The South African Renewables Initiative:

Advancing South Africa's Low Carbon Industrial and Economic Strategy

Working Paper Prepared for the
Government of the Republic of South Africa

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About this report

This working paper sets out the case and recommendations for enhancing South Africa's industrial and economic policies by responding to climate change and associated risks and opportunities. It has been prepared for the Department of Trade and Industry (DTI) and the Department of Public Enterprises (DPE) of the Government of the Republic of South Africa.

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Low Carbon Growth Plans - Advancing Good Practice, Zadek and Forstater (2009), Project Catalyst

The Business of Adaptation, Forstater, Huq, and Zadek (2009), AccountAbility and the International Institute of Environment and Development

Radical Simplicity in Designing National Climate Institution: Lessons from the Amazon Fund, Zadek, Forstater, Polacow, and Boffino (2009), AccountAbility and the Avina Foundation

Advancing Sustainable Competitiveness of China's Transnational Corporations, Guoqiang, and Zadek (2009), Development Research Centre of the State Council and the International Institute of Sustainable Development

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All conclusions, recommendations, errors and omissions in the report are associated with the authors alone.

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Summary

This paper sets out the case for enhancing South Africa's industrial and broader economic policies by responding to the threats and opportunities associated with climate change.

South Africa's current industrial policy aims to diversify the nation's technological and industrial base beyond traditional dependence on mining, mineral processing and agriculture, by improving competitiveness and output in upstream engineering and 'nearby' industries such as transport machinery and food processing.

Tomorrow's low carbon economics offer ***major opportunities for South Africa:***

- *Industrial development.* Diversifying the energy mix could enable opportunities to develop new energy and industrial value-chains in designing, manufacturing and operating new energy technologies.

- *Premium value.* Opportunities for export industries, such as mining & processing, and agriculture & food processing, to strengthen export competitiveness and national brand reputation through demonstrated responsiveness to climate and associated challenges, such as water use.

- *New markets.* Increasing demand worldwide, and particularly regionally, for renewable energy, renewable energy and energy efficient technology climate change adaptation technologies could offer new export opportunities for South Africa.

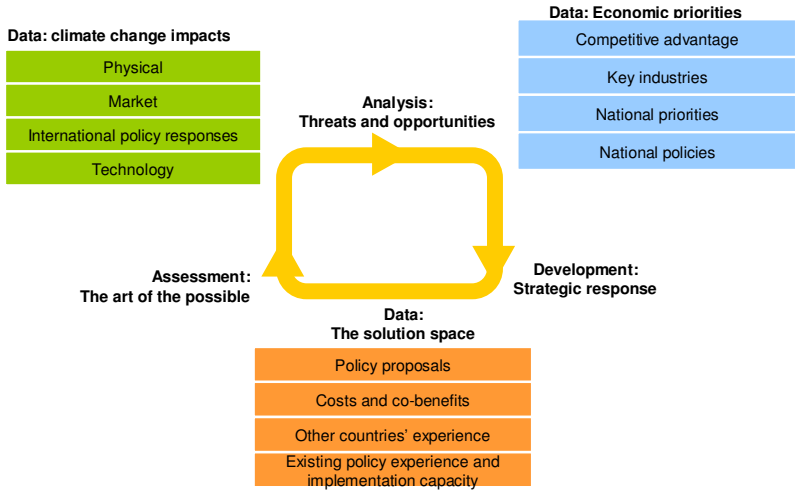
Equally, climate change and low carbon competition poses ***economic and broader social threats to South Africa***:

- *Direct climate impacts.* The direct economic impacts of climate change through, for example, reduced water availability, which may particularly impact agriculture but also mining and the viability of water-hungry energy generation.

- *Trade barriers.* State-imposed carbon border tariffs and the commercial application of private standards will increase costs, impede market access, and could damage the 'brand' of South Africa sourced goods.

- *Investment constraints.* Investor nervousness of countries that are failing to respond to perceived risks could reduce the flow and raise the cost of capital, directly and through insurance and credit pricing.

Exhibit A: Methodology outline: developing low-carbon industrial strategy



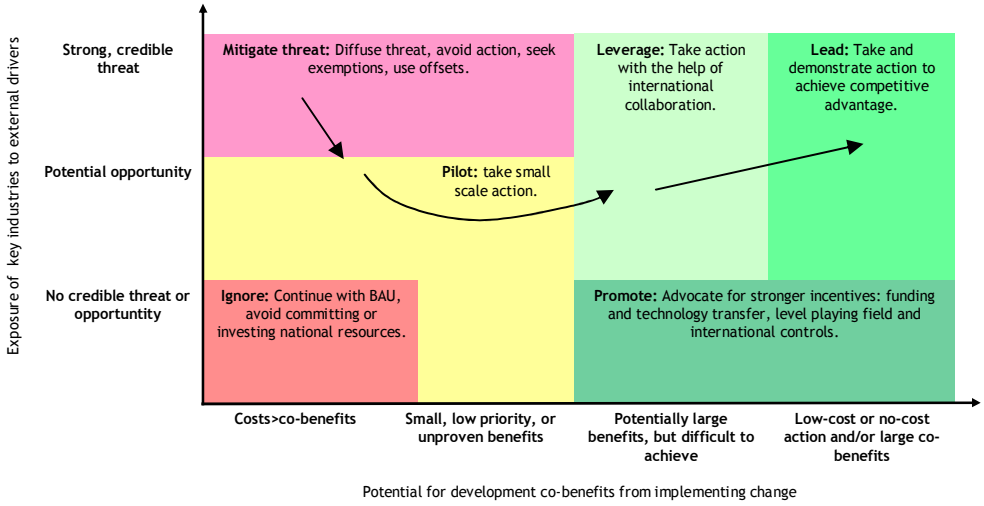
This study pilots a methodology to analyse climate change threats and opportunities through an economic lens, in order to develop and assess policy proposals, as part of a national strategic response.

The opportunities and risks vary between sectors and therefore a sector-by-sector analysis is needed to illuminate the dimensions of industrial and broader economic strategy which could support South Africa's transition to low-carbon competiveness. For example, there are likely to be considerable gains from investment in and enterprise development associated with a drive for energy efficiency, just as there may be opportunities for early moves in transforming South Africa's vehicle production business in preparation for a post-combustion engine era.

This initial study concentrates on two sectors: energy intensive exporters associated with the mining sector, and the fruit and wine industry. In the case of South Africa's mining sector, one perceived threat is from international policy responses, whereas the key threat for its wine sector is both such policy responses and local physical impacts. Despite the lack of clarity regarding any future international carbon regime, there is no doubt that high-carbon economies will face an assortment of increasing challenges in international markets. However, at present there is a lack of robust data to determine the extent of this threat. One leading South African mining house, however, has developed its own estimates of this risk, and stated that carbon-sensitivity in their markets might be valued at anything from 2-10% of their global revenue within five years. Similarly, the primary shareholder of a major, privately owned, South African wine producer confirmed that he fully expected carbon, energy and water use and intensity in production to become increasingly an issue in their international markets in the next decade.

Economic gains will flow to South Africa if it addresses both climate-related opportunities and threats in a coherent and timely manner. Conversely, damage could be sustained to the South African economy if this changing context is not factored into the nation's economic policy and practice.

Exhibit B: Forging a strategic adaptation pathway



South Africa's strategy needs to be one enables industries to forge a pathway of adaptation which starts by aligning current interests, in response to threats in the short term, but enables transition towards new sources of competitiveness, rather than defending old ones.

The assessment of threats and opportunities highlights the critical need for South Africa to green its energy supply in order both to enable the development of new energy value chains and to secure, and possibly enhance, market access for key export sectors. Yet despite significant opportunities for generating more renewable energy, as well as substantial energy efficiency gains, South Africa has not yet been able to realise these opportunities and related economic gains. Constraints include the wide gap between the cost of coal and associated electricity prices, and the cost of renewables and the financial and institutional constraints to implementing the existing 'feed-in' tariff designed to overcome this gap.

***At the heart of the pro*blem are the fiscal constraints to supporting the feed-in tariff at sufficient scale and speed to catalyse domestic value chains and enable energy intensive exporters to green their value proposition in international markets.** The governments' target is for renewables to make up 4% of the national energy mix by 2013. This will mean generating 10,000 GWH of electricity, at a feed in tariff cost of around R15 billion, financed by spreading the costs amongst all electricity consumers. However, initial estimates are that to generate potential for significant domestic value chains rapid growth to at least 10% (and maybe 15%) renewables in the energy mix is needed. Such a requirement could not be entirely financed by the South Africa consumer or government. Therefore, what is likely to happen is that fiscal and political constraints will continue to hold back major growth in renewables, which in turn will lead to slow, technology-fragmented growth with few industrial spin-offs and delayed benefits to exporters facing economic risks.

Overcoming constraints to the investment in and production of green energy is the single most attractive climate-related, economic opportunity for South Africa. Key necessary elements of this strategy will be:

1. *Greening export-orientated value chains*, especially where international markets will embody statutory and private carbon and water related standards.

2. *Developing green energy supplies*, both to support green value chains and to develop new industrial opportunities associated with renewables.

What is needed is a catalytic facility enabling the procurement (and demonstration of procurement) of material levels of renewable energy involving government, energy intensive business and the international community. This in turn will require public policies combined with collective business action to effectively realise the economic opportunities and mitigate the risks:

3. *Renewables investment* will require the right enabling environment, including policies, subsidies, and institutional arrangements, as well as business engagement and investment.

4. *Exemption from any state-sponsored, carbon-linked trade barriers, will need to be negotiated by South Africa*, either entirely or on a sector basis linked to agreed policy reform and investments.

5. *Business engagement in the development of the next generation of private standards* will be essential to ensure that suitable standards are used in international value-chains with South African origination of destinations.

Proposed is an initiative to kick-start South Africa's low carbon economy by e*stablishing a mechanism, the South African Renewables Initiative (SARI), which can finance the feed-in tariff at a level speed needed to enable a rapid increase in renewables with the associated industrial and economic benefits from value chain development and export value protection or enhancements.*

This would:

- *Advance industrial development.* Enable the development of an associated alternative energy technological and industrial base.

- *Mobilise systematic international support.* Enable the process to take place by attracting sufficient international support to overcome initial barriers, and to achieve mitigation at a large scale and low administrative cost.

- *Align incentives towards energy efficiency.* By effectively increasing industrial energy tariffs in a gradual and planned way, to reflect the cost of clean energy generation.

Under the (initial) proposal, the REFIT would be financed from a combination of four possible sources:

1. *Domestic electricity consumers*, as currently envisaged, to an acceptable limit.

2. *Carbon levy*, currently at 2 cents/kwh but with potential for being increased and hypothecated and channelled back into REFIT.

3. *Green purchase obligation* by major energy and carbon-intensive exporters, graduated to increase over time.

4. *International public finance,* sourced from (Annex 1) countries with a climate financing commitment, and an interest in bringing its own energy companies into joint industrial ventures in South Africa.

South Africa's economic policy can be considerably enhanced by a focus on low carbon economics. This policy briefing, although preliminary, builds on the work of others in South Africa and internationally in demonstrating the concepts, thinking and basic methodology involved in developing a low-carbon economic strategy. A second phase of work is now planned as set out below.

Box 1: Phase 2: Design for Implementation

Following on from this initial research, phase 2 involves the design and development of SARI. Through robust analysis, and engagement with high-level decision makers in South African government, industry and civil society, as well as with donor governments and supply chain partners, this phase will address a number of key design questions, in particular:

- What are the *economics of supporting REFIT*, and in particular what would be the international public finance required, over what period and at what implied cost per ton of carbon mitigated, and how could an 'exit' be assured based on changing subsidy requirements and the growth of domestically generated resources.

- What would be the *industrial opportunities* linked to renewables development, on the basis of what technology portfolio, with what potential private sector partners and with what impact on jobs, income and export opportunities.

- What would be a viable *green purchase obligation* for carbon and energy-intensive exporters, how might this obligation be structured over time, how might exporters respond through own investment in energy efficiencies and other measures, and what finances would it generate for REFIT (see above and also below).

- What would be the best *institutional arrangements* for SARI, taking account of experience elsewhere (such as the Amazon Fund) but also crucially taking account of regulatory and other institutional issues.

- What might be the *'monetization' to exporters* of greening their energy supply for specific markets/sectors, resulting from avoidance of barriers, whether statutory, private or behavioural, and what opportunities might there be for generating a South African 'green brand lift' through the planned measures.

- What might be the *regional energy implications* of the proposed initiative, taking account of planned system integration, low carbon energy sources from elsewhere.

1 Introduction

This paper has been prepared for the Department of Trade and Industry (DTI) and the Department of Public Enterprises (DPE) of the Government of the Republic of South Africa (RSA).[1] It takes a 'Low carbon economics' approach focused on national self-interest as the sole driver, irrespective of whether South Africa has broader concerns for the global public good, in order to identify how best to enhance the associated economic impacts.

Its aims are to:

(1) **Set out the key links between economic policy and climate change in South Africa**.

(2) **Develop and demonstrate a methodology for analysing these linkages** by reference to a limited set of cases, and using existing data, as a pilot for further and deeper analysis and policy development

(3) **Define high-level strategic initiatives that could proactively position the South African economy** to optimise its access to opportunities and materially decrease the risks created by the global response to the climate change process.

The specific terms of reference are set out in Annex A.

1.1 Developing a framework for low-carbon economics

The international policy and economic context is shifting, albeit unevenly, towards an emphasis on low carbon economics. Many countries have recognised the need for a national 'low carbon growth plans' which assess climate change risks and opportunities and provide the basis for a coherent set of national policy responses. South Africa's Long Term Mitigation Strategies process was a particularly early approach, and has been recognised both for the quality of its analysis and the breadth of its stakeholder involvement.[2] Other countries have taken similar approaches, combining micro-economic analysis of the costs of mitigation ('the cost curve') and macro-economic modelling of impacts of policies the economy as a whole.[3] The World Bank's Energy Sector Management Assistance Program is working with South Africa, Mexico, India, Mexico, Brazil and Indonesia to share experiences, tools and lessons from their initial low-carbon growth planning processes which Korea is establishing a Global Green Growth Institute to share experiences and know-how and will help more countries develop growth strategies.

The challenge of developing feasible economic policies for low-carbon growth goes beyond mapping opportunities for cost effective mitigation to meet global goals for climate stabilisation. While this provides a critical layer of information, it is not enough to develop effective and implementable national policies.

Climate change will transform the opportunities and threats that economies face, through a combination of physical impacts and changing international policy and market conditions.

Enabling transformation to low carbon economics must start with an analysis that is embedded in the national interest; the gains to be made from proactively realising new opportunities and the defensive adaptations necessary to respond to climate impacts and international policy and market conditions. Understanding the balance

of threats and opportunities, costs and benefits then gives a basis for considering the policy options for immediate pain alleviation, leveraging avenues of international support, generating co-benefits or demonstrating performance in ways that enable long term competitiveness.

Exhibit 1: Climate change impacts on economies

Domain	Potential sources of economic impact
Physical impacts	• Climate-sensitive industries and infrastructure: temperature change, reduced water supply, shifting climatic zones, changing risk of drought, storm surge and flooding. • Broader economic impacts: distribution networks, infectious disease transmission, settlement patterns and migration, power-supply.
Market impacts	• Private standards and carbon labelling on 'embodied emissions'. • Change in demand patterns – increased demand for low-carbon products. • Investment constraints to countries failing to respond to risks. • Reputation impacts.
Policy response impacts	• Carbon markets. • Carbon border adjustments. • Mandatory product standards. • Opportunities for funding for adaptation and green technology investment.
Sector response impacts	• Technology developments – availability of green technology alternatives.

1.1.1 The case for an industrial policy response

Individual businesses will of course react to these changes, driven by self-interest to manage their own exposure to threats, and capture new business opportunities. Indeed mobilizing such private sector capacity, expertise, capital, risk sharing and innovation will be crucial to the success of any national climate change strategy.

However, as Nicholas Stern *et al* have pointed out, there are compelling reasons to suggest that private sector responses to climate change are likely to be sub-optimal, unless they are supported by a coherent national economic development strategy.

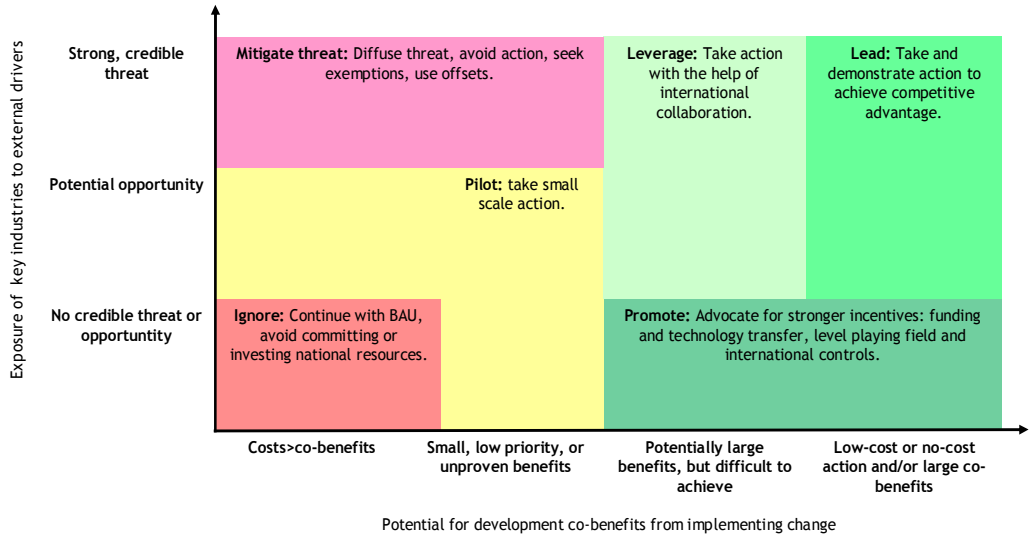
Box 2: Obstacles to low-carbon economic transformation

- **Lack of awareness.** Climate change risks are poorly understood, uncertain and distant and are not yet well recognised as material issues by investors and managers. Research into climate change risks does not put them into commercial terms or make the information accessible to businesses.
- **Market failure due to lack of information and pricing incentives.** Markets fail to develop because of lack of transparency of information and ability to reflect this in pricing.
- **Obstacles for SMEs and micro-enterprises.** Small and informal sector businesses often lack the resources, expertise and risk appetite to take up new technologies, products or services that would strengthen productivity and resilience.
- **Perverse incentives.** Existing policies of subsidy and regulation that get in the way of adaptation to climate threats and opportunities. This includes subsidies to water and power that prevent investment in resource saving measures.
- **Path-dependency.** Existing patterns of investment that make it difficult to switch to new technologies.
- **Externalities.** Private adaptation measures can generate positive and negative externalities that are not reflected in the market price and therefore under or over produced. This includes for example health impacts of transition to cleaner fuels, employment creation, the economy wide benefits of investing in the search for new markets, and the ability to negotiate recognition and benefits for climate change action (such as carbon border tax exemptions or access to international climate funding) at a national or sector level.
- **Poor business environments.** Familiar obstacles to doing business are also obstacles to adaptation. Corruption, restrictive and overly bureaucratic processes, lack of access to infrastructure, transportation and capital and barriers to trade all prevent businesses adapting to changing risks and opportunities, whether climate related or from other sources.[4]

1.1.2 Forging a pathway towards low-carbon competitiveness

From the perspective of national self-interest a number of different low-carbon growth strategies can be developed.

Exhibit 2: Mapping potential low carbon growth strategies



Strategy	Why?	When?
Lead in enabling industry to take strong action and demonstrate performance.	To realise opportunities to improve competitive advantage, which cannot be achieved through individual business action.	When the threats/opportunities are clear and significant, but there are market failures preventing actions that would create co-benefits to the economy.
Leverage international support and collaboration make action possible	To protect vulnerable assets and livelihoods and support economic growth.	When the external threats/opportunities are significant, but the national implementation capacity is not sufficient.
Promote calls for stronger incentives and controls at an international level.	To mobilize greater international support for actions that would enable sustainable development.	When the external incentives are not strong enough to unlock low-carbon growth opportunities which exist.
Pilot experimental approaches and smaller scale action.	To investigate growth potential from addressing emerging areas of threat/opportunity.	When the balance of threats, opportunities and co-benefits are unclear.
Mitigate immediate threats to the economy by seeking exemptions, using offsets or seeking compensation.	To enable industries to reconcile climate and competitiveness pressures.	When taking action to reduce emissions or climate-proof would make the industry uncompetitive and endanger national growth prospects.
Ignore potential climate change threats and opportunities, continuing with business as usual	To avoid committing resources, or endangering growth which could meet more pressing national priorities.	Where climate change poses no credible threat or opportunity, and action is not feasible or attractive.

Assessing which of these strategies is likely to be a no-regrets measure, given the huge uncertainties both around climate change impacts and international responses

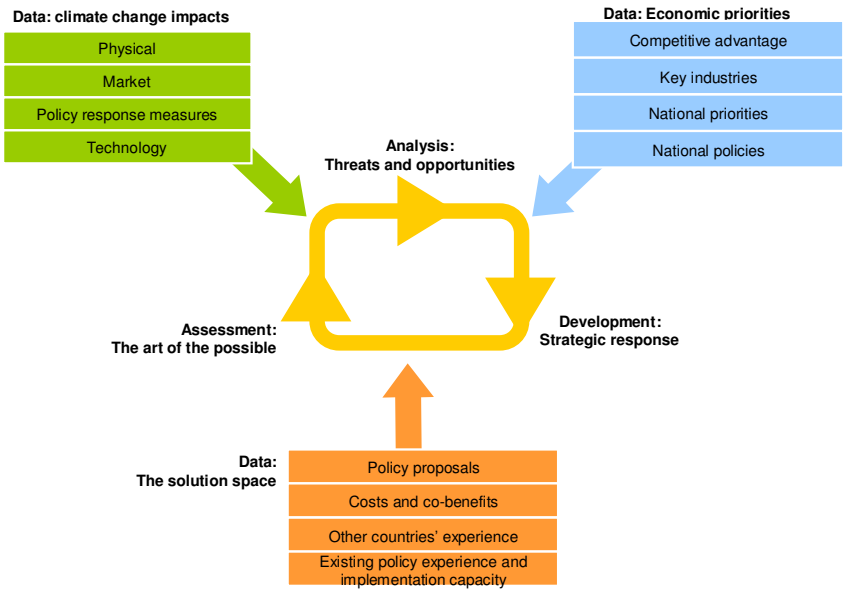
is the key challenge. In addition policies need to pass three tests, to ensure that they are implementable and well aligned both to environmental and economic imperatives:

1. **Contribution to industrial development priorities** – does it deliver against industrial development goals such as stimulating investment, job creation and growth in new technologies and?
2. **The art of the possible** – can it be implemented, or is it likely to be blocked by political and bureaucratic obstacles? Implementable policies tend to be those that are:
    - *Focused.* Aimed at influencing a clearly defined system.
    - *Unavoidable.* Able to be linked to a regular event or decision that would need to be made anyway.
    - *Standardised***.** Implemented through a managerial solution, that can be standardised and subject to quality control but that enables ongoing learning
    - *Unopposed.* Based on a set of interests that can be aligned to ensure support for the process and its outcomes.
    - *Championed.* Lead by a social entrepreneur or champion able to see how to do things differently, and advocate for it within the system.
3. **Mind the gap** – how far does it go towards grasping the technical opportunities for GHG mitigation and adaptation that are identified by scientific and economic studies (such as in South Africa the Long Term Mitigation Scenarios)?

1.2 Methodology of this study

This study pilots a methodology to analyse climate change threats and opportunities through an economic lens, in order to develop and assess policy proposals as part of an overall national strategic response.

Exhibit 3: Methodology outline



The methodology draws on existing data sources and elements of analysis (such as marginal abatement cost curves, scenarios, and sector level vulnerability analyses where these have been developed) but is also designed to be run iteratively, starting quickly and with sparse data, if necessary. It can then used to focus further data gathering and analysis and structure ongoing processes of dialogue between policy makers and the private sector, which is so crucial to the development of effective industrial policy.[5]

A more detailed outline of the methodology is attached as annex C. This report, demonstrates a limited first round application of this methodology to the South African economy, focusing on a few key sectors and an initially limited degree of engagement with national experts and stakeholders.

2 Climate change threats and opportunities in South Africa

2.1 National economic priorities

South African industry has been characterised by low manufacturing profitability which in turn has led to low investment, low output, poor export and employment performance and ongoing dependence on mining, minerals and agriculture.[6] Current industrial policy aims expand employment; particularly in low-and medium-skill industries by enhancing the competiveness of existing export industries and diversifying the technological and industrial base into upstream engineering and 'nearby' industries such as transport machinery and food processing. [7]

Crucial to these objectives are skills development and the expansion of infrastructure capacity. The country is in the midst of the a major electricity and transport capital expenditure programme to overcome infrastructure constraints following forty years of low investment. This is critical in the face of rolling blackouts, and low levels of access to modern power supplies. However, the speed and level of this investment is held back by the fact that Eskom and Transnet have to finance investment through a mix of funding from tariffs, borrowing and internal efficiency measures.

While South Africa had been following a policy of trade liberalization and openness, which had left its infant upstream industries open to an intensely competitive global environment, the current administration is more open to using trade measures (such as WTO-compliant anti-dumping measures) to enable upstream industries supplying to upgrade and achieve economies of scale and be able to compete with imports.

Key sectors where these industrial policies are focused are:

- **Machinery and industrial transport equipment.**
- **Automotive sector**
- **Mining and Metals and their supply upstream supply chain** Iron, steel and aluminium. Coal is also one the most significant exports of South Africa, in the same league with gold and platinum.
- **Chemicals, plastic fabrication and pharmaceuticals**
- **Agriculture and food processing:** Agricultural exports remain significant, although have declined in share. [8]
- **Forestry, pulp and paper, and furniture.**

2.2 Identifying threats and opportunities

South Africa has a low cost, high carbon energy supply compared to most developed and developing countries (see box 3). This has been a traditional source of industrial competitiveness, reflected in South Africa's international marketing of itself to investors as offering electricity at 'very favourable rates'. The electricity system continues to attract significant on-going indirect and direct state subsidies. Major industrial users of energy are particularly concerned that exporting industries have access to competitively priced electricity.[9]

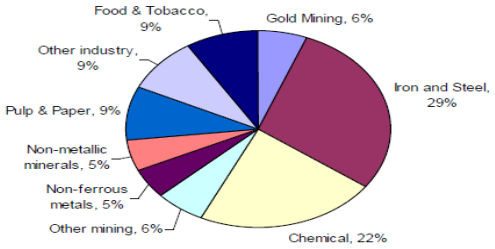
South Africa's carbon intense energy supply, and export dependence on energy intensive primary products, leaves it exposed to potential threats to its competitiveness from state-imposed trade measures and the commercial application of private standards which may increase costs, impede market access, and could damage the 'brand' of South Africa sourced goods.

Box 3: Energy in the economy

South Africa's per capita carbon emissions are well above the global average and by far the largest in Africa, explaining why the country accounts for over half of the continent's overall carbon emissions. South Africa is a major exporter of coal, which thereby makes a significant contribution to its economy. Amplifying this impact is the unusually low cost of electricity generation because of the relatively low factory-gate coal prices, but also because of significant on-going indirect and direct state support.

About 90 percent of South Africa's electricity comes from coal-fired power stations. – and a significant proportion of its liquid fuels also come from coal. Energy comprises about 15 percent of GDP creating employment for about 250 000 people. Large-scale, energy-intensive primary mineral beneficiation and mining industries dominate energy use. [10]

Exhibit 4: Final energy consumption by sub-sector, 2001



[Source: Winkler et al (2006)

South Africa's estimated total emissions from all sources is approximately 440 million metric tonnes of CO2-e. A few companies dominate South Africa's direct local emissions: *Sasol* (61 million metric tonnes CO2-e), *ArcelorMittal SA* (12.4 million metric tonnes), *BHP Billiton* (4.5 million metric tonnes), *Anglo American* (3.4 million metric tonnes).[11]

For most companies and sectors, electricity usage remains the dominant source of emissions. Eskom, the state-owned monopoly responsible for both the grid and generation aspects of electricity delivery. Has reported emissions of 220 million metric tonnes.

2.2.1 Border carbon adjustments

In a differentiated carbon price regime, there will be strong pressure in the industrial countries to take trade actions against countries that set low carbon prices. These unilateral measures termed border carbon adjustments (BCAs) could be a flat tariff, a tax, or a requirement for the importer to purchase carbon credits. Both politicians in the US and EU have advocated for BCAs Senators John Kerry and Lindsey Graham, recently wrote *"There is no reason we should surrender our marketplace to countries that do not accept environmental standards. For this reason, we should consider a border tax on items produced in countries that avoid these standards. This is consistent with our obligations under the World Trade Organization and creates strong incentives for other countries to adopt tough environmental protections".* France's President Nicolas Sarkozy is promoting the BCA option nationally and across Europe. Although there are huge political and technical obstacles to a BCA being enacted it is a real and credible threat. [12] Despite the lack of clarity regarding any future international

carbon regime, there is no doubt that high-carbon economies will face an assortment of increasing challenges in international markets, including carbon border tariffs or private standards established by commercial traders.

Most of the existing literature on the consequences of BCA policies focuses on the impacts for the industrial countries in terms of overall emissions reductions and competitiveness. The broad findings are that unilateral actions lead to relatively small leakage in terms of aggregate emissions rises in unregulated countries. However, there can be larger emissions and competitiveness effects in some sectors, for example, cement, steel, and aluminium, which are therefore most likely to be targeted by trade measures. Handicapped by the absence of past events, or experiment to draw from there have been few efforts to quantify the impact of these trade actions on developing countries. However countries with carbon intense energy supplies are beginning to consider how this will impact on their export competitiveness.[13] A recent multi-country modelling exercise by the Centre for Global Development concluded that BCAs could amount to a tariff equivalent of over 20 percent on energy intensive exporters, resulting in lost exports of up to 20 percent.[14]

2.2.2 Private standards

There is a growing awareness amongst consumers, retailers, OEM and brand manufacturers about the 'embodied carbon' associated with production and transportation of consumer products. 'Carbon Footprinting' either at a product level, or at a corporate level is making these supply chain emissions increasingly visible and material. Consumer carbon labelling schemes have been developed in order to show how much green house gas has been emitted during the production, processing and transport of a product, while multinational companies are increasingly assessing and reporting on 'scope 3' (i.e. supply chain) emissions, in addition to the carbon footprint of their direct operations.

While it is early days in the establishment of product carbon footprinting and carbon labelling, and their impact in terms of shifting consumptions patterns is untested, what is clear is that suppliers to multinational companies and global value chains are likely to see increasingly common requirements to report on the greenhouse gas emissions embodied in their products. This information could then be translated into consumer-facing carbon labels, social contracts with producers to reduce footprints (such as that involved in the Carbon Trust's carbon labelling scheme) and carbon standards as part of procurement contracts.

2.2.3 Investment constraints.

Private sector companies and investors are realizing that climate change is not merely a social, political or moral issue, but an economic and business issue that impacts on investment risk and opportunity. Investor nervousness of countries that are failing to respond to perceived risks is likely to increase, and is likely to reduce the flow and raise the cost of capital, directly and through insurance and credit pricing. A recent review of climate risk assessment practices by international asset managers confirms that these developments are still at an early stage. Nearly half of the respondents said they do not consider climate risks at all because they do not believe that climate change is financially 'material' to investment decision-making, however a large number beginning to include climate risks in their due diligence.[15] Kevin Parker and Mark Fulton of Deutsche Bank believe that investors will increasingly assess the transparency, longevity and certainty offered by different national policy environments as they navigate the shift to low-carbon economics. They believe that investors will increasingly seek to invest their money in countries that demonstrate a

transparent, long-lived, comprehensive set of policies which effectively put a price on carbon, including through policies and incentives, such as feed-in tariffs. [16]

Multilateral development banks are also beginning to incorporate low-carbon and climate risk criteria into their investment strategies. The first stage has been the setting up of specific green funds, such as the World Bank's Clean Technology. However there is also pressure to mainstream these considerations. The World Bank is currently reviewing its energy policy, and DFID has recently called for 60 per cent of the Bank's energy portfolio to fund 'clean' energy technologies.[17]

2.2.4 Direct climate change impacts

South Africa is vulnerable to direct climate change effects (see box 4). This will have economic impacts of climate change through for example reduced water availability, particular impacting agriculture but also mining and the viability and returns to water-hungry energy generation.

Box 4: South Africa's vulnerability to physical impacts of climate change

The majority of the climate models used by the Intergovernmental Panel on Climate Change (IPCC) agree that northern and southern Africa are likely to become much hotter and dryer (as much as 4°C or more) over the next 100 years. For South Africa, climatic conditions in the West of the country are projected to become warmer and drier, while conditions east of the line may become warmer and wetter.

Seasonal weather patterns will be less predictable and drought and flood events will become more frequent and intense. There may be large-scale soil erosion, resulting in significant losses of nutrient rich soil, due to increased variability and intensity of rainfall events. Overall surface and groundwater resources are projected to decline.

These changes will intensify the pressure on the country's scarce water resources, with implications for agriculture, employment and food security. The maize crop over most of southern Africa already experiences drought stress on an annual basis. This is likely to get worse with climate change and extend further southwards, perhaps making maize production in many parts of Zimbabwe and South Africa very difficult if not impossible.[18]

It is expected that crop net revenues may decrease by as much as 90% by 2100, particularly in the western parts of the country. Productivity will decrease, particularly for rain-fed agriculture. Irrigated agriculture will be less vulnerable although the overall decrease in surface and groundwater supplies will put pressure on irrigated agriculture in the future.

Farmers will need to adapt to changing frequency and distribution of pests and disease, and the need to adopt alternative cultivars and crops suited to the new climate. Small-scale farming is expected to be more vulnerable than large-scale holdings, monocultures more than multi-cropping.[19]

Climate change will also impact on human health due to direct temperature and an increase in the range of disease vectors, particularly malaria and cholera. It is projected that an additional 5.2 million people will be at risk of malaria in the expanded areas prone to malaria over the next 50 years in South Africa, as a consequence of prolonged summers.

While assessment by the IPCC concluded South Africa's coastal vulnerability was not significant, new research points to potentially catastrophic scenarios resulting from temperature changes and the disintegration of ice sheets. Research conducted by the cities of Cape Town and Durban say that the consequences of rising sea levels will be greater and more far-reaching than was previously believed. A 2008 risk assessment done for the City of Cape Town concluded that 2% of the Metro area is severely at risk from sea flooding over the next 25 years, leading to an expected loss of real estate value of around R20bn. [20]

However, in addition to these threats, tomorrow's low carbon economics offer major opportunities for South Africa.

2.2.5 Industrial development opportunities

Diversifying the energy mix could enable value-chain development in developing, producing and managing new energy technologies, changing industrial processes and

ultimately producing green products and services. These industries lend themselves to mobilizing low-skill jobs as well as redirecting high-skilled jobs into new areas of enterprise and innovation. [21]

Renewable energy jobs tend to be more decentralised than coal, gas or nuclear power station employment, providing employment in rural areas. In particular, solar thermal power stations have a high potential for driving local industrial development, and jobs as they are based on a small fraction of high-tech components, compared to investment in steel, concrete, mirrors, and labour.[22] While rooftop solar water heaters offer significant employment opportunities for semi-skilled artisans.

A study published by the Sustainable Energy and Climate Change Partnership in South Africa concluded that if South Africa generates 15% of its energy from renewable sources by 2020, this would result in the creation of in the region of 36,000 new direct jobs and 109,000 indirect jobs, without taking away from employment in the coal sector.[23]

WWF estimates the 2020 the clean energy technology industry will be worth €1,6-trillion a year - ranking behind automobiles and electronics as the third-largest industrial sector globally.[24] Both China and the US have focused on this sector's growth potential to drive their economic recovery programmes and create jobs. The South African government also recognizes the job creation potential of renewable energy and has included this as part of their economic stimulus package and of ongoing economic development goals and objectives. The challenge however is for the government to effectively develop and implement measures and policies to meet these goals.[25]

2.2.6 Premium value opportunities

As consumers and businesses around the world increasingly seek to reduce their own carbon footprints, there may be opportunities for South Africa's export industries such as the mining and processing, and agriculture and food processing sectors to strengthen their export competitiveness and national brand reputation through demonstrated responsiveness to climate and associated challenges, such as water use.

Companies including Bayer, Dell, Dole Fruit, Toyota have joined UNEP's Climate Neutral Network, pledging themselves to work towards the quest of climate neutrality, joining countries such as Tuvalu, New Zealand, Pakistan, Iceland and Costa Rica that have vowed to reduce their emissions of greenhouse gases to zero. Thailand has developed a national carbon-labelling programme. Countries such as China, South Korea and Guyana are also seeking to gain new market opportunities from transforming their economies to green growth. [26] "For China, greening development is not just driven by concerns about pollution and resource security within the country, but also the potential to upgrade production methods and brand reputations to world-class levels. Beijing is therefore setting higher environmental standards and investing in green R&D to drive growth into low-carbon markets.[27]

South Africa's 'Proudly South African' labelling campaign already recognises the potential for premium value from aligning the national brand to positive attributes of quality and social and environmental responsibility. These signs of international transformation and growing demand for carbon transparency in supply chains highlights a potential opportunity to gain premium value opportunities from cutting carbon intensity.

2.2.7 *New Markets*

According to the literature, the main bulk of and industrial supply chain development in renewable energy will be to supply local energy needs. This is because of the high transport costs for heavy and bulky equipment, and the availability of local infrastructure. Nevertheless firms and countries, are also seeking to develop export-oriented excellence in renewable energy components. While South African industries are unlikely to be able to unseat the global leaders in this sector, including Asian manufacturers and European technology companies, its trade links and importance to regional power supply in Southern Africa offers the opportunity to gain new regional export markets for green technologies and renewable energy management.[28] South Africa's new Industrial Policy Action Plan therefore recognises the potential for long run export earnings growth, drawing on the example of countries like Australia and Israel, where successful domestic Solar Water Heater (SWH) promotion programmes have lead to the establishment of internationally competitive SWH manufacturing industries. The strategy sees the international (particularly African) market as a source of long-run demand that will outlast any short-term mass rollout strategy.[29]

For South Africa's sophisticated agriculture sector, which has developed skills for production under marginal conditions, there may also be export opportunities in providing the skills, know-how and technologies needed for adaptation to climate change.

2.2.8 *Potential for leveraging international support*

The Copenhagen Accord agreed that funding will be provided to developing countries to enable and support enhanced action on mitigation and adaptation. The collective commitment by developed countries was for USD 30 billion for the period 2010 – 2012 (balanced between adaptation and mitigation). Developed countries also committed to a goal of mobilizing USD 100 billion dollars a year by 2020, to flow through the Copenhagen Green Climate Fund, as well as other bilateral, multilateral and market mechanisms.

If this funding is to achieve its objective, it will need to be channelled in ways that support the development of a critical mass of capabilities in high emitting countries to shift them towards low carbon growth. It will need to be able to secure high volumes of emission reduction, efficiently, transparently and with low-administrative cost.

Funders, will therefore be looking for opportunities to channel climate funding, particularly in the early phase into bilateral and multilateral projects which not only deliver crucial early emission reductions, but which also help to build and demonstrate the kinds of deals, institutions and governance mechanisms that will be needed to enable larger sums of money to flow.

One key area of innovation here is the growing development of intermediating financing mechanisms that consolidate international, climate-focused public finance into domestic low-carbon growth funds. The Brazilian Amazon Fund is a case in point, an autonomous public interest investment vehicle supported by the Brazilian Government but managed by the Brazilian National Development Bank (similar in mandate to DBSA). Its design, characterised by radical simplicity and stakeholder involvement shows that it is possible to quickly set up national climate institutions that are able to bridge between the nationally driven low-carbon development imperatives and international funders' concern transparency and low-cost emission reductions (see box 5)

Box 5: The Brazilian Amazon Fund

The Amazon Fund is an innovative pilot of a National Implementing Entity for Reduced Emissions from Deforestation and Forest Degradation (REDD). Although the Amazon Fund was created by the government and is managed by a public bank, it is a private fund and the guidance for the application of the funds are set by a multi-stakeholder committee Radical simplicity characterises the design of the Amazon Fund, underpinned by five key innovations:

- **Performance-based financing:** International funds are secured on the basis of emission reductions demonstrably achieved.
- **Competency-based investing:** Project investing is undertaken through a mandate to the Economic and Social National Development Bank (BNDES), enabling diverse stakeholders to co-design the criteria whilst avoiding their interference in investment decisions.
- **Cost-effective value chain:** Low-cost, rapid decision making is supported by short chains of command and a simple reporting arrangement.
- **Restricted multi-stakeholder governance:** A multi-stakeholder committee guides the Fund, with the Government having sufficient rights to intervene to give it the confidence to confer considerable autonomy in practice on the Amazon Fund.
- **Autonomous, policy coherent investing:** Project investment decisions are made autonomously from the international community, following credible guidelines, coherent with government policy and agreed by a multi-stakeholder advisory group and with high levels of transparency as to decisions made and finances allocated.

The Amazon Fund provides lessons relevant to broader climate financing and related institutional design. Ambitious targets will not deliver if we rely for implementation on top-down, bureaucratic, public institutions, internationally or nationally. The Amazon Fund is an early start, ambitious but still untested alternative, which taken together with two decades experience of such approaches in other areas, point us in the right direction, including:

- **Fit-for-Purpose Design**: good design need not be costly or time-consuming to initiate, demonstrated by the Amazon Fund's rapid concept-to-practice timeline.
- **Pay for Performance:** performance based payments combined with institutional and sovereign autonomy in investment decisions is definitely the way to go.
- **Autonomous Public Interest:** it is feasible and attractive to blend public interest, multi-stakeholder involvement, government rights and responsibilities and autonomy to secure public accountability, innovation and flexibility, and professionalism.

[Adapted from: Zadek et al, 2009, Radical Simplicity in Designing National Climate Institutions: Lessons from the Amazon Fund, AccountAbility]

3 Sectoral analysis

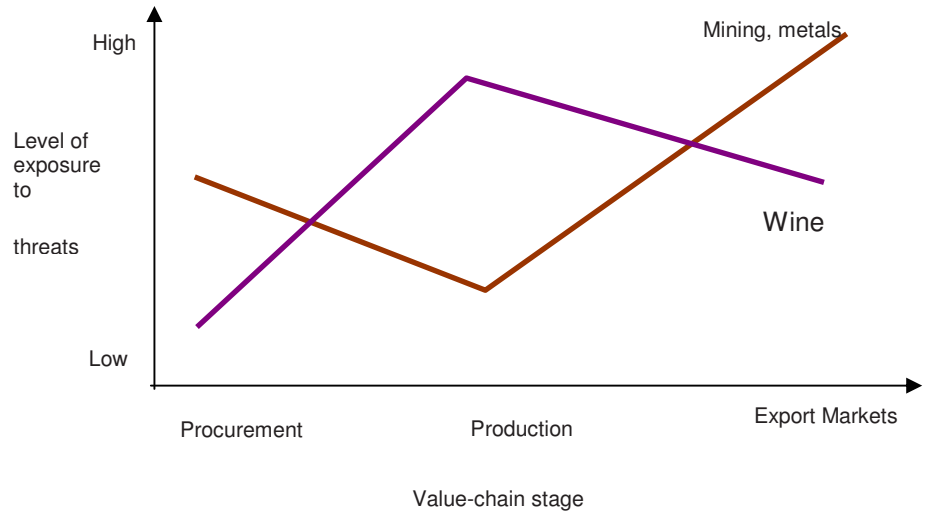
While the previous chapter outlined the key potential opportunities and threats to the South African economy, however the relative balance of these factors, and how they play out in practice will vary between sectors.

A number of research studies are currently taking place to assess what climate change challenges could mean in terms of specific threats and opportunities to South African industry sectors. Most notably CAMCO, TIPs and Commark are conducting an eighteen-sector study, while COMMARK has been working closely with the food and wine sector. At the time of writing, results from these studies are not yet available. Nevertheless it is possible to outline an initial at a broad level the potential risks and opportunities to key industry sectors, and industrial development policies.

One useful way to better understand the risks and opportunities to different sectors is to assess how climate change physical, market, international policy and sector response factors will impact at each stage in their value chain, from procurement of critical inputs, to operational production processes to distribution networks, market access and competitiveness of exports.

This is illustrated briefly, in this study, for two key South African value chains: mining and metals and wine.

Exhibit 4: Value chain analysis for two industries



3.1 Mining industry value chain analysis

Phase 1: Procurement

For South Africa's mining and associated smelting and processing industries, there are climate change threats associated with the procurement, production and product export stages, with the highest levels of immediate threats concentrated at the export stage, from international policy responses.

Key procurement inputs include:

- **Electricity** is a significant cost input in mining, used for the transport of personnel, material and ore, production machines, and mineral processing as well as essential safety processes of water pumping, ventilation and cooling. As mineral and metal reserves get deeper, mining operations are getting more energy intensive Energy security and cost is therefore a particularly strong concern.

- **Transportation.** Mines depend on the rail and port facilities to convey their products to markets.

- **Water**. Mines depend on water supplies for dust allaying, cooling and metallurgical processes, as well as for personal use by mine workers and their families and local communities.

In general individual mines have little influence on the price of their products therefore any climate impacts, whether through regulation or adaptation costs that effect the cost of these essential inputs will affect mine cost structures and profitability.

Security of power supply is crucial, and the majority of mines have agreements with Eskom that seek to maintain electricity for the pumping, winding and ventilation requirements of mines at all times. In return mines agree to shed load when Eskom experiences under-frequency conditions in its system. Because mines can control their electricity demand to some extent they are able to make use of tariff options that minimise their cost of electricity.[30] Nevertheless, power cuts cause expensive loss of work and money. South Africa's Electricity Supply Industry restructuring and Eskom's ability to raise finance to modernize and expand energy generation capacity is crucial to the mining industry's continuing ability to procure sufficient and reliable power supply.

Credit is a critical input for the mining industry. Given the high energy use and high GHG intensity of energy supply in South Africa, it is likely that climate change risk concerns amongst investors may also become a constraint for South Africa's miners as the world becomes more carbon constrained.

Phase 2: Production

There is little research on the direct impacts of climate change on the production phase of the mining value chain. However a recent study of Canadian mining offers some pointers as to potential impacts. The study by the David Suzuki Foundation confirms finds that the Canadian mining sector is vulnerable to the effects of climate change, with variability in climate already having a material adverse impact on certain mining operations. It also notes that climate change impacts on decommissioned mines are not well understood. Of course the specific impacts of climate change on mining in South Africa will be quite different from Canada, where for example one of the problems reported was warm temperatures leading to ice road closures. However mining everywhere is an environmentally dependent business and this suggests that research into the impacts of climate change on mining in South Africa would be warranted.[31]

Phase 3: Export

Probably the climate change risk that is most concentrating minds in the South African mining and metals industry at present is the threat of border carbon adjustments (BCA), imposed by key importing countries such as the EU and US.

Although there remains significant political disagreement and debate about whether to impose such measures, the low level of ambition of the Copenhagen Accord has led to growing calls for such unilateral actions. The French President Nicolas Sarkozy and Germany's Angela Merkel both support the call for BCAs, as do energy intensive industries in Europe and the US. The first carbon tax to reduce the greenhouse gases from imports has been implemented, between the US states of Minnesota and North Dakota, focused on coal-powered electricity. If BCAs are implemented internationally they would almost certainly impact on industries strategic to South Africa such as steel and aluminium smelting.

Within the mining and energy intensive export industries, potential regulatory, market and physical risks are now being recognised and companies are beginning to explore them. However, there remains a dearth of robust data to determine the extent of this threat, or indeed the extent to which it could feed through in the form of lower public revenues from mining concessions in future. One leading South African mining house, however, has developed internal estimates of this risk, and stated off the record that carbon-sensitivity in their markets might be valued at anything from 2-10% of their global revenue within five years. Put differently, the lower estimate amounts to roughly 20% of their net revenue, explaining why this company is actively exploring options for investing in renewables generating capacity for self-use to protect their position, or possibly even to enhance it through carbon-based differentiation.

Wine and fruit industry sector analysis

South Africa is the world's tenth largest wine producer, with production concentrated in the Western Cape. Key competitive pressures are intensified competition, the consolidation of retail outlets, rising interest rates and high levels of wine production globally.[32] However, in recent years it has also become clear that climate change is becoming a threat to the industry.

> *"We fruit farmers are totally dependent on water for irrigation. In the worst case scenario, Western Cape fruit farmers will be forced to stop producing certain types of fruit, or stop farming altogether."* Trevor Abrahams, Western Cape farmer

> *"More and more the retailers are going to be pressurised by their customers, and as this pressure mounts, the pressure is going to be sent back down the line to suppliers. If we want to maintain our position on the shelves in the next five to 10 years, we're all going to have to monitor our activities in the environment "* Michael Back, Backsberg wine estate

The primary shareholder of a major, privately owned, South African wine producer confirmed that he fully expected carbon, energy and water use and intensity in production to become increasingly an issue in their international markets in the next decade, adding that he thought it unlikely that South Africa would be able to secure blanket exemptions from carbon border tariffs or private standards by virtue of them being part of Africa.

Phase 1: Procurement

An increase in temperature to the predicted temperature range will result in increased evapo-transpiration which, together with the expected drying of ground water supplies, will require an increase in irrigation. At the same time, industrial water charges are likely rise because of general reduced water resources.

Shifting rainfall patterns in South Africa suggest that it is not so much the overall ability of the agricultural sector to procure water that will be a risk, but the location of water supply and growing regions that will require shifts in patterns of cultivation.

Phase 2: Production

The key concern in the wine sector is for the direct physical impacts of climate change on grape growing. Increase CO2 levels and temperatures affect the productivity, quality of yield, pest and disease burden, and water requirements. Farmers will need to adapt with changes to agricultural management and choice of grape varieties.[33] For fruit farmers there will need to be shifts in the planting, dormancy management and cultivar selection of apples and pears. There may also need to be a greater shift to stone fruit growing in response to climate change. There are also opportunities to adopt conservation farming techniques and technologies which increase the carbon sequestration of land-use based practices such as conservation tillage, tree restoration and biochar. These are both mitigation (carbon storage) and adaptation (water holding, and productivity improving) measures. However to date the administrative barriers to securing CDM funding have proved too onerous too support farm level action.

Phase 3: Export

Although initially the focus of much consumer climate change action in this area has been on 'food miles', research into the carbon footprint of the food products indicates that international transport is in fact a relatively small part of the farm-to-plate impacts. Research into the South Africa's fruit and wine industry shows that it is the processing and storage stage, rather than international transport that has the highest impact. While this is good news for South Africa, as it means that food export carbon footprints are amenable to local improvement, it also highlights that South Africa's carbon intensive energy mix is likely to be a competitiveness issue for industries outside of the traditional energy-intensive sectors.

Several large international retailers have launched aggressive climate change and environmental programs focused on reducing GHG emissions through their supply chain, and some are also moving towards consumer information on emissions associated with products. [34] For example retail giant Tesco is currently trialling carbon labels on 20 products in its range, and other retailers in the UK, France, US and Japan are also following this trend.

At least 16 different methodologies for calculating the carbon footprint of products have been developed in the UK, Germany, France, Switzerland, Sweden, New Zealand, USA, Japan, Korea and Thailand. However, ultimate impacts of such measures depends on the exact functioning of carbon labels, on the consumer response and on the vulnerability of exporting countries in terms of availability of substitutable products.[35]

On the other hand, climate change adaptation may also open up new markets for South Africa's agricultural technology firms. South African fruit production is relatively sophisticated, and is already adapted to growing apples in marginal areas, and using micro and drip irrigation. There may therefore be opportunities for South African industry to export its technology and know-how to other fruit producing regions facing adaptation challenges.

4 Developing industrial low-carbon growth strategies

It is clear that South African industries face climate change threats, in the medium term. In the case of the mining sector, the main immediate threat is from international policy responses, for the wine sector the key threat is local physical impacts, although market responses by private actors may also prove to be a credible threat.

Both sectors therefore face a range of choices, from business as usual to leadership. Given the degree of uncertainty about climate change and international responses to it, each of these strategies is supported by different assumptions and hopes, in most cases with little robust evidence or analysis to support assessment of the best course of action.

Exhibit 5: Strategic options

Strategy	Why?	Why not?
1. **Ignore**	• Climate change risks poorly understood, not seen as material. • Uncertainty about international carbon regime.	• Climate change risks and opportunities increasingly recognized as material. Therefore need to take proactive position.
2. **Mitigate**	• Assumption that carbon emission permits or offsets will be cheaper than renewables. • Hope that South Africa can negotiate exemptions from carbon border tariffs or private standards by virtue of them being part of Africa	• Recognition that money spent on emission permits or offsets is lost to the South African economy, and could be used to instead kick-start local renewables opportunities. • Fear that South Africa unlikely to be able to negotiate blanket exemptions.
3. **Pilot**	• To better understand risks and opportunities and to develop proof-points for solutions.	• The energy mix is a major underlying issue for many industries. Can only be solved at scale.
4. **Promote** calls for stronger incentives	•	• Because industry is locked into low energy costs as a basis for competitiveness.
5. **Leverage** international support	• To use CDM and intergovernmental climate funding to support investment in renewables, adaptation.	• Agricultural sector: CDM mechanisms too onerous for farm application (e.g. for biochar). • Energy sector/ energy intensive exporters: Misaligned incentives. Even with CDM need REFIT subsidy to make renewables investment viable in short to medium term.
6. **Lead** performance.	• Energy sector/ energy intensive exporters: To explore and develop a new mechanism for leveraging international funding for power sector development. • Food/agriculture exporters: To develop South African standards and capacity to meet new international demands linked to climate change.	•

While the Fruit and Wine Sector has recognised the threats and opportunities and is taking a piloting and potentially leadership approach in standard setting (see Box 6), the

energy-intensive export faces structural constraints that have made it difficult to go beyond the first or second strategies, neither of which are likely to be winners in the long-term.

Box 6: Mobilising collective action in the fruit and wine industry

The fruit and wine sector has recognised the need for collective business action, and is pushing ahead to develop standards and an industry strategy for low-carbon competitiveness and climate resilience. Key players in the wine and fruit industry have recognised the need to develop a comprehensive, industry-scale response to climate change. One of the first movers was Colours Fruit which, in response to concerns about market access, came together in 2006 with its major UK importers and shipping company to determine the "carbon footprint" of their supply-chain into the UK, piloting the Carbon Trusts PAS2050 Standard. This analysis, and subsequent work at an industry level highlighted that the most energy intensive part of the supply chain was not, as the consumer attention on 'food miles' would suggest the international transportation leg, but local refrigerated transportation and cold storage. This is consistent with other analysis of food exports.[36]

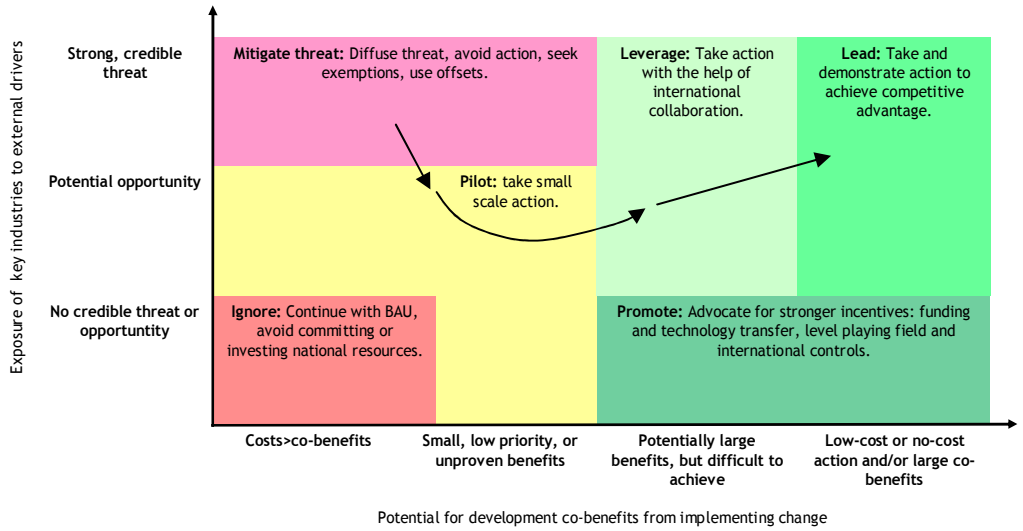
The fruit and wine industry has developed an industry sector research and dialogue process to develop the analysis to support the development of a strategic industry response to climate change, benchmarking the industry's GHG emissions with global competitors to enable on-farm emission reductions, informed and authoritative comment, debate and negotiation by stakeholders and policy-makers and standardised measurement, reporting and comparison of individual farm and exporter emissions. This has been widely supported by the industry and through high level engagement by key exporters.

The South African Fruit and Wine Industry initiative has developed carbon footprinting tool to assist all entities within the fruit and wine export sector by to measure and report on their emissions.[37] While the process was initiated in response to external pressure, they have found that farmers were keen to pursue energy efficiency opportunities and on-farm renewable energy sources from a cost-saving point of view, driven by national tariff increases.

Diversifying South Africa's energy mix is crucial to reducing economic threats for energy-intensive exporters and could also enable the growth of new industries and the creation of jobs in renewable energy and associated sectors. However, at present this is not happening because the high cost of the REFIT subsidy at scale levels is resulting in an inability to achieve scale of renewable generation rapidly. As a result of sub-critical scale, no associated industrial development of renewables sector is taking place, and carbon intensive export sectors cannot rapidly green their value chains, increasing vulnerability and diluting opportunity.

The pressures identified are only likely to get stronger in the future, so South Africa's strategy should be one that enables its industry to forge a pathway of adaptation which starts by aligning current interests in the short term, but enables them to transition towards new sources of competitiveness, rather than defend old ones which are slipping away. A further advantage of such forward-looking early action is that it could enable the sectors to mobilise international support rather than risk international sanction.

Exhibit 6: Reacting to external pressure: towards a strategic pathway to low-carbon competitiveness?



While individual businesses may plot their own path through these threats and opportunities, these are unlikely to be adequate, particularly in the energy-intensive export sector. Although there is growing corporate sector awareness that climate change poses risks and opportunities, analysis of reporting on climate risk by the Carbon Disclosure Project concludes that it is questionable whether corporate responses are yet at a sufficiently strategic level to match the risks and opportunities.[38]

There are compelling reasons to suggest that the government support and coordination will be needed to enable strong and rapid enough progress, and to unlock opportunities for international climate financing, and technology transfer as well as sector-wide recognition or exemptions.

- *Over coming the REFIT premium, to enable rapid renewables development* requires a national approach involving coordination of policies, subsidies, and institutional arrangements, as well as business engagement and investment.

- *State-sponsored, carbon-linked trade barriers*, for example, are likely in the coming period, but exemptions might be negotiated by South Africa, either entirely or on a sector basis linked to agreed policy reform and investments.

- *Business engagement in the development of the next generation of private standards* will be essential to ensure that suitable standards are used in international value-chains with South African origination of destinations (see box 5 for an example of how the fruit and wine industry is already mobilising as a sector on this).

4.1 The South Africa Renewables Initiative

South Africa's low carbon economic strategy must include the greening of its energy supply. Overcoming constraints to the investment in and production of green energy is the single most attractive climate-related, economic opportunity for South Africa. South Africa's energy intensive export industries face a world in which they will need to ensure access to electricity which is not only globally competitive on price terms, but also in terms of GHG emissions.

Yet despite significant opportunities for generating more renewable energy, as well as substantial energy efficiency gains, South Africa has not yet been able to realise these opportunities and related economic gains (see box 7) Despite encouraging changes and signs of change to come, there remain profound constraints developing renewables in South African, at a scale and speed that would support industrial development.

Box 7: South Africa's renewable energy potential and constraints

South Africa's greatest renewables opportunity (excluding nuclear) is solar thermal, especially in the northern zones of the country. Estimates vary considerably, but most indicate that a significant part of South Africa's demands can be met through this technology pathway, increasingly including base load as storage technologies become more effective.[39] South Africa will be capable of generating 15% of its electricity from a combination of wind and solar power by 2020, says conservation fund the WWF.

WWF estimates that South Africa could 15% of its electricity from a combination of wind and solar power by 2020, and that without international support this would raise the cost of electricity by only 15% compared with that of building coal-fired power stations. There are also significant opportunities for energy efficiency gains. [40] However, to date the country has not been able to engage aggressively in transforming the energy mix towards renewables. A history of low energy tariffs also makes long-term investment in energy efficiency measures uneconomic, locking in dependence on low energy costs. Key reasons for this lack of progress are:

- **High cost renewables versus low cost coal.** The gap between the cost of renewables and the cost of coal electricity is very wide, with the current tariff that too low to support the buying of renewables in any quantity. Carbon taxes or CDM money will not close the gap. South Africa has passed legislation to enable a feed-in tariff to overcome this gap. The current renewables feed-in tariff (REFIT) is about R1/kwh (with variations depending on technology), which is considered reasonable for concentrated solar power (CSP) and high for solar photovoltaics (PV). However Eskom, and energy consumers have a limited ability to finance this tariff.

- **Existing difficulties just to meet rising demand and provide security of supply.** Eskom's poor financial situation and current priority to close the supply gap through coal-power station building projects, reduce its ability and, incentives to finance, champion and manage renewables investment.

- **Continued pressure to keep energy tariffs low.** Low-cost energy has been seen as an essential part of South Africa's competitive advantage, and despite recent rises, they remain low in global terms (some estimates suggest that the current price is 35 cents/kwh below full economic costs).

Recent developments illustrate the government's firm desire to advance progressive change. In particular, the recent Cabinet decision to allow for a 31% rise in electricity

prices with a game plan for a 100% increase in the next 3-5 years signals its commitment to move towards fuller economic pricing. Second is the move to establish an Interim System Operator (ISO) to remove from Eskom its problematic monopoly over generation, distribution and the right to mandate new Independent Power Providers.

The government has set a renewables target for 2013 of 4% of the national energy mix, which is about 10,000 GWH, so costing around R15 billion (or about 1.5 billion Euros), which is planned to be financed by spreading the costs amongst all electricity consumers.

However some estimates are that to generate potential for significant domestic value chains requires at least 10% (and maybe 15%) renewables in the energy mix ramped up rapidly over the next ten years. A similar volume of renewables is likely to be needed for South Africa's export industries to have an adequate source of 'green energy' to buy in order to safeguard themselves in international markets, or indeed earn a premium.

Despite prospects for declining renewables generating costs, due to technology learning curves, such a requirement would face major constraints in gaining finance from South African consumers or government. Therefore under current circumstances, political and fiscal barriers are likely to remain major obstacles to growth in renewables, which in turn will lead to slow, technology-fragmented growth and limited industrial spin-offs and economic upsides.

No single policy lever can overcome the barrier to advancing renewables, the challenge is however to identify 'keystone' policy interventions that could be instrumental in unlocking the underlying inertia. What is needed is a catalytic facility enabling the procurement (and demonstration of procurement) of material levels of renewable energy involving government, energy intensive business and the international community. This would:

- *Advance industrial development.* Enable the development of an associated alternative energy technological and industrial base.

- *Mobilise systematic international support.* Demonstrating government and private sector commitment to changing the energy related carbon footprint in a way that is both consistent with the requirements of climate change science, and economically viable for the country. This would enable sector level negotiation of exemptions or waivers on Border Carbon Adjustments, and by attraction of international support to overcome initial barriers.

- *Align incentives towards energy efficiency.* By increasing industrial energy tariffs in a gradual and planned way, to reflect the cost of clean energy generation. Giving energy users greater ability to control and plan for predictable costs, rather than risk unilateral action by trading partners. This visibility and predictability of rising energy costs would enable greater investment in energy efficiency measures.

Proposed is an initiative to kick-start South Africa's low carbon economy by advancing a low carbon pathway for major existing export sectors, and by catalysing new industrial and export opportunities through the creation of a renewables energy sector. This would involve establishment of a mechanism to solicit, receive and manage international and domestically sourced funds to enable REFIT to be rapidly scaled, so as to facilitate a critical mass of demand to stimulate investment in renewables and related industries.

The ***South Africa Renewables Initiative*** would be made up of four, interrelated strands:

- *International support to subsidise the domestic renewables feed in tariff***,** potentially linked to the global climate deal, through bilateral climate funds or possibly through multilateral fast start fund or other multi-country funds.

- *A green energy purchase obligation* for energy intensive exporters, linked to a premium tariff initially set low but rising in planned series of steps in line with development of renewables generating capacity. This would enable these heavy users to plan for, signal and demonstrate their commitment to increasing the renewable component of their energy inputs.

- *Greening South African exports*, a promotional initiative involving public and private players, but also crucially involving government negotiating exemptions from future carbon border adjustments.

- *REFIT subsidy* financed from a combination of four possible sources:

    - *Domestic electricity consumers*, as currently envisaged, to an acceptable limit.

    - *Carbon levy*, currently at 2 cents/kwh but with potential for being increased and hypothecated and channelled back into REFIT.

    - *Green purchase obligation* by major energy and carbon-intensive exporters, graduated to increase over time.

    - *International public finance,* sourced from UNFCCC Annex 1 countries with a climate financing commitment, and an interest in bringing its own energy companies into joint industrial ventures in South Africa.

This would:

- Raise money to subsidise the feed-in tariff and boost production of renewables, to a scale and speed that would enable the industrial development opportunities.

- Provide a signal that is long and loud, both for energy providers to invest in renewables capacity, and for energy users to invest in energy efficiency, and for international trade partners to recognise that South Africa is pursuing a low carbon development pathway.

- Offer the international community the opportunity to achieve mitigation at a large scale and low administrative cost, while supporting the transition of South Africa to low carbon development and a rising ability to pay its own costs for renewables.

A more detailed concept note is attached as annex C.

5 Conclusions and Next Steps

South Africa's economic policy can be considerably enhanced by a focus on low carbon economics. This policy briefing, although preliminary, builds on the work of others in South Africa and internationally in demonstrating the concepts, thinking and basic methodology involved in developing a low-carbon economic strategy.

This analysis has demonstrated the concepts, thinking and basic methodology involved in developing a low-carbon development strategy, that is embedded in national industrial development priorities and that is driven by an analysis of the threats and opportunities to key industries from climate change.

The next step is to develop a robust design for SAFI, including gaining the essential support and involvement of key players within South Africa and internationally. Key questions which need to be answered are:

- *What are the economics of supporting REFIT*, and in particular what would be the international public finance required, over what period and at what implied cost per ton of carbon mitigated, and how could an 'exit' be assured based on changing subsidy requirements and the growth of domestically generated resources.

- *What would be the industrial opportunities* linked to renewables development, on the basis of what technology portfolio, with what potential private sector partners and with what impact on jobs, income and export opportunities.

- *What would be a viable green purchase obligation* for carbon and energy-intensive exporters, how might this obligation be structured over time, how might exporters respond through own investment in energy efficiencies and other measures, and what finances would it generate for REFIT (see above and also below).

- What would be the best *institutional arrangements* for SARI, taking account of experience elsewhere (such as the Amazon Fund) but also crucially taking account of regulatory and other institutional issues?

- What might be the *'monetization' to exporters* of greening their energy supply for specific markets/sectors, resulting from avoidance of barriers, whether statutory, private or behavioural, and what opportunities might there be for generating a South African 'green brand lift' through the planned measures.

- What might be the *regional energy implications* of the proposed initiative, taking account of planned system integration, low carbon energy sources from elsewhere, etc

These questions will be answered through robust analysis, and engagement with high-level decision makers in South African government, industry and civil society, as well as with donor governments and supply chain partners.

Annex A: Terms of Reference

Annex A

Terms of Reference for Concept Paper on

Low Carbon Growth Planning and Industrial Policy

Climate change is conventionally seen through the lens of a systemic risk, with the associated cost-benefit analysis focused on justifiable costs of risk mitigation and adaptation. Such a lens fails however to account for the underlying economics of climate change, which requires a deeper examination of the potential impacts on key economic sectors, and how such impacts can be mitigated (avoided or/and climate-proofing) and amplified and realised (sector development opportunities). Arising from such an analysis is an understanding of employment consequences and opportunities, and the critical policy instruments that need to be developed and applied to transform climate management into a coherent industrial strategy.

Most so-called low carbon growth plans (LCGPs) aspire to such ambitions, but in the main focus on determining the most cost-effective means of carbon abatement. Behind the scenes, however, away from the climate limelight, several countries are increasingly focused on the industrial policy implications of the emerging global transition to a low-carbon economy. Recently in the news is the USA, subsidising action on key low carbon technologies, and considering its options in shaping global trading arrangements in its favour, for example through carbon border tariffs. Less visible are the growing efforts by nations as diverse as Denmark, Brazil, Guyana, Mexico and China in assessing policy options for accelerated developments in key sectors such as solar technology and biofuels, land use and agricultural transformation, etc.

In this context, there are three key industrial policy related issues that need to be systematically considered in the dti Industrial Policy development process:

- It is probable that as businesses are measured regarding their carbon footprint and make commitments regarding capping that footprint, countries whose economies are very "carbon intensive" face the risk of being excluded from global supply chains. This is a major risk to South Africa's exports. In contrast, a low carbon economy could become an important differentiator in sustaining and opening up export markets.
- The "energy infrastructure industrial complex" meaning the cluster of suppliers (services, manufactured products and technology developers) that support the production of energy is a central component of South Africa's economy, that can either catalyse economic activity and investments alongside large energy related build programs or result in massive imports with an associated balance of payments problem. Policy, long term planning and systematic coordination are key determinants as to the quality of the cluster and its growth.
- The ethic of the global carbon deal is for developed countries to support emerging economies to build lower carbon economies. Unless South Africa has a clear strategic plan around how to qualitatively transform its energy mix and associated "energy industrial complex" the country's ability to engage productivity with potential partners in the North will be compromised.

South Africa has progressed significantly in its analysis of mitigation scenarios, and for some sectors and regions adaptation challenges and options. Indeed, its Long

Term Mitigation Scenarios (LTMS) are well-known internationally and generally celebrated as exemplifying good practice analysis. Yet South Africa has failed to date in progressing any serious analysis of how best to translate climate challenges into industrial and economic policy. As a result, there is a disconnect between for example South Africa's position in current global negotiations on climate and the main policy platforms for government's economic policy. Similarly, the lack of convincing research on climate-related employment impacts and opportunities has left the space open for ill-informed and unhelpful speculation.

Proposed is an initial paper that sets out the parameters for connecting climate and industrial and economic policy, maps out existing and on-going work in the area in South Africa, provides some international comparators, offers an initial view as to the areas of greatest likely impact and opportunity, and sets out a proposed pathway for building a more complete and useful bridge between climate policy and industrial and economic policy. In a sense, the paper would provide a 'proof of concept' that the bridge is of importance to South Africa and more broadly in Africa and elsewhere. In doing so, the paper would provide an entry point for a more in-depth analysis that would provide clearer guidance on policy implications going forward.

The paper will be a collaborative effort involving the DPE, the University of Stellenbosch and a UK based think-tank, AccountAbility, that has just conducted a global review of current low carbon growth plans undertaken recently on behalf of the international climate policy platform, Project Catalyst.

Annex B: Authors

Dr Simon Zadek is a Visiting Senior Fellow at the Centre for Government and Business of Harvard University's Kennedy School. He founded, and was until recently Chief Executive of AccountAbility, where he established the organisation's global leadership in sustainability standards, collaborative governance and responsible competitiveness, extending its impact from bases in Beijing, Sao Paulo, London and Washington, and through activities in South Africa and across the Middle East. Simon sits on the International Advisory Board of the Brazilian business network, Instituto Ethos, the Advisory Board of the sustainability fund manager, Generation Investment Management, and the Boards of the International Centre for Trade and Sustainable Development and the Employers' Forum on Disability. He has been a lead advisor to Project Catalyst, a major global initiative to analyse what would constitute an adequate global response to the carbon challenge and to identify the areas of greatest impact and cost these initiatives. Simon's work with businesses, governments and international organisations over the last decade has contributed to establishing responsible business on the global map as a core business strategy and public policy issue and practice.

Edwin Ritchken was the Project Manager for this report, for DPE. He is Strategic Projects Advisor to the Director General and Minister of Department of Public Enterprises. In this post he has been responsible for amongst other projects: (a) The design and implementation of the competitive supplier development program which has the objective of leveraging the national power and logistics investment programs to promote investment in plant, skills and technologies in relevant supply chains. (b) The design of the South Africa Power Project which is aims to leverage the twenty year power build program to strategically develop new industries and technologies. (c) Oversight of the nuclear fleet procurement process. (d) The design of the defense related industry development strategy based on projected defense expenditures. (e) The development of strategies for private sector participation in the port and rail industries. Edwin has published articles on issues ranging from rural development, black economic empowerment, strategic procurement, supply chain development and regulating cross-national capital flows. Edwin has a Bachelor of Economic Science, a Bachelor of Arts (hons) and a Phd from the University of the Witwatersrand.

Saliem Fakir is a leading South African researcher and commentator on the economic implications of climate change has conducted numerous pieces of work in the area. He currently Heads the Living Planet Unit at the World-wide Fund for Nature in South Africa. His primary work involves leading a team of experts in defining a low carbon economy roadmap for South Africa – the work looks at what can be achieve realistically in South Africa and what the economic benefits will be for South Africa if it went the low carbon route.

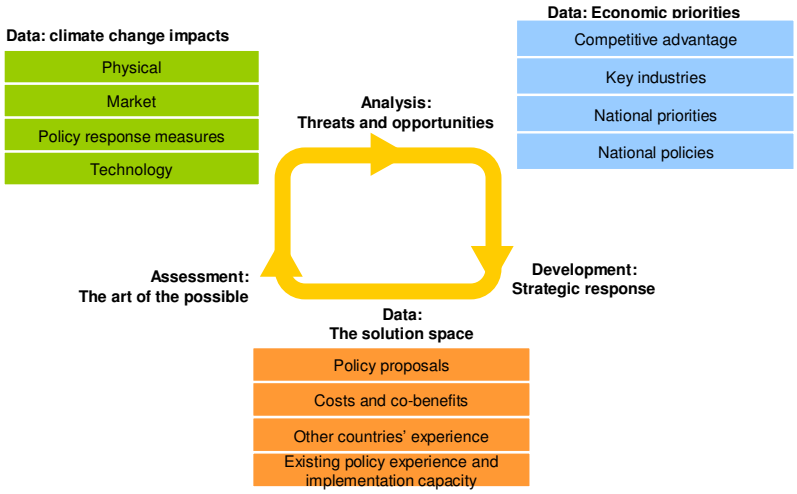
Maya Forstater is a researcher who has worked for over ten years in the field business and sustainable development, working with major corporations, multi-sector partnerships and business groupings in the energy, ICT, apparel, mining and minerals and mobility sectors to advance their understanding and practice in relation to issues including climate change, human rights and labour standards. She has authored and contributed to numerous publications including Responsible Business in Africa: Chinese Business Leaders' Perspectives (Harvard), 'Low Carbon Growth Plans: Advancing Good Practice' (Project Catalyst), and The Business of Adaptation (IIED) and Mobility for Development (WBCSD)

Annex C: Methodology Outline

Rationale

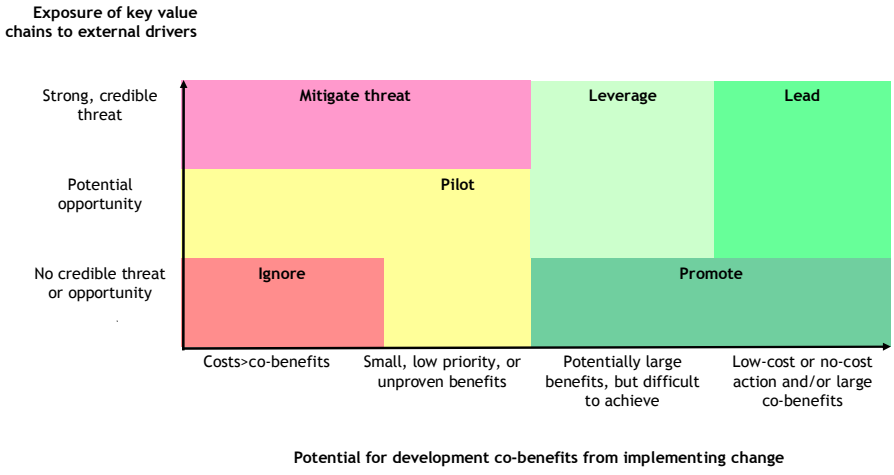
- **Focus:** Assesses climate change challenges in relation to national economic priorities
- **Objective:** determine strategic, actionable policy responses to address the key challenges that climate change poses to national growth and development.
- **Get started:** Draws on existing data sources, develops iteratively .
- **Get better:** can be run quickly, with sparse data in the first round and used to target further data analysis.
- **Mind the gap:** Tests proposals against technical opportunities indicated by marginal abatement cost curve analysis – but is not driven by low-cost abatement analysis.

Process



Analytic framework: low carbon growth strategies

Strategy	Why?	When?
Lead in enabling industry to take strong action and demonstrate performance.	To realise opportunities to improve competitive advantage.	When the threats/opportunities are clear and significant, and the actions would create co-benefits to the economy.
Leverage existing avenues of international support and collaboration make emission abatement or climate-proofing action possible	To protect vulnerable assets and livelihoods and support economic growth.	When the external threats/opportunities are significant, but the internal business case is less strong.
Promote calls for stronger incentives and controls at an international level.	To mobilize greater international support for actions that would enable sustainable development.	When the external incentives are not strong enough to unlock low-carbon growth opportunities which exist.
Pilot experimental approaches and smaller scale action.	To investigate growth potential from addressing emerging areas of threat/opportunity.	When the balance of threats, opportunities and co-benefits are unclear.
Mitigate immediate threats to the economy by seeking exemptions or offsets.	To enable industries to reconcile climate and competitiveness pressures.	When taking action to reduce emissions or climate-proof would make the industry uncompetitive and endanger national growth prospects.
Ignore potential climate change threats and opportunities, continuing with business as usual	To avoid committing resources, or endangering growth which could meet more pressing national priorities.	Where climate change poses no credible threat or opportunity, and action is not feasible or attractive.

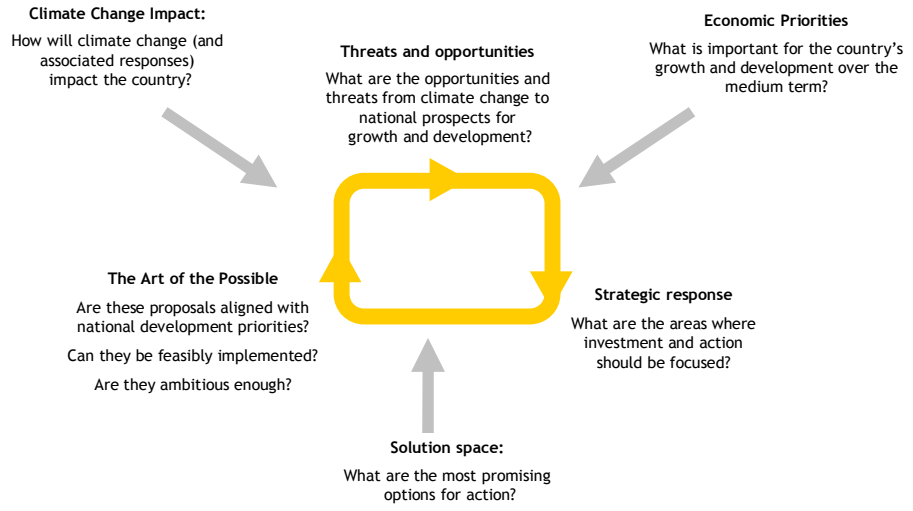


Research team competencies

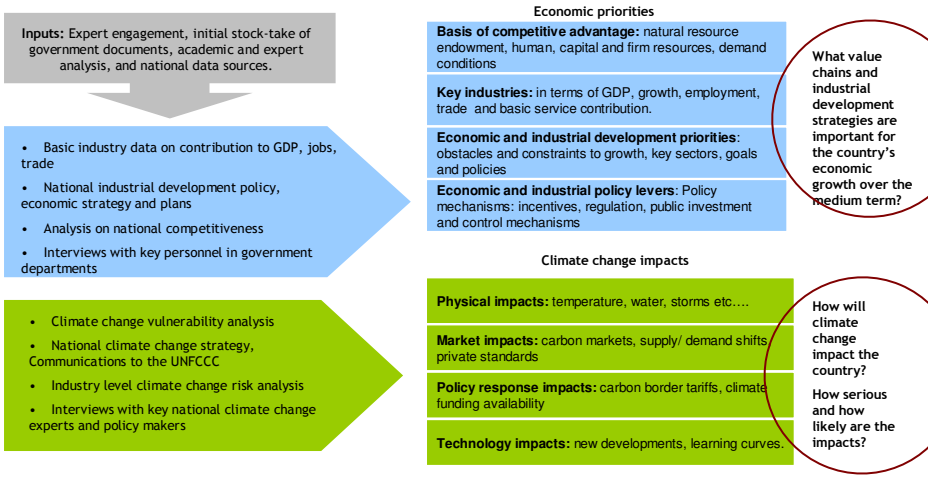
A multi-disciplinary research team able to draw on expertise on:

General	National context specific
Economic policy analysis	Economic policy priorities and policies
Climate change international response	Climate change impacts and vulnerability
Low carbon growth strategies and the economics of climate change	National political and insitutional processes

Exam Questions



Step 1: Gathering Data



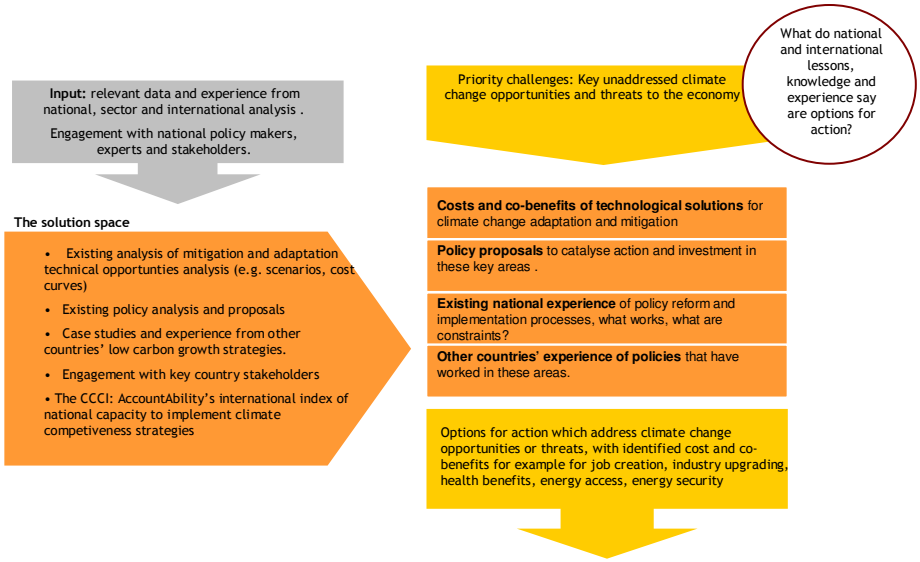
Step 2: Identify and assess threats and opportunities

What are the opportunities and threats from climate change to national prospects for growth and development?

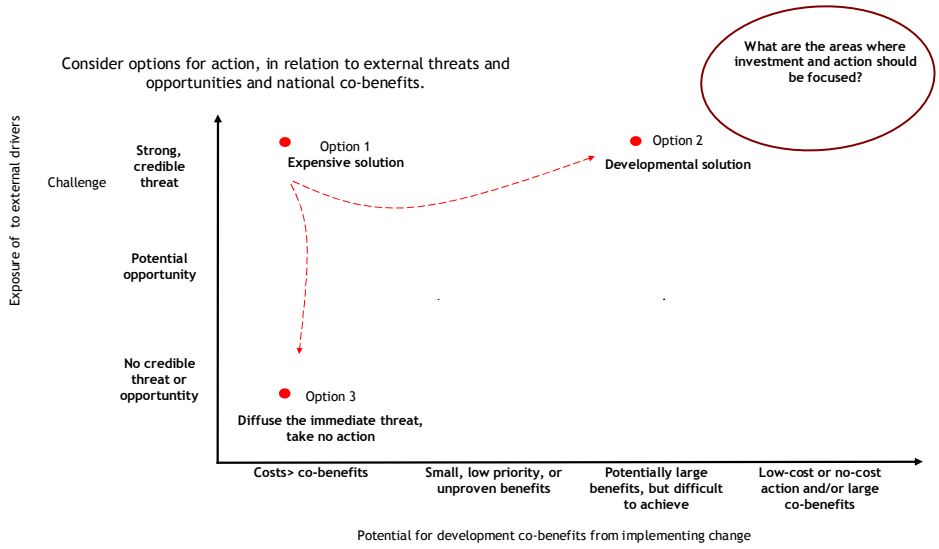
For the value chains and industrial development priorities of the country

	Possible Threats	Possible Opportunities
Physical impacts - How will changes in temperature and water supply, and risk of infectious disease, drought, desertification, storm surge and flooding impact on the economy?	•Whole economy impacts e.g. on water supply, migration. •Impacts on climate sensitive sectors e.g. agriculture, fishing, and tourism. •Impacts on costal and delta industrial centres. •Impacts on costs of infrastructure development.	•Climate change benefits for some industries and countries. •New business to address adaptation needs. •'No regret' actions which strengthen economic resilience regardless of level of climate change.
Market impacts - How will the efforts to reduce carbon footprints within global value chains impact on the ability of key industries to access markets and compete?	•Higher cost of inputs. •Higher cost of capital •Higher costs of production to meet low-carbon market standards. •Loss of competitiveness/access to markets due to private standards on embodied carbon. •Reduced demand for exported products/services (inc. tourism).	•Ability to differentiate at the level of nation, sector brands or products on the basis of reduced GHG impacts. •Increased demand for low carbon products and services. •Access to capital on the basis of lower climate change risk.
Policy response impacts - How will international policy responses to climate change impact on industrial competitiveness?	•Price of carbon - cap and trade schemes or carbon border taxes make products non-competitive. •Climate change conditionalities limit access to existing ODA funding.	•Access to climate funding which can be invested in low-carbon infrastructure with benefits for industrial development. •Access to technology and capacity building under technology transfer agreements. •Opportunity to create jobs, build down-stream industries as a result of policy driven measures to meet international commitments.
Technology impacts -How will green technologies developing internationally in key sectors, impact on national competitive advantage.	•New green technologies make existing assets and sources of competitive advantage obsolete or uncompetitive.	•First mover opportunities as a technological innovator. •Efficiency opportunities and savings as a technology adopter. •Opportunity to leap-frog old infrastructure technologies, avoid expensive lock-in.

Step 3: Identify potential responses



Step 4: Strategy development



Step 5: Assessment

	Assesment criteria		
Proposed action	It is aligned with national development priorities?	Can it be feasibly implemented?	How much will it achieve in terms of overall emissions abatement, or specific adaptation impact?

Does the overall strategy address the key challenges that climate change poses to national growth and development?

Can a set of actionable and fundable steps be determined for making it happen?

How far does the overall strategy go in contribution towards global goals on climate change, and grasping potential technical solutions.

What are the implications for the country's international relations and positions on climate change?

Annex D: South Africa Renewables Initiative Concept Note

"Enhancing South Africa's competitiveness by advancing a low carbon pathway for major existing export sectors, and by catalyzing new industrial and export opportunities through the creation of a renewables energy sector."

Background

South Africa's energy intensive export industries, such as mining and associated materials beneficiation and materials manufacture, depend on access to electricity at prices that are competitive in global terms and in line with similar industries in other parts of the world.

However, the threat of international policy responses to climate change, in the form of Border Carbon Adjustments (BCA) imposed unilaterally by trading partners such as the EU and US mean that the GHG emission intensity of this energy supply is likely to become a competitive issue in future.

At the same time there may be opportunities to demonstrate product differentiation from reducing the carbon intensity of products and processes, through both sourcing progressively less GHG intensive electricity, and investing in energy efficiency measures made economically viable by the associated energy price rises.

These businesses have a choice as to whether to wait-and-see, and perhaps respond later if BCAs become a reality by buying low cost forestry offsets or accept the tariff, or whether to take direct action now to begin to transition towards lower green house gas emissions.

If these industries can be mobilised to take action at a sector level a number of potential opportunities can be unlocked which improve the balance of costs-and-benefits for South African industry:

- **Predictability.** Greater ability to control and plan for predictable costs, rather than risk unilateral action by trading partners.
- **Immediate risk mitigation.** Sector opportunity to negotiate exemptions or waivers on Border Carbon Adjustments.
- **Industrial development**. Uses money that would have been paid out to importer country treasuries or forestry offsets to catalyse development of the local industrial value chain for renewable energy industry and carbon capture and storage.
- **Local investment.** Opportunity to use money that would have been paid out to importer country treasuries or forestry offsets to catalyse development of the local industrial value chain for renewable energy industry and CCS.
- **International support.** Ability to raise international climate funding to support national, sector level action.
- **Early action and learning.** Opportunity to catalyse an early start in investments in renewables to avoid lock in South Africa to a carbon intensive energy pathway, or else force a very major investment in nuclear that might not be the most cost effective approach to take.

The ***South Africa Renewables Initiative*** would be made up of four, interrelated strands:

- *International support to subsidise the domestic renewables feed in tariff***,** potentially linked to the global climate deal, thereby enabling it to be operationalised, incentivising investment in renewables and related industrial opportunities. This offers the international community the opportunity to achieve mitigation at a large scale and low administrative cost.

- *A green energy purchase obligation* for energy intensive exporters, linked to a premium tariff initially set low but rising in planned series of steps in line with development of renewables generating capacity. This would enable these heavy users to plan for, signal and demonstrate their commitment to increasing the renewable component of their energy inputs.

- *Greening South African exports*, a promotional initiative involving public and private players, but also crucially involving government negotiating exemptions from future carbon border adjustments.

- *Establishing a fund* which would solicit, receive and manage both international funds (to subsidise REFIT) and any funds arising from the premium on the domestic green tariff, both to secure the positive incentive of REFIT tariffs, and to seed-fund renewables investment.

SARI would provide a mechanism for raise international and national green tariff funding to provide the REFIT subsidy to make renewables a profitable option. It could also direct a portion of its money to specific areas of investment to enable development of local renewables value chains such as R&D and strategic industry development.

Under the (initial) proposal, the REFIT would be financed from four possible sources:

1. *Domestic electricity consumers*, as currently envisaged, to an acceptable limit.

2. *Carbon levy*, currently at 2 cents/kwh but with potential for being increased and hypothecated and channelled back into REFIT.

3. *Green purchase obligation* by major energy and carbon-intensive exporters, graduated to increase over time.

4. *International public finance,* sourced from (Annex 1) countries with a climate financing commitment, and an interest in bringing its own energy companies into joint industrial ventures in South Africa.

The money thus raised would be used to subsidise the feed-in tariff and boost production of renewables.

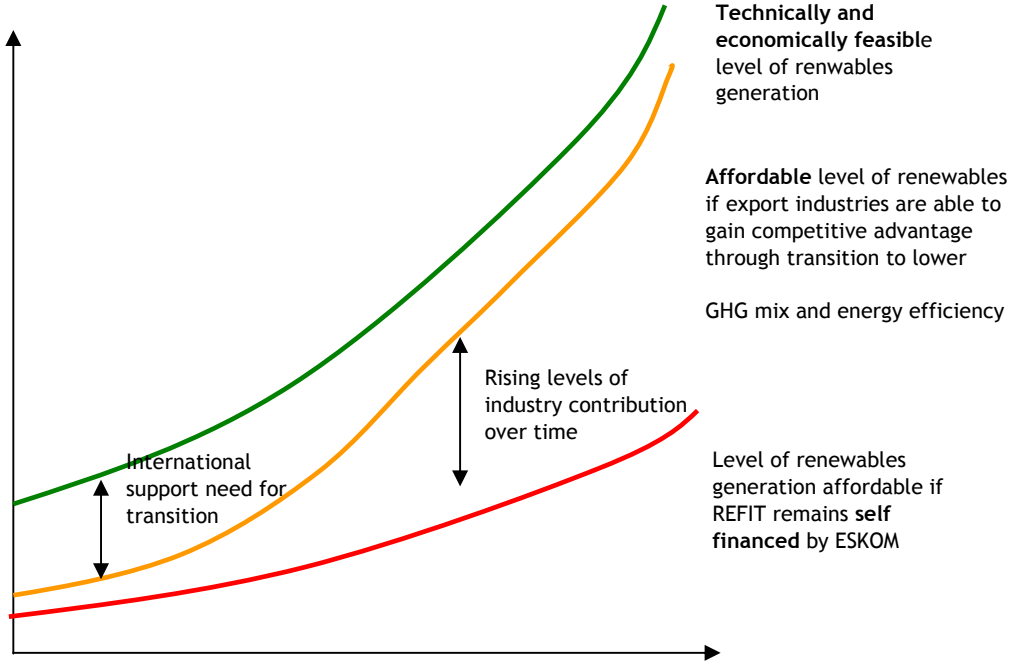
These would be linked to a plan for steadily rising levels of renwables capacity, and for rising levels of industry and international contribution to meet the need for greater sums to subsidise the feed-in tariff as more renewable energy is delivered (although at a falling price per KWH, due to learning curves, and transitioning towards a rising proportion of the costs being borne by industry).

One possible approach envisaged for the international public finance (but needing detailed design work) is that it would:

- Be provided on the basis of kWh produced according to a formula that ensured that it was only supporting some or the entire gap between the REFIT and the full economic cost (not the current price of electricity), which would also incentivise full economic pricing.

- Decline over time and eventually cease because of: (a) falling renewable energy unit costs, (b) increasing financial flows from carbon levy and green purchase obligations, (c) increasing capacity for South African consumers to pay some element with economic growth and income growth.

Exhibit 7: Charting a low-carbon growth pathway through SARI



This would provide a signal that is long and loud, both for energy providers to invest in renewables capacity, and for energy users to invest in energy efficiency, and for international trade partners to recognise that South Africa is pursuing a low carbon development pathway.

This route, if successful, would respond to specific pressures that energy intensive exporters are facing and use their commitment to action to leverage international support, it would then use this combined stream of funding to provide long-term signaling about renewables demand.

This approach would overcome key institutional barriers to progress by mitigating the current perverse and negative incentive to Eskom not to progress. It would remove the requirement on Eskom to fund the incremental costs of the renewables feed-in tariff, and furthermore it would in able them to access this funding themselves, enabling greater investment in renewables by both Eskom and IPPs. From an international perspective, such a subsidy would in effect be financing carbon mitigation, albeit indirectly and potentially more efficiently and effectively than project based approaches.

Whilst this approach might be most efficient, there may be institutional challenges in securing a medium term commitment from Annex 1 countries to such a 'top-up' subsidy scheme. A second option would be to establish a supply-side support mechanism that would lower the cost of capital invested in renewables, and on this basis reduce the effective level of REFIT required to stimulate such investment. The impact might therefore be the same but would not require a multi-year commitment by governments accustomed to making only single year allocations.

Investigating which approach would in practice be a smart intervention depends on the practical specifics, and it is in this context the next step would be a study to assess the feasibility, effectiveness and acceptability of these ideas.

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