change, and in the shaping of national climate policy more broadly. A recent criticism of the climate policy emphasis in South Africa has been on the apparent imposition of climate change policy on industry, without effective consultation with the private sector (Business Day, 15 February 2010). Calls for government to engage with business, in order to take into account the private sector's views and aspirations, have been put forward.

Whilst these concerns may be warranted, it is further argued that business should play an instrumental role in developing and implementing climate policy, in a manner that goes beyond a process of engagement. Given the global nature of the climate challenge and the global nature of response measures, and given that climate change incorporates important elements related to commercial and industrial competitiveness, it is arguable that a concerted business drive on climate change, in collaboration with government, is preferable to ensure that the necessary measures and enabling environments are developed to address the country's immediate and longer-term carbon risks. In other words, business pressure on governments to support low carbon transitions may be proactively required to assist South African companies to thrive in a carbon constrained future.

As an example, major fossil fuel investments in energy infrastructure represent a long-term carbon liability that will almost certainly be passed onto consumers and industry in the event that carbon is priced into the economy. At the same time, regardless of domestic carbon pricing, a number of activities ranging from tourism to manufacturing exports could be prejudiced by increasingly carbon intensive electricity production. Associated costs for Carbon, Capture and Storage (CCS) may also need to be factored into decision making, as the country continues to make use of coal resources.

As such, it would not be surprising to see certain businesses leading the way for the decarbonisation of the national electricity grid, linked to increased scope for independent clean energy producers and the identification of commercial low carbon energy solutions. Such actions will not be based on altruistic intentions but on the management of climate change as an issue of commercial significance, to ensure that South Africa is not left in a prejudiced position in comparison to other countries. Evidence of increasing domestic sentiment in this regard can be found in a number of sources (DEAT & DST, 2009; CDP, 2009; NBI and BUSA, 2009).

Business involvement on climate change, particularly in high risk and high opportunity sectors, should thus not be left to a process of engagement. In certain cases, such as in the fruit and wine sector, direct leadership has been displayed in response to commercial drivers, well in advance of policy. This latter approach is arguably an indication of what is required in a number of industries: concerted business action on climate change, supported by all spheres of government, as part of a holistic and effective climate response.

## 5.3 The South African Emission Reduction Target

In December 2009 South Africa announced a conditional national emission reduction target whereby the country's emissions would peak by 2020-2025, plateau for a decade and then decline in absolute terms from 2035 onwards. Under such a scenario, the country's carbon dioxide equivalent ($CO_2e$) emissions would peak closer to 600 parts per million in 2025 rather than reaching 1600ppm by 2050 and rising.

The target, which is conditional on international support through finance, technology transfer and capacity building, nevertheless represents a massive challenge for the country. Achieving the target goes beyond the modelling work undertaken within the Long Term Mitigation Scenarios (LTMS), and will require fundamental shifts in the structure of the economy and makeup of the country's energy system.

In particular, the role of the energy sector will be critical in achieving the emissions path put forward by President Zuma at the Copenhagen Climate Summit. Energy supply and consumption related to direct fuel combustion, synfuel production, refineries, fugitive methane emissions in coal mining and electricity use account for 79% of all greenhouse gas emissions in South Africa (DEAT, 2009b). The work of reducing emissions in the energy sector will also need to encompass a variety of role-players including government departments, the private sector and state owned enterprises. Programmes implemented by the Departments of Energy, Environmental Affairs, Transport, Human Settlements, Trade and Industry, Science and Technology, Mineral Resources and Agriculture, Forestry and Fisheries, to name a few, as well as energy intensive industries, local municipalities and Sasol, Eskom and Transnet, will all be crucial in the achievement of significant emission reductions in the country.

In a number of areas the energy sector is relatively well prepared to address emissions: much of the policy framework including the Renewable Energy White Paper and Energy Efficiency Strategy are in place, a Renewable Energy Feed-In Tariff has been developed, and the introduction of improved public transport and refinement of the Energy Efficiency Accord are fairly well advanced. Despite this progress, areas of concern remain, including:

- The overall slow introduction of energy efficiency measures and standards in the country, including residential demand management measures such as large-scale solar water heater and ceiling insulation rollout
- The lack of immediate low carbon fuel switching options in the country. Natural gas supplies are not plentiful in South Africa and where available or imported, these are currently predominantly used within the Sasol and PetroSA gas-to-liquids programmes. Although South Africa has gas agreements in place with Namibia and Mozambique, much work and time will be required to set up agreements with other countries in Sub-Saharan Africa with plentiful gas reserves, such as Tanzania, Angola and Nigeria. A Regional Gas Pool, as a complementary body to the existing Southern African Power Pool (SAPP), is still some way off from being developed, despite the benefits of natural gas for providing a low carbon, efficient and reliable energy source
- Continued uncertainty over the future of conventional and high temperature pebble bed nuclear power generation in the country. Decisions regarding nuclear power will need to be made rapidly, as nuclear power stations can take 8 years or more to develop, and time is fairly limited for investment decision making if the targeted emissions' trajectory is to be reached. Indeed, energy related investment made in the next decade will go a long way to deciding the country's emissions profile for the next 20 to 30 years, crucial periods from a climate perspective
- A lack of public scrutiny, engagement and accountability regarding the energy and electricity planning process in the country. This matter is dealt with in more detail in Section 5.4 below

Despite the considerable challenges that are evident, the achievement of the national emission reduction target undoubtedly offers potential economic opportunities for South Africa. Firstly, such an effort can help drive the implementation of Sustainable Development Policies and Measures (SD-PAMs) in the country; in other words, those national programmes that support sustainable development, result in net economic benefits and reduce emissions.

In addition, opportunities exist to leverage international support for registered Nationally Appropriate Mitigation Actions (NAMAs). This approach to developing country mitigation has been substantially incorporated within recent climate agreement processes, including the Copenhagen Accord. It is expected that NAMAs will facilitate direct financial flows or the generation of tradable credits for developing countries, through the implementation of policy-based commitments to emission reductions. Efforts to achieve the national reduction target can thus be supported by wider financial flows, the adoption of best practices and other forms of assistance.

## 5.4 Energy Planning

As a result of the critical role of the energy sector in reducing national emissions, and given the dominance of electricity based emissions for the majority of South Africa's largest listed companies (see, for example, CDP, 2009), it is apparent that energy planning and subsequent investments will play a key role in South Africa's climate future. This role includes the overall emissions trajectory of the country, but also applies to the climate change performance of a variety of companies, a number of whom will likely face increasing pressures and incentives to address the carbon footprint of their organisation, products or service offerings.

However, at present energy planning in South Africa is fragmented between Eskom, NERSA and the Department of Energy (DoE), and has been managed without sufficient public engagement. Public engagement on energy planning is vital not only to ensure transparency and accountability in the energy planning process itself, and to attain energy security objectives, but also offers the opportunity for business, labour and other key role-players to influence the carbon trajectory of the country. Effective consultation with, and public accountability to, civil society and other constituents in energy planning is an important part of ensuring dialogue and debate within the democratic process, as key decisions affecting the profitability and carbon related liabilities of companies, and the livelihoods of ordinary citizens, are enacted, and in many cases, entrenched for decades to come in the form of long-lived investments.

Recent legislative developments requiring that an Integrated Resource Plan (IRP) for electricity be published and made available for public review and scrutiny offers some encouragement in this regard. Also encouraging are announcements made by President Zuma that an Independent System Operator is to be established in the country (The Presidency, 11 February 2010). Aside from providing overall direction for the operation of the national power system, the Independent System Operator has an important planning function in the development of subsequent IRPs, and plays a key role in the procurement of power under current regulations, including new generation from Independent Power Producers (IPPs)[7]. Whilst the first IRP, published on the 31st of December 2009, provides only a short and unqualified synopsis of current electricity planning, plans to prepare a revised IRP2 from January 2010 could support the development of this document as a useful planning aid and guide for developers, investors and companies alike.

[7] *See the Electricity Regulation Act, No. 4 of 2006: Electricity Regulations on New Generation Capacity (Notice 721 of 2009) published by the Department of Energy on 5 August 2009.*

However, ultimately what is required is both an Integrated Energy Plan (that addresses all energy sources including liquid fuels) and an Integrated Resource Plan (a plan focusing on electricity only) that incorporate agreed upon climate change goals, in a manner appropriate with a consultative policy process on issues of national importance. Such an approach will ensure that carbon constraints on commerce and industry, whether formal or informal, can be accounted for and addressed within an effective, transparent and accountable energy planning process.

## 5.5 National Risks of Inaction and Benefits of Action

As climate change brings new risks for the national economy that need to be identified and managed, so further risks of inaction for South Africa become apparent. Important in this regard are the economic and commercial risks of 'business as usual'. The costs associated with business as usual growth, certain elements of which are discussed in the table below, have largely not been examined to the extent to which mitigation actions have been evaluated. This context creates a somewhat superficial comparison between a business as usual scenario on the one hand, and a mitigation scenario on the other.

Thus, whilst the transaction costs associated with the implementation of a low carbon transition for the economy do need to be considered carefully, so there are risks and costs associated with a failure to embark on low carbon development.

The table below outlines a number of the key risks of climate inaction, and corresponding benefits of action, for the South African economy, highlighting some of the risks associated with business as usual, as well as additional benefits of low carbon growth:

**Table 6: Risks of Inaction and Benefits of Action on Climate Change**

| Risks of Climate Inaction | | Benefits of Climate Action | |
|---|---|---|---|
| **Strong exposure to high fuel and energy costs** | ▪ Continued low levels of energy efficiency, coupled with insufficient public transport and heavy reliance on road based freight, places South Africa at considerable risk from rising electricity and fuel prices<br>▪ The International Energy Agency (IEA) predicts that oil will reach $100 a barrel by 2020 and $115 by 2030 as a result of rising demand in Asia and the developed world, despite the effects of the global economic downturn (IEA, 2009)<br>▪ Rising oil prices stabilising at levels approaching $100 a barrel in the medium-term | **Improved vehicle efficiencies and effective public transport** | ▪ Strong social benefits, improved air quality and tourist access, and reduced economic losses from traffic congestion through effective public transport development<br>▪ Emphasis on vehicle efficiency and public transportation reducing oil import requirements, with significant benefits for the national balance of payments. At present, oil remains South Africa's single largest import |

| Risks of Climate Inaction | | Benefits of Climate Action | |
|---|---|---|---|
| | could have significant negative impacts on GDP, considerably in excess of estimated mitigation costs for the economy (DEAT, 2007d). Balance of payments negatively impacted by increased oil import requirements<br>▪ Heightened electricity prices from carbon pricing in conventional power generation could outweigh costs of implementing low carbon energy options, unless certain industries are exempt<br>▪ Building stock remains inefficient and vulnerable to energy price hikes | | |
| **Continued exposure to trade, tourism and supply chain related barriers** | ▪ Continued exposure of South African exports to various global supply chain initiatives, and potential border tax adjustments, as well as reduced tourism competitiveness from long haul flights, climate regulation in aviation and carbon intensive domestic transportation and accommodation | **Trade, tourism and supply chain benefits** | ▪ Introduction of climate mitigation efforts and reduced carbon content in exported goods helping to retain market share, whilst encouraging commercial opportunities within the growing ecotourism and experiential (e.g. heritage and culture) travel market<br>▪ Support for foreign and national investment to exploit South Africa's considerable renewable energy resource potential |
| **Entrench-ment of carbon intensive assets** | ▪ Maintenance of outdated technology and failure to attract low carbon technologies, services and manufacturing<br>▪ Continued carbon price risk for long-lived fossil fuel capital assets<br>▪ Climate sensitive or energy intensive | **Enhanced efficiencies in support of socio-economic development and competitive-ness** | ▪ Enhanced industrial energy efficiency improving production processes and reducing energy price risks, whilst supporting export goods in carbon sensitive markets<br>▪ Improvements in efficiencies of residential housing reducing |

| Risks of Climate Inaction | | Benefits of Climate Action | |
|---|---|---|---|
| | industries unable to source clean energy supplies and inputs as required to mitigate supply chain, investor, regulatory or reputational pressures | | consumer impacts of electricity prices whilst supporting improved indoor air quality and safety for poor households |
| **Concerns for international relations and company reputational losses** | ▪ Relative losses in national prestige, failure to access international funding support for mitigation actions and potentially damaging company branding impacts<br>▪ Ability to influence global climate change decision making to ensure parity with competitor countries limited by lack of mitigation involvement | **Development of green jobs** | ▪ Opportunities for labour intensive employment generation in renewable energy, energy efficiency, organic farming, biofuels and fire control, in sectors presently characterised by increased capital investment and declining employment levels<br>▪ Opportunities to expand the strong existing finance and services components of the national economy in the delivery of carbon management tools, carbon markets and employment in climate related service industries<br>▪ Wider support for the movement towards a knowledge based economy in support of national economic advancement (DST, 2008) |
| | | **Improved access to finance, technology and international climate negotiations** | ▪ Opportunities to benefit from international financial flows and technology transfer in support of developing country mitigation efforts<br>▪ Increased ability to influence climate change policy and decision making at the global scale, including securing competitiveness for key industries and within key markets |

# 6 Envisaging a Way Forward for South Africa

> "Our vision for South Africa in 2018 includes: a diversified, supply secured sustainable energy sector; achieving a 25-percent share of the global hydrogen and fuel cell catalysts market with novel platinum group metal (PGM) catalysts; and being a world leader in climate science and the response to climate change."
>
> - Department of Science and Technology. (2008) *Ten Year Plan for Science and Technology*

Climate change is resulting in changes in national, regional and international regulatory landscapes, influencing supply chains, shifting consumer preferences and providing a variety of new commercial opportunities. Navigating these complexities and ensuring a resilient and strengthened economy requires collaborative work on the part of business, government, labour, non-governmental organisations (NGOs) and the research community.

This section of the report attempts to highlight a number of key elements that could form part of a wider national mitigation response to climate change, with the intention of avoiding potential pitfalls and realising tangible economic benefit. The themes touched on are by no means exhaustive, but consider pertinent components of a proposed way forward.

## 6.1 Addressing Key Economic Risks

Left unaddressed, risks to the South African economy from climate change can be expected to intensify, with an increasing level of international action by governments and non-governmental actors influencing and affecting South African industries. Key risks drawn out from this study that need to be addressed are outlined in the table below:

**Table 7: Addressing Key Economic Risks**

| Sector | Risk Type | Potential Response Measures |
|---|---|---|
| **Agriculture, Forestry & Fisheries / Manufacturing (Food & Beverages)** | - Supply chain: food miles | ▪ Highlight the requirement for a sustainable development approach to food miles that recognises the important socio-economic benefits of agriculture for Africa, even as these countries attempt to cope with detrimental physical impacts from climate change. Awareness raising and support from retailers, industry associations and consumers in key export markets is required<br>▪ Conduct product life cycle assessments of key items in comparison with international competitors to provide true comparison of emissions<br>▪ Support cross sector partnerships between food and beverage producers, packaging manufacturers and logistics to reduce emissions across the value chain<br>▪ Highlight the food and other air miles associated with goods imported into South Africa i.e. the export |

| Sector | Risk Type | Potential Response Measures |
|---|---|---|
| | | carbon miles associated with goods from Europe |
| **Mining & Quarrying** | - Carbon pricing<br>- Sector emission caps | ▪ Ensure parity on climate change matters, particularly pricing mechanisms, with key competitor countries such as Canada, the USA, Russia and Australia at a minimum, as part of ongoing climate negotiations<br>▪ Support substantial energy efficiency programmes in mining and diversify national energy mix to reduce climate change liabilities |
| **Manufacturing (Petroleum Products)** | - Carbon pricing<br>- Sector emission caps<br>- Investor risk | ▪ Carbon pricing risk for coal-to-liquids and gas-to-liquids programmes to be addressed through possible exploration into other technologies including hydrogen power, renewable energy, combined cycle gas turbines (CCGT) and integrated gasification combined cycle (IGCC) linked to CCS<br>▪ Incorporation of carbon pricing at micro level within project feasibility assessment and investment decision making<br>▪ Emphasis on synfuels production for pilot CCS programmes |
| **Manufacturing (Chemicals)** | - Carbon pricing<br>- Sector emission caps | ▪ Reduction in carbon pricing risk through promotion of energy efficiency and through ensuring sector based equivalence with competitor nations, as part of ongoing climate negotiations<br>▪ Diversification of national electricity mix to reduce carbon liabilities |
| **Manufacturing (Non-Metals: Glass and Cement)** | - Carbon pricing<br>- Sector emission caps<br>- Supply chain | ▪ Management of potential sector based emission caps or intensity targets for cement through ensuring parity with competitor nations<br>▪ Monitor any attempts to introduce a Border Tax Adjustment, particularly in the EU<br>▪ Reduction in carbon pricing risk through promotion of efficiency measures and reduced clinker content in cement<br>▪ Improved energy efficiency, cullet recycling and bottle light weighting in glass manufacture<br>▪ Diversification of national electricity mix to reduce carbon liabilities |
| **Manufacturing (Metals: Iron and Steel, Aluminium)** | - Carbon pricing<br>- Sector emission caps | ▪ Reduction in carbon pricing risk through the promotion of efficiency measures<br>▪ Management of potential sector based emission caps or intensity targets for iron and steel production through effective engagement with competitor nations |

| Sector | Risk Type | Potential Response Measures |
|---|---|---|
| | | ▪ Monitor any attempts to introduce a Border Tax Adjustment, particularly in the EU<br>▪ Implement the use of recycled aluminium where possible, and promote the use of aluminium as an important material in vehicle efficiency design<br>▪ Promote valued added industries such as in the production of aluminium based products |
| **Utilities (Electricity)** | - Carbon pricing<br>- Investor risk<br>- Sector emission caps | ▪ Strong risk of sector based emission reduction targets and heightened operational costs through carbon taxation to be addressed through investment diversification, securing international financial support for clean energy technologies, power generation efficiency measures and reduced peak electricity demand through demand side management<br>▪ Significant investment cost savings can be achieved through technologies such as solar water heaters and efficient appliances in driving down peak electricity demands, thereby reducing overall system requirements and power station capacity needs |
| **Construction** | - Regulatory risk through enhanced efficiency standards<br>- Carbon pricing | ▪ Monitor regulatory developments and investigate best practices in managing sustainable or green building code compliance<br>▪ Support enhanced efficiency measures, particularly in new building stock, in order to reduce energy consumption requirements<br>▪ Address the thermal efficiency requirement in residential housing to mitigate heightened peak demand requirement derived from increased household connections and residential energy use |
| **Trade, Catering and Accommodation Services (Tourism and Hospitality)** | - Trade and market access<br>- Promotion of local tourism in European and North American markets<br>- Increased fuel costs impacting long haul flights and business travel<br>- EU Directive on Aviation | ▪ Highlight the requirement for a sustainable development approach to tourism that recognises the industry's important socio-economic benefits for Africa, drawing on the principles of the Davos Declaration and World Tourism Organization (UNWTO) Resolution on Tourism and Climate Change<br>▪ Promote public transport and non-motorised transport, as well as dedicated rail network links between major airports and cities, as part of the delivery of low carbon tourism efforts<br>▪ Support cross sector partnerships between aviation, industry associations and tourism marketing, as well as hotel and accommodation services, to support and promote emission reduction activities |

| Sector | Risk Type | Potential Response Measures |
|---|---|---|
| | | ▪ Conduct a life cycle analysis of key tourism destinations and itineraries, identifying areas of strong GHG reduction potential<br>▪ Offer high sustainability local carbon offsets to tourists as part of existing and future travel packages<br>▪ Address other tourism related concerns such as safety and security and improved human resource capacity to promote wider competitiveness |
| **Transport, Storage and Communication**<br>**(Road Based Freight, Aviation & Shipping)** | - Carbon pricing<br>- Sector based emission caps in maritime sector<br>- EU Directive on Aviation | ▪ Introduce measures to enhance vehicle, aeroplane and shipping fuel efficiency, including fuel economy standards for light vehicles<br>▪ Support a global agreement on shipping emissions as and when this comes into place, rather than a variety of regional agreements with different compliance criteria<br>▪ Provide enhanced logistics planning, intelligent traffic management and effective public transport in support of wider freight based efficiency |
| **Financial, Insurance, Real Estate and Business Services** | - Carbon pricing<br>- Investor risk | ▪ Significant potential risk for investors is associated with carbon intensive infrastructure in the context of a national carbon pricing regime or sector based targets for large emitters<br>▪ Integrate climate change considerations into risk management systems, including project financial and risk evaluation methods |

As the table above demonstrates, in a number of instances it is possible to turn climate related risks into potential opportunities and market differentiators. Such an approach will require proactive measures to identify and develop effective solutions, and may require cross-sectoral collaboration to achieve significant results.

## 6.2 Exploiting Key Economic Opportunities

It is important that South Africa look to exploit key economic opportunities brought about by climate change. The value of these initiatives will be increasingly realised as both national and international pressure to address emissions increases, and as the climate externality is increasingly incorporated within market forces. Key areas of economic opportunity drawn out from this study are outlined in the table below:

**Table 8: Exploiting Key Economic Opportunities**

| Sector | Opportunity Type | Potential Response Measures |
|---|---|---|
| **Agriculture, Forestry & Fisheries** | - Fire control<br>- Organic farming<br>- Biofuels<br>- Biomass power generation<br>- Land based carbon offsets<br>- Manure management | ▪ Promotion of labour intensive agricultural practices in support of fire control, organic farming, biofuels and land based carbon offsets, including through the EPWP<br>▪ Support for biomass based power generation, including from agricultural residues, via the Renewable Energy Feed-In Tariff process<br>▪ Investigate the development of a Regional Biofuels Strategy for the Southern African Development Community (SADC) region to support biofuel investment opportunities in Sub-Saharan Africa<br>▪ Development of biogas digesters and organic manure fertilisers in poultry, cattle and pig farming where viable |
| **Mining & Quarrying** | - Platinum<br>- Copper<br>- Uranium | ▪ Promote the use of platinum as a catalyst in fuel cells and consider establishing hydrogen power technologies for domestic and export markets<br>▪ Promote the use of domestic uranium and copper supplies where appropriate in energy efficiency applications and power generation |
| **Manufacturing (Electrical Machinery & Apparatus)** | - Energy efficiency | ▪ Identify industry energy efficiency requirements and establish local manufacture of equipment where desirable<br>▪ Support import tariff liberalisation of energy efficient products for which local manufacture is deemed undesirable or unfeasible<br>▪ Promote local manufacture of clean energy technologies for national and regional application, including as part of government procurement efforts |
| **Manufacturing (Transport Equipment)** | - Rail and public transport equipment<br>- Electric vehicles | ▪ Enhance domestic manufacturing capacity in rail and bus technologies<br>▪ Support current investment and export opportunities for electric vehicle entrepreneurs, such as the current Joule electric car developed in |

| Sector | Opportunity Type | Potential Response Measures |
|---|---|---|
| | | South Africa |
| **Utilities**<br>**(Electricity, Gas and Water)** | - Grid connected renewable energy<br>- Energy efficiency<br>- Attraction of new clean energy finance & investment | ▪ Access international financial support for the subsidy period required under the REFIT before cost equivalence is achieved with conventional technologies<br>▪ Reassess caps on renewable energy resources within electricity planning based on potential international financing support measures<br>▪ Support labour intensive renewable energy generation in the traditional electricity sector which is currently characterised by declining employment levels<br>▪ Promote private sector electricity market participation including through securing Power Purchase Agreements in accordance with electricity regulations<br>▪ Develop a long-term Renewable Energy Strategy and target, with consideration to areas of potential comparative advantage, desired support areas and long-term grid planning<br>▪ Support for local renewable energy manufacture and maintenance, including for concentrating solar power, wind and solar photovoltaic (PV) systems such as thin-film solar PV<br>▪ Identify new areas of clean energy investment<br>▪ Provide an enabling environment for investment on the part of multilateral lenders, venture capital, private equity and others, via ensuring the ability to sell electricity to the national and municipal grids at a market determined price<br>▪ Ensure an Independent System Operator and Single Buyer Office<br>▪ Consider the introduction of an energy efficiency trading scheme, linked to the global carbon market, to support cost effective efficiency measures in industry, including through the proposed Power Conservation Programme (PCP)<br>▪ Provide adequate finance and authority to an independent body tasked with implementing energy efficiency across all levels of society<br>▪ Emphasise the reduction of residential peak demand in managing overall power system investment requirements<br>▪ Through the Working for Energy programme provide support for various energy efficiency and renewable energy technologies |

| Sector | Opportunity Type | Potential Response Measures |
|---|---|---|
| **Construction** | - Solar water heaters<br>- Insulated ceilings | ▪ Promote local solar water heater and insulated ceiling manufacture through Small, Medium and Micro Enterprise (SMME) support programmes, tax rebates and business support information<br>▪ Co-ordinate energy efficiency measures through an independent and sufficiently resourced energy efficiency agency linked to business support centres, industry associations and tax rebates |
| **Financial, Insurance, Real Estate and Business Services** | - Climate change related service provision<br>- Carbon markets and trading<br>- Energy efficiency support measures & services<br>- Teleconferencing and green IT<br>- Clean energy finance & investment project capital | ▪ Establish a Business Climate Change Support unit within existing industry channels, through which climate expertise, resources and tools can be shared<br>▪ Establish appropriate sector based emission reduction strategies and plans to mitigate against national, regional and international climate related risks<br>▪ Identify areas of potential commercial opportunity in teleconferencing facilities, green IT and clean energy investment<br>▪ Provide SMME support and training to start up energy management companies<br>▪ Maintain a national clean energy Research and Development (R&D) hub to target specific technologies for long-term research, support and deployment<br>▪ Integrate low carbon planning within urban design including through support for non-motorised transport, densification, mixed land use and public transport<br>▪ Develop South Africa's climate change research, policy and response expertise<br>▪ Provide support for mitigation and adaptation policy, response measures and implementation within the SADC region<br>▪ Integrate domestic clean technology opportunities within the Industrial Policy Action Plan (IPAP) |

An analysis of key mitigation measures in the energy sector provides an instructive example of opportunities to support job creation, energy security and economic growth in the country. Recent modelling of key interventions in this sector with a strong sustainable development benefit, ranging from improved vehicle efficiency, enhanced public transport and commercial energy efficiency, through to the increased use of natural gas and renewable energy, confirms the wider economic potential of low carbon energy solutions in South Africa. Under a Sustainable Development Policies and Measures (SD-PAMs) approach to addressing emissions in the energy sector, cumulative GHG savings of 2 863Mt $CO_2e$ are achieved

between 2001 and 2030, derived at a net cost saving over the period of R4 754 per ton of $CO_2e$ abated (ERC, 2008). This is a significant economic saving per ton of carbon abated.

Such commercial opportunities need also to be placed in the context of declining employment levels in the traditional electricity sector as a result of increasing capital intensity. Between 1985 and 2005, the South African electricity generation sector shed approximately 40 000 jobs, despite a considerable increase in power capacity during this period (Quantec Standardised Industry Database, 2009). The current potential for employment creation in renewable energy in comparison to conventional technologies is marked, as UNEP report:

> "About 2.3 million people have in recent years found new jobs in the renewable energy sector, even though these provide only 2 per cent of global primary energy. In comparison, total employment of the oil and gas, and oil refining industries in 1999 was just over 2 million jobs" (UNEP, 2009 p19).

Emphasis on promoting a local renewable energy industry has prompted calls for South Africa to set a target of 15% renewable energy supply by 2020, based on the potential for job creation and economic advancement. This includes increasing calls for the development of renewables from the private sector (see NBI, 2009).

## 6.3 Business Involvement on Climate Change

Business in South Africa has begun to respond to this global challenge, and in various areas, has led the way in delivering commercial solutions to climate change. The recent formation of climate working groups, facilitated by the National Business Initiative (NBI), provides further positive signs in this regard.

Private sector dialogue on climate issues, including how best to address key concerns and incorporate the role of business, is essential to ensure that efficient and effective mechanisms are put in place as both domestic and international climate rules are laid out. Failure to identify and address emerging threats and enablers could prejudice a number of South African businesses.

The private sector has a key role to play in the finalisation of the National Climate Change Response Policy by the end of 2010. However, in addition to supporting existing policy development procedures, it is suggested that effective business action on climate change requires a number of complementary measures, including:

- **The establishment of a national Business Support Unit on climate change,** through which climate expertise can be channelled to business in support of technical and strategic planning. This entity should be effectively embedded within an existing industry association, such as the NBI or Business Unity South Africa (BUSA)

  The provision of a climate support unit linked to existing initiatives, such as the Energy Efficiency Accord, and the ability to highlight commercial opportunities through carbon finance and tax rebates, offers the potential to pool knowledge and resources whilst catalysing climate efforts. Linkages with additional activities, such as the BUSA and Department of Trade and Industry (dti) climate change forum, can also be provided through this entity

- **The movement of climate change onto the company executive level.** Chief Executive Officers and the Executive Boards of companies are crucial in determining a company's positioning in a low carbon future. The role of executives in this regard includes:

  - Developing a strategic understanding of climate change issues and the implications for their industry

- The ability to take a longer-term (five year plus) view when making investment decisions that have a carbon or climate change component
- Providing leadership and drive to secure the change necessary to prepare the business for a low carbon economy

- **Regular and formalised communication channels between business, government, labour and civil society on climate change.** Under the auspices of the National Committee on Climate Change (NCCC), or other suitable body, engagement by key societal role-players is essential for ensuring that national climate decisions are consultative and supported at the international level

Taken together, the above measures can support business preparedness for climate change and assist companies to thrive in carbon constrained environments.

## 6.4 National Policy Direction

South Africa is currently preparing the policy environment in which climate change is to be addressed in the country. The development of a Climate Change Response Policy is underway, underpinned by the national emission reduction target, and National Treasury has been extensively involved in evaluating the use of carbon pricing in the economy. This policy development process raises important issues for consideration, including:

- **The need for a consistent policy direction.** A clear policy direction is required on climate change that is consistent across key government departments. Of key concern is the integration of climate change objectives within energy and transport planning, Research and Development (R&D), as well as industrial policy. A clear and transparent regulatory environment also supports a stable investment climate, a key requirement if South Africa is to invest heavily in low carbon assets
- **The phasing-in of climate regulations.** The Department of Environmental Affairs (DEA) has for a number of years made clear its intention to introduce the mandatory reporting of emissions in South Africa, followed by the introduction of a suite of regulatory and fiscal measures. The provision of adequate lead times on new regulations for business is an important means for promoting buy-in, reducing transaction costs and supporting commercial solutions. In addition, promoting results based targets, and providing the private sector with flexibility in abatement choices, supports innovation and reduces compliance costs
- **Short-term planning is required to match our long-term vision.** Whilst exploiting quick wins is instrumental to South Africa's mitigation approach, much decision making and planning is required in the short-term to ensure that longer-term emission objectives are achievable. The framework for South Africa's long-term carbon future is likely to be laid in the next decade or so
- **Support for wider industry competitiveness.** Measures must also be considered to ease the financial or other burden on companies. This includes the use of complementary policies to enhance industrial competitiveness in other areas, supporting revenue neutral environmental taxation as far as possible, and ensuring that national measures are complemented by mitigating risks at the global scale, whilst ensuring a fair global climate deal for South Africa. Effective business support on climate change, whereby key issues, related to regulation, financial opportunities and commercial risks, can be identified and addressed, and linked to existing support measures, forms an additional component. Significant business support is required if the national emission reduction target is to be achieved, and indeed, if South Africa is to address the multitude of risks and opportunities brought about by global mitigation response measures

A comprehensive roadmap for climate change in South Africa, backed by integrated planning and flexibility in the development of commercial solutions, offers a number of opportunities for the private sector to address climate related issues.

## 6.5 Funding and Technology Transfer

South Africa has potential to benefit from international funding allocations and technology transfer in support of low carbon development. The work of the Clinton Climate Foundation and the World Bank's Clean Technology Fund (CTF) provide examples of current financial assistance, and in the case of the CTF, the granting of sizeable soft loans to aid mitigation efforts in South Africa.

Although the details on available international funding are still to be clarified, significant allocations for low carbon solutions committed to by Japan, the United States and EU within the Copenhagen Accord, highlight additional areas of funding to be allocated to developing countries, a portion of which could be directed to mitigation actions in South Africa. A variety of bilateral arrangements between individual nation states and sectoral agreements may also be entered into in support of agreed upon outcomes.

Technology transfer offers opportunities for industry partnerships and joint ventures between developed and developing countries, as well as reduced licensing costs for new technologies and the transfer of skills and experience. Stumbling blocks may be experienced in certain areas, such as in relation to intellectual property rights, but support for technology transfer remains a key tenet of international climate change agreements.

South Africa's announcement of a national emission target conditional on finance, technology transfer and capacity building makes clear the country's intention to engage in comprehensive mitigation actions provided that effective international assistance is realised. A number of technologies that could benefit from financial and technological support, linked to capacity building and support for long-term socio-economic objectives are listed below:

**Table 9: Technological and Financial Assistance in Support of Mitigation**

| Forms of Support | Sector | Mitigation Action |
|---|---|---|
| **Technology transfer and/or financial flows through:**<br>▪ **Internationally registered NAMAs**<br>▪ **Bilateral agreements**<br>▪ **Sectoral agreements** | **Utilities**<br>**(Gas, Electricity)** | ▪ Solar power, including Concentrating Solar Power (CSP), Solar PV and Solar Water Heaters<br>▪ Clean coal technologies, including Integrated Gasification Combined Cycle (IGCC), supercritical and ultra-supercritical power generation and Carbon Capture and Storage<br>▪ Wind power<br>▪ Energy efficiency technologies including boiler efficiency improvement, smart meters and monitoring tools<br>▪ Policy instruments including energy efficiency targets and the Renewable Energy Feed-In Tariff (REFIT)<br>▪ Combined Cycle Gas Turbines (CCGTs) |

| Forms of Support | Sector | Mitigation Action |
|---|---|---|
| | | ▪ Waste management including recycling methods and biogas utilisation |
| | **Manufacturing (Petroleum Products)** | ▪ Hydrogen energy and fuel cell technologies, including within syngas production<br>▪ Carbon Capture and Storage |
| | **Agriculture, Forestry and Fishing** | ▪ Conservation agriculture including reduced tillage and precision farming<br>▪ Fire control<br>▪ Enteric fermentation |
| | **Mining & Quarrying** | ▪ Coal Bed Methane (CBM): extraction and use |
| | **Transport, Storage and Communication** | ▪ Urban mass transport systems<br>▪ Traffic management systems<br>▪ Fuel efficiency improvements<br>▪ Electric vehicles |
| | **Financial, Insurance, Real Estate and Business Services** | ▪ Carbon pricing<br>▪ National emission inventories and reporting |

Source: Own analysis, DST (2007) and Imbewu (2009)

## 6.6 Sector Support Mechanisms

A number of key sectors in South Africa, including Agriculture, Mining, Manufacturing, Electricity, Construction, Trade and Financial Services could be substantially impacted by climate change. Increasing governmental and non-governmental action on climate change, including the progression of domestic climate policy, calls for increasing sector based responses.

Such an approach is particularly pertinent given the increasing emphasis on sector based action in developed countries. It is critical that South Africa develop a thorough understanding of proposed sector based mechanisms or 'new mechanisms', to ensure that the implementation of any such programmes provides a fair and robust approach to emission reductions, and provides opportunities for the country to share in sector-based carbon markets. Whilst sectoral approaches did not receive much attention at the Copenhagen Conference of the Parties (COP), it is expected that this issue will come into greater focus in future years, necessitating that South Africa is fully aware of the potential risks and benefits that are on offer.

Regardless of current international approaches, the announcement of the national emission reduction target, commensurate on an effective global climate deal being established, outlines the significant mitigation task for many sectors in South Africa. Establishing sectoral emission reduction strategies and action plans, linked to both national policy and global debates on the

use of sector based mechanisms, is of paramount importance in the effective management of climate concerns.

Sector-based mitigation plans, focused on both high risk and high opportunity sectors and co-ordinated through relevant government departments, forums and industry associations, is consider the third critical element in a comprehensive national mitigation response, linked to both effective business engagement on climate change, and the establishment of a clear and consistent policy framework in South Africa.

Finally, it is also the case that a variety of cross sectoral partnerships will be required. For example, reducing emissions in the tourism industry will require partnership between aviation groups, hospitality services, transportation providers, tour operators and tourism marketing centres. The identification of requisite partnerships should from part of comprehensive sector climate change strategies and plans.

# 7 Conclusion

> "Our customers have made it clear that providing solutions to environmental challenges like climate change is essential to society's well-being, and a clear growth opportunity for General Electric. Companies with the technology and vision to provide products and services that address climate and other pressing issues will enjoy a competitive advantage."
>
> - Jeffrey Immelt, GE chairman and CEO

Climate change has moved from an issue of largely environmental concern to an issue of commercial significance in the period of a few decades. The potential impacts of climate change on economies, industries and companies, both positive and negative, are now far-ranging in their scope. In addition, the challenge of addressing climate change has only just begun, with local and global mitigation responses expected to amplify and extend their reach as the decades progress.

Efforts to maintain short and medium-term growth can no longer ignore the implications of climate change for business and the economy more broadly. Many of the commercial implications of climate change are already being experienced in developing countries such as South Africa, driving private sector innovation but also creating new areas of economic vulnerability.

The risks of inaction on climate change could be significant for South Africa, impacting on the competitiveness and resilience of the national economy. At the same time, a number of climate liabilities have the ability to be reoriented into opportunities to enhance competitiveness, access external support and deliver new products and services into markets.

The secondary impacts of climate change affect each sector of the economy differently, with most sectors displaying a range of threats and potential benefits. A number of pro-climate initiatives are also of significant value in the promotion of sustainable development in South Africa. This includes through substantial job creation, poverty alleviation, energy security and economic growth benefits in the Agriculture, Manufacturing, Construction, Electricity and various Services sectors.

Areas of significant opportunity for the encouragement of domestic manufacturing content can be found in the promotion of energy efficient equipment and machinery, the development of renewable energy technologies, as well as public transport infrastructure and equipment. Areas of significant opportunity for labour intensive growth, including in support of jobs for unskilled and semi-skilled workers, can be found in organic produce, organic cotton production, managed biofuel development, enhanced fire control, the promotion of energy efficient buildings, the construction of public transport and renewable energy infrastructure, renewable energy manufacture, as well as recycling programmes. There are also substantial economic opportunities for high skill and high wage employment in the tertiary sector through the development of carbon markets and a host of professional services.

There is clearly no panacea to the management of climate change issues in South Africa. This document supports heightened business leadership on climate change, in recognition of the commercial implications of climate change for a range of industry activities, and the nation's relatively poor climate competitiveness at present. Such business leadership is to be matched by an effective and enabling policy environment for mitigation actions in South Africa, supporting the reduction of carbon liabilities in the economy whilst enhancing opportunities for low carbon growth.

Short-term dialogue and planning on climate change issues is essential in order to evaluate the country's mitigation options, maintain national competitiveness and advance opportunities presented by international climate support measures. Effective engagement in the multilateral climate negotiations process is also essential to ensuring that globally agreed climate outcomes, implementation mechanisms and support structures offer a fair and balanced agreement for advanced developing countries such as South Africa.

The conditional national emission reduction target put forward by South Africa makes clear the requirement that an effective climate agreement be established, which offers significant emission reduction commitments from the developed world, and which provides adequate global support to developing countries, including for specific mitigation actions. In the absence of such an agreement and wider mitigation environment, South Africa could be considerably prejudiced in relation to key competitor nations and face imbalanced threats to business based on protectionist policies in developed countries.

Nevertheless, as emphasised throughout this document, climate change is not just a matter of domestic regulation or global agreements. Climate change also operates as an increasingly influential force within multilateral lenders, banks, investment houses, industry association work, retailer action and the choices of ordinary citizens. Irrespective of national or global commitments to mitigation efforts, key elements of the climate challenge will remain, and key opportunities will be open to the country.

The development of sector based mitigation plans that manage risk, exploit opportunity and establish cross sectoral partnerships where required, will need to consider both regulatory and non-regulatory challenges from climate change, as key sectors of the economy seek to thrive in a carbon constrained world.

Proactive responses across the private and public sector are required to effectively address climate change in South Africa. Successful management of this global challenge will require short-term pragmatism and longer-term planning, linking business, government, labour, NGOs and the research community in support of low carbon growth.

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# List of Acronyms

| | |
|---|---|
| **BRT** | Bus Rapid Transit |
| **BTA** | Border Tax Adjustment |
| **BUSA** | Business Unity South Africa |
| **CBM** | Coal Bed Methane |
| **CC** | Climate Change |
| **CCGT** | Combined Cycle Gas Turbine |
| **CDM** | Clean Development Mechanism |
| **CDP** | Carbon Disclosure Project |
| **CFL** | Compact Fluorescent Lamp |
| **$CO_2$** | Carbon Dioxide |
| **$CO_2e$** | Carbon Dioxide Equivalent |
| **COP** | Conference of the Parties |
| **CTF** | Clean Technology Fund |
| **CTL** | Coal-to-Liquids |
| **DEA** | Department of Environmental Affairs |
| **DEAT** | Department of Environmental Affairs and Tourism (now DEA) |
| **DME** | Department of Minerals and Energy (now DoE) |
| **DoE** | Department of Energy |
| **DoT** | Department of Transport |
| **DST** | Department of Science and Technology |
| **DTI** | Department of Trade and Industry |
| **EE** | Energy Efficiency |
| **EPWP** | Expanded Public Works Programme |
| **ERA** | Electricity Regulation Act |
| **ETS** | Emissions Trading Scheme |
| **EU** | European Union |
| **EU-ETS** | European Union Emissions Trading Scheme |
| **GATT** | General Agreement on Tariffs and Trade |
| **GDP** | Gross Domestic Product |
| **GHG** | Greenhouse Gas |
| **GW** | Gigawatt |
| **GWh** | Gigawatt Hour |

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| **ICMM** | International Council on Mining and Metals |
| **IEP** | Integrated Energy Plan |
| **IGCC** | Integrated Gasification Combined Cycle |
| **IMO** | International Maritime Organization |
| **IPP** | Independent Power Producer |
| **IRP** | Integrated Resource Plan |
| **ICT** | Information and Communication Technology |
| **IT** | Information Technology |
| **KWh** | Kilowatt Hour |
| **LDC** | Least Developed Country |
| **LTMS** | Long Term Mitigation Scenarios |
| **LULUCF** | Land Use, Land Use Change and Forestry |
| **MRV** | Monitoring, Reporting and Verification |
| **Mt** | Million tons |
| **MW** | Megawatt |
| **MWh** | Megawatt hour |
| **NAMA** | Nationally Appropriate Mitigation Action |
| **NBI** | National Business Initiative |
| **NCCC** | National Committee on Climate Change |
| **NERSA** | National Energy Regulator of South Africa |
| **NGO** | Non-Governmental Organisation |
| **NMT** | Non-motorised Transport |
| **OECD** | Organisation for Economic Cooperation and Development |
| **PCP** | Power Conservation Programme |
| **PPA** | Power Purchase Agreement |
| **PV** | Photovoltaic |
| **R&D** | Research and Development |
| **RE** | Renewable Energy |
| **REDD** | Reducing Emissions from Deforestation and Degradation |
| **REFIT** | Renewable Energy Feed-In Tariff |
| **SAA** | South African Airways |
| **SADC** | Southern African Development Community |
| **SAPP** | Southern African Power Pool |
| **SD-PAMS** | Sustainable Development Policies and Measures |

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| **SIDS** | Small Island Developing States |
| **SMME** | Small, Medium and Micro Enterprise |
| **t** | Ton |
| **$tCO_2$** | Ton of carbon dioxide |
| **$tCO_2e$** | Ton of carbon dioxide equivalent |
| **UNFCCC** | United Nations Framework Convention on Climate Change |
| **UNWTO** | World Tourism Organization |
| **WTO** | World Trade Organization |

## Glossary of Terms

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| **Adaptation** | Adjustment in natural or human systems to a new or changing environment brought about by climate change. Adaptation refers to adjustments made by these systems to reduce their vulnerability to actual or anticipated climate change, or to exploit any beneficial opportunities |
| **Afforestation** | The process of establishing and growing forests on bare or cultivated land that has not been forested in the past 50 years |
| **Anthropogenic Emissions** | Emissions of greenhouse gases associated with human activities. These include burning of fossil fuels for energy, deforestation, land-use changes and emissions of other GHGs |
| **Biofuel** | A fuel produced from organic matter produced by plants. Examples of biofuels include alcohols (from fermented sugar), black liquor from the paper manufacturing process and soybean oil |
| **Biomass** | The total dry organic matter or stored energy content of living organisms. Biomass can be used for fuel directly by burning it (e.g. wood), indirectly by fermentation to an alcohol (e.g. sugar) or extraction of combustible oils (e.g. soybeans) |
| **Border Tax Adjustment** | A tax on imports by a country with an effective domestic carbon price in place, on countries without carbon pricing in place, as a means for maintaining local industry competitiveness |
| **Bus Rapid Transit** | A bus based transit system that delivers fast, comfortable and cost-effective urban mobility through the provision of segregated right-of-way infrastructure, rapid and frequent operations, and excellence in marketing and customer service |
| **Carbon Capture and Storage** | The capture of $CO_2$ emitted from large point sources, and its subsequent compression, transportation and injection into underground geological formations for long-term storage. |
| **Carbon Sequestration** | The capture of carbon or carbon dioxide in a manner that prevents it from being released into the atmosphere for a specified period of time. Includes storage in forests, soils, the oceans, or underground in depleted oil and gas reservoirs, coal seams and saline aquifers |
| **Carbon Market** | A popular term for a trading system through which countries may buy or sell units of greenhouse gas emissions (not just carbon dioxide) in an effort to meet their national limits on emissions, either under the Kyoto Protocol or under other agreements. The term can also be used to describe the trading of carbon under a voluntary market |
| **Carbon Offset** | A tradable commodity that allows entities to offset the emissions associated with an organisation, product or event, through the purchasing of emission reduction credits equivalent to, or a proportion of, the quantity of emissions generated in the first instance |

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| **Carbon Pricing** | The use of a pricing signal, in this case the pricing of carbon within the economy, as a market-based approach to achieving environmental objectives. Carbon pricing is generally implemented either through:<br>▪ The introduction of taxation on greenhouse gas emissions (commonly referred to as a 'carbon tax'). This approach places an administered direct price on emissions in the economy; or<br>▪ The introduction of an emissions trading scheme for permitted emission allowances (commonly referred to as a 'cap and trade scheme'). Under this approach, an indirect market-determined pricing signal is established for carbon emissions as determined by market forces<br>Hybrid market instruments, employing elements of a carbon tax and emissions trading scheme, can also be established (Goldblatt, 2010) |
| **Combined Cycle** | Electricity generation where the waste heat of a gas turbine generator is used to heat water in a boiler to drive a steam-turbine generator, thereby increasing power generation efficiency |
| **Conference of Parties** | The meeting of parties to the United Nations Framework Convention on Climate Change (UNFCCC) |
| **Demand Side Management** | The shifting of electricity usage to off-peak periods |
| **Emissions Cap** | A mandated restraint, in a scheduled time frame, that puts a 'ceiling' on the total amount of anthropogenic greenhouse gas emissions that can be released into the atmosphere by any particular country or entity |
| **Emissions Trading** | A market-based approach to achieving environmental objectives that allows those reducing GHG emissions below what is required to use or trade their excess reductions with entities wishing to offset their emission through purchasing. Trading can occur at the domestic, international and intra-company level |
| **Enteric Fermentation** | Fermentation that takes place in the digestive processes of ruminant animals, such as sheep and cows, which results in the release of methane |
| **European Union Emissions Trading Scheme** | Emissions trading programme covering large $CO_2$ emitting installations within the European Union. Each country within the European Union has a National Allocation Plan which provides installations in covered sectors with an allocation of tradeable allowances for their $CO_2$ emissions, and may also allow for auctioning of allowances |
| **Food Miles** | Commonly, the distance travelled and greenhouse gas emissions associated with the transportation of food and other products from their area(s) of production to the final consumer |
| **Fuel Cell** | An electrochemical device that combines hydrogen and oxygen to produce electricity, heat and water. The source of hydrogen can be either pure hydrogen or a number of other fuels (such as methanol or other hydrocarbons) which are first converted to hydrogen and $CO_2$ |

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| **Independent Power Producer** | Typically limited-liability, investor owned enterprises that generate electricity either for bulk sale to an electric utility or for retail sale to industrial or other customers with certain conditions |
| **Intensity Target** | A dynamic target expressed by the ratio of emissions over gross domestic product or unit of output |
| **Mitigation** | Measures taken to combat human induced climate change. Technically, human interventions to reduce the sources or enhance the sinks of greenhouse gases |
| **Nationally Appropriate Mitigation Actions** | Nationally defined policy-based commitments that produce verifiable greenhouse gas emission reductions in support of developing country mitigation activities |
| **Reforestation** | The act or process of re-establishing a forest on land that had been deforested in the last 50 years |
| **Renewable Energy Feed-In Tariff** | A mechanism to promote the deployment of renewable energy that requires specific entities to purchase the output from qualifying renewable energy generators at pre-determined prices |
| **Sectoral Approach** | Mitigation actions, such as emissions caps and intensity targets, applied to an entire global sector.<br>Proponents of sectoral approaches suggest that they limit the competitive distortions within an industry that may occur when a sector operates in a number of countries characterised by differentiated national actions on climate change |
| **Synfuel** | Synthetic fuel or synfuel is a liquid fuel obtained from coal, natural gas or biomass. It may also refer to fuels derived from other solids such as plastics or rubber waste. Common use of the term is to describe fuels manufactured via the Fischer Tropsch conversion method (source: http://en.wikipedia.org/wiki/Synthetic_fuel) |
| **Syngas** | Syngas (from synthesis gas) is the name given to a gas mixture that contains varying amounts of carbon monoxide and hydrogen.<br>Examples of production methods include steam reforming of natural gas or liquid hydrocarbons to produce hydrogen, the gasification of coal, biomass, and in some types of waste-to-energy gasification facilities.<br>Syngas is also used as an intermediate in producing synthetic petroleum for use as a fuel or lubricant via Fischer-Tropsch synthesis and previously the Mobil methanol to gasoline process (source: http://en.wikipedia.org/wiki/Synthesis_gas) |
| **Sustainable Development Policies & Measures** | A broad term used to describe policies and measures enacted by developing countries that facilitate local sustainable development benefits and help to address global climate change |

*Source: Drawn in part from IPIECA (2007), Pew Center (2009) and http://carbonfinance.org*

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High Commission
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