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Does money grow on trees? The role of climate change finance in South Africa

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Masters dissertation. Final submission.
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Declaration of Academic Honesty

I, Jocelyn Newmarch, student number 400595, declare that this is my original work. Where I have drawn upon the work or ideas of other scholars I have given them full credit. I am aware of the consequences for plagiarism and I declare that I have not plagiarised any part of this report.

This work has never been submitted before for any degree or examination at any other university. I am submitting it in partial fulfilment of the Master of Arts degree in Development Studies at the University of the Witwatersrand.

Signed:

15 February 2013

Abstract

Rapid, human-forced climate change as a result of greenhouse gases is threatening the fabric of human civilisation itself. It is clear that we need to alter our development and poorer countries will need to develop while limiting their emissions, but it is not clear what sustainable development would entail. Climate change policy solutions have pivoted on carbon trading, under the auspices of the Clean Development Mechanism (CDM), but this too has failed to limit growth in carbon emissions. This report looks at the operations of the CDM in South Africa as a source of climate finance meant to facilitate sustainable development. Though South Africa has emphasised its commitment towards a low-carbon transition, in practice its national planners seek to preserve energy-intensive mineral and industrial sectors. This research draws on both primary and secondary documents as well as interviews with carbon professionals to conclude that CDM projects have played a limited role in South Africa, but has tended to reproduce the existing minerals and energy complex within the country.

Acknowledgments

It is a strange and wonderful privilege to be able to undertake academic research at a postgraduate level, in being able to think deeply, with rigour and perhaps occasionally even courage, about one particular tapestry of cause, effect and impact.

I always finish a research project (academic or otherwise) with mingled emotions of gratitude and humility. Research can be a lonely and frustrating endeavour, as most postgraduates can attest. At the same time, the researcher is made profoundly aware of how dependent she is on the goodwill of many, many people, some friends and colleagues, others strangers. I was constantly humbled by the willingness of so many smart, hardworking people to extend a helping hand. I do not claim one-tenth of Isaac Newton's genius, but like him, I know what it is to stand on the shoulders of giants.

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Glossary

Carbon

Carbon is an element found on the Periodic Table. It is present in all known life forms and, with oxygen, makes up carbon dioxide, an important greenhouse gas.

Carbon Credits

A tradable certificate issued for reducing one tonne of carbon dioxide or equivalent gases. In this respect, it is a form of money.

Carbon Dioxide

A colourless, odourless gas produced by all animals when they breathe. Carbon dioxide is the most common warming gas. It is represented by the chemical symbol CO_2.

Carbon Dioxide Equivalent

There are several warming gases which can contribute to rising temperatures on earth. They may have a greater or smaller amplification effect, and they are measured for our purposes according to carbon dioxide equivalents – that is, the equivalent amount of carbon dioxide which would be needed to produce the same amount of warming. Methane and hydrofluorocarbon have particularly large effects, but are far less common than carbon dioxide. Carbon dioxide equivalent is represented by the following symbol: CO_2e.

Carbon Market

The carbon market is where carbon credits are bought and sold.

Certified Emission Reduction (CER)

Certified Emission Reductions, a form of carbon credit, are issued by the Clean Development Mechanism's Executive Board. Each CER represents a one tonne reduction of carbon dioxide equivalent gases.

Clean Development Mechanism (CDM)

The Clean Development Mechanism was created by the Kyoto Protocol and falls under the United Nations Framework Convention on Climate Change (UNFCCC). It aims to promote sustainable, low-carbon technology in poorer countries by certifying projects which use less carbon than similar projects using more energy-intensive technology or fossil fuels. The CDM Executive Board issues carbon credits known as Certified Emission Reductions (CERs) for emission reductions by the project.

Climate Change

In this report, climate change refers to a change in climate over time which can be directly or indirectly attributable to human activity. This is sometimes referred to as anthropogenic climate change. However, changes in the climate can occur naturally and have done so in the past.

Designated National Authority (DNA)

A government body which vets all CDM applications in the respective country, in this case South Africa. The DNA can stipulate additional criteria for CDM projects in the country, over and above the international standards developers must adhere to. The DNA's job is to consider whether applications will further sustainable development in that country. Projects must have DNA

approval before the CDM Executive Board will consider the application and decide whether to grant carbon credits.

Environmental Rights

Environmental rights are rights which include the right to clean air and water. Friends of the Earth International holds that these rights include access to unspoiled natural resources that enable survival, such as land, shelter, food, water and air. The organisation also classifies certain political rights under the environmental rights umbrella, including rights for indigenous people, the right to resist unwanted development, the right to information and participation in decision-making, and the right to claim reparations for violated rights for climate refugees and others displaced by environmental destruction, the right to claim ecological debt, and the right to environmental justice.

Section 24 of South Africa's Constitution stipulates that everyone has the right to an environment that is not harmful to their health or well-being, to have the environment protected for the benefit of present and future generations, through measures to prevent pollution, promote conservation, and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.

Fossil Fuels

Coal, oil and gas were formed by the anaerobic decomposition of natural organisms, over millions of years, and are consequently known as fossil fuels. They generally contain high percentages of carbon, are non-renewable, and are the dominant source of energy in the world today.

Greenhouse Effect

Much of the thermal radiation emitted by the Earth's land and seas is captured by the atmosphere, including clouds, and bounces back to the planet's surface. This effect is known as the greenhouse effect (IPCC AR4: 155).

Without the greenhouse effect, the Earth would not be habitable by humans. However, we can have too much of a good thing, and scientists are warning that an accelerating greenhouse effect has already resulted in rising temperatures.

Greenhouse Gases

Gases which contribute to the greenhouse effect by trapping heat rays are known as "greenhouse gases". The most well-known of these gases are probably carbon dioxide and methane. The common abbreviation is GHG.

Kyoto Protocol

Currently, the only legally binding international agreement targeting greenhouse gas reduction is the Kyoto Protocol, which was agreed in Kyoto in 1997 and came into force in 2005. The protocol is linked to the United Nations Framework Convention on Climate Change. It sets binding targets for 37 industrialised countries and the European community for reducing greenhouse gas emissions. These amount to an average of five percent against 1990 levels over the five-year period between 2008 and 2012. The protocol places a heavier burden on developed countries under the principle of "common but differentiated responsibilities". It recognises that these countries are chiefly responsible for the current high levels of greenhouse gases in the atmosphere, as a result of more than 150 years of industrial activity. Countries must meet their targets primarily through national

measures, but the protocol also allows them to meet their targets through market-based mechanisms (UNFCCC, nd).

Market-based mechanisms

The Kyoto Protocol permits developed countries to use three market-based mechanisms in partial fulfilment of their national greenhouse gas targets. These are: emissions trading, also known as the carbon market; joint implementation (JI); and the clean development mechanism (CDM). In this report, I discuss mainly the first and last of these three, as JI is not applicable to developing countries such as South Africa(UNFCCC, nd).

United Nations Framework Convention on Climate Change

This convention is abbreviated as UNFCCC and entered into force in 1994 to prevent "dangerous" human interference with the climate system. It has now been ratified by 195 countries, who are known as Parties to the Convention. The UNFCCC is one of the three Rio Conventions, adopted at the 1992 Earth Summit in Rio de Janeiro. Its sister conventions are the UN Convention on Biological Diversity and the UN Convention to Combat Desertification (UNFCCC, nd).

Rights of Nature / Rights of Mother Earth

he Rights of Nature movement recognises and honours nature's rights. Its approach states that "nature in all its life forms has the right to exist, persist, maintain and regenerate its vital cycles" (Global Alliance for the Rights of Nature, nd). Such environmental rights are also known as "rights of Mother Earth". Ecuador included rights for nature in its constitution in 2008, and Bolivia passed the "Law of Mother Earth", enshrining nature's rights, in 2011 (Guardian 2011a).

"It's not easy being green... It's beautiful, and I think it's what I want to be."–Kermit the Frog (Bein' Green, 1970)

Introduction

By some accounts, this report should be written from beyond the grave. According to some interpretations of ancient Mayan texts, the end of the world was expected to occur on either 12 or 21 December, 2012. Meanwhile, the Rapture, which is believed by evangelical Christians to signal the beginning of the end times, when those faithful to God will be taken into heaven, was supposed to occur on 21 October 2011.

It is easy to laugh at the lunatic fringe, and apocalyptic beliefs have been a constant at least since the Roman Empire. But the thought still gnaws. Maybe we are in the end times.

Many scientists agree that we are in the midst of the sixth great extinction the Earth has seen. Species are disappearing at rates last seen at the end of the age of the dinosaurs. This time, the extinctions are attributed not to natural causes, but to the impact of humans: habitat destruction, the introduction of invasive species, and human-induced climate change.

The present trajectory of human activity means that the planet is on course for an average four degrees of warming–a level which many believe threatens human civilisation itself.

The Earth's climate is changing rapidly–more rapidly than it ever has in the past–and this time, human activity is the cause. It is true that climate change, as a natural phenomenon, has always accompanied life on our planet. Indeed, the greenhouse effect–resulting from heat-trapping gases in the atmosphere–first made our planet habitable.

But physical science is uncaring. As the levels of greenhouse gases continue to rise, so we can expect temperatures to carry on increasing. There is broad agreement among scientists that human dependence on fossil fuels has resulted in this warming phenomenon.

There are now seven billion people alive on the planet, and demographers predict that we will reach nine billion by 2050. Yet providing adequate food, water, shelter and energy for current needs is a battle that we are far from winning, with surpluses for the rich, while many remain without enough for their basic needs. Continuing to degrade the ecosystems on which our settlements depend, will further exacerbate this situation.

Even if we were able to meet all these pressing challenges, we are still faced with our dependence on fossil fuels in the form of oil, gas, and coal. Monbiot (2007) argues that while it is technically feasible to reduce carbon emissions by the amount required by science, it will not be possible without a fundamental change in society. Future generations will need alternative energy sources in order for society to continue in its current form – but these sources are not easy to identify and come with their own problems, as Monbiot describes.

It is clear that we need to alter our development path in order to avoid the worst impacts of climate change and degraded natural resources. What is not clear is precisely how this should be achieved. While most agree that development should be sustainable, there is wide disagreement as to what sustainable development actually means in practice.

Industrialisation has directly led to human-forced climate change. This linkage strikes at the heart of capitalism itself. Some market fundamentalists appear to have responded by denying the reality of climate change (Oreskes and Conway). Others argue that capitalist principles should remain at

the heart of any development path, including a low-carbon path–that capitalist-centred development can, and should, be sustainable. Indeed, capitalism can, in this view, be the saviour of sustainable development. The difficulty here is that we are still working out precisely how this would work.

Industrialised Western countries have been able to achieve their present rates of development by emitting large amounts of greenhouse gases. The Industrial Revolution was fuelled by coal, and Europe was able to expand its economies through the resources colonialism provided.

Countries signing on to the Copenhagen Accord, of which there are now 141 (UNFCCC website, not dated), have recognised that greenhouse gas concentrations should be stabilised at a level leading to no more than a change of two degrees Celsius in global temperatures (Copenhagen Accord 2009).

This means that the traditional, carbon-intensive path of economic growth will no longer be open to developing countries. Instead, developing countries who wish to pursue economic growth–and I'm not aware of a single exception–need to forge a new path which will limit carbon emissions. While the path to wealth for the First World was paved with coal, we in poorer countries will have to break new ground. In prioritising this goal, are we allowing capital to benefit from a problem it helped to create? More pragmatically, can we use capital to solve this problem without setting up new impasses?

In global negotiations climate change policy solutions pivot on carbon trading (emissions trading). Broadly put, most wealthy countries have agreed to cut their emissions while assisting their poorer counterparts to finance sustainable development. So far this sounds good and fair. The difficulty is

that carbon trading would allow rich countries to continue polluting while locating carbon reduction initiatives (reflected on their greenhouse balance sheet) to poorer countries. Such carbon reduction initiatives are defined quite broadly, and often result in only a hypothetical reduction of greenhouse gases.

So far the Kyoto Protocol, the only legally binding agreement targeting greenhouse gas emissions, has failed to deliver even modest reductions in emissions. In part this may be due to its inclusion of the carbon trade for emissions reduction purposes. Under the protocol, 37 industrialised countries along with the European Union undertook to cut their emissions by an average of 5% on 1990 levels, between 2008 and 2012 (UNFCCC, not dated). But world emissions have actually increased. The International Energy Agency now estimates world production of greenhouse gases to be 30,6 gigatonnes of carbon dioxide equivalent–the largest amount yet (The Guardian 2011b).

Up to the present, increasing emissions of carbon dioxide and other warming gases has been the only way to reduce poverty. Cleaner technologies, which emit fewer greenhouse gases, are often seen as too expensive and may require skills that are in short supply. In response, poor countries have asked rich nations for funding, capacity building, and technology transfer. One of the ways in which sustainable development is currently funded is through the Clean Development Mechanism (CDM).

The CDM is a market-based mechanism under the Kyoto Protocol which allows participants in developed countries to buy carbon credits in order to offset their greenhouse gas emissions. It has two aims: to promote sustainable development and to allow industrialised countries to meet their emissions targets at a lower cost.

In South Africa, the debate around sustainability takes on a particular urgency. The country is blessed, or cursed, with considerable mineral resources, coal included, which has profoundly shaped its development over the past century. Widespread unemployment and poverty sit uneasily alongside gleaming shopping malls. Cheap energy from coal has fuelled economic development, but although access has improved the latest census found that only 58.8% of households use electricity for heating (up from 49.9% in 2001), while 73.9% use electricity for cooking. Given that 84.7% of households used electricity for lighting, it seems likely that affordability remains a barrier to more intense power use within households (Statistics South Africa 2012).

Climate change is expected to impact on food security and water availability, bring more intense storms, and reduce biodiversity. According to the National Climate Change Response White Paper, South Africa is "extremely vulnerable" (Department of Environmental Affairs 2011: 8) to climate change impacts, which are likely to include an overall decrease in water availability, coupled with heightened frequency and intensity of extreme weather events, floods, droughts, and veld and forest fires. In addition, many species of plants and animals are likely to become extinct.

The same paper describes climate change as "one of the greatest threats to sustainable development" and asserts that unmitigated climate change "has the potential to undo or undermine South Africa's own development goals and the Millenium Development Goals" (Department of Environmental Affairs 2011: 9).

Coastal regions, including economic and tourist centres such as Cape Town and Durban, may be vulnerable to storm surges from rising sea levels. Poor people in rural areas rely on subsistence

farming and fishing–livelihoods which make them particularly vulnerable to adverse weather events.

Yet the government has continued to prioritise large coal power stations and mining projects. Renewable energy may be the path of the future, but historically it is the mining industry which has created the most jobs.

The tension between environmental and economic considerations is very apparent, and nowhere more so than in the field of energy policy. To borrow Stone's (1996) formulation of the inherent tension in sustainable development, should the South African government prioritise generations yet unborn, or meet the needs of people who are presently suffering?

In this report, I will focus particularly on the problem that climate change represents in South Africa and the financing of carbon offset projects in this country. Climate change finance is a broad and growing area, so I have chosen to focus specifically on the impact of carbon finance, through certified emission reduction certificates (CERs or carbon credits) on South African sustainable development initiatives.

By definition, sustainable development is an idealistic philosophy, calling for present populations to exercise restraint in favour of often hypothetical future generations. Capitalism, in its sustainable (or green) form is likewise idealistic. I argue that the practice of green capitalism, or carbon capitalism, in South Africa, represents a failed idealism.

I have used a sustainable development lens to focus my analysis of this area of the economy, in conjunction with Shiva's (1988) ecofeminist critique of development and capitalism and the Mother Earth rights perspective put forward by Stone, Solon and Cullinan.

On paper, South Africa should be a natural candidate for substantial inflows of carbon finance– both private money operating through the carbon market and bilateral aid. South Africa is, after all, a developing country with high rates of poverty, inequality, and unemployment, as well as being the world's 12th largest greenhouse gas emitter (Department of Environmental Affairs 2010). Clearly, if we are to live up to the lofty promises contained in the voluntary offer made to the international community of reducing our emissions growth by 34% by 2020, and 42% by 2025, we will need substantial financial and technical assistance–a point acknowledged by the South African government itself.

In practice, however, South Africa's policy framework for climate change mitigation and carbon finance has only recently been fleshed out, and until recently there were few incentives for the private sector to adopt greener technology. Relatively few carbon offset projects have been registered by the United Nations' Clean Development Mechanism board, with many languishing at concept stage. The New Growth Path views green industries chiefly as a tool for job creation, while the latest version of the Industrial Policy Action Plan (IPAP2) promotes the green economy alongside the automobile and minerals beneficiation sectors.

The country's politicians promote a transition towards a green economy which would see growing economic activity in green sectors, leading to investment, jobs and competitiveness, and the entire economy shifting towards cleaner industries and sectors (Environmental Affairs website: 2012).

Nevertheless, construction continues of new coal-fired power plants, and mining remains a priority sector for government and business alike. So while a green economy is inscribed as a goal on paper, in practice our economy has remained brown.

My research analyses the barriers which still face carbon offset projects and how carbon finance is being used in the economy. Though some work has already been carried out in this area, climate finance is still a developing subject in the international negotiations, and the domestic policy framework is still sketchy. There is therefore a need for additional research.

The project will seek to answer the following questions:

What role do carbon offset projects play in the South African economy?

What explains South Africa's embrace of such carbon offset projects?

What is the relationship between these carbon offset projects and sustainable development?

Theory and literature review

In this section I will present some of the discussion that centres on key concepts for my research: sustainable development, climate change, climate finance, and the South African situation. In particular I cite key arguments drawn from environmental and ecological economics, and from relevant historians.

Sustainable development

All development depends upon natural resources, such as water availability, good soil, plants for medicine and food, timber for furniture, biomass for fuel. Without these natural resources, human society would collapse. According to Diamond (2005), this particular outcome has occurred many times in human history. He argues that the Greenland Viking settlement, the Easter Island culture, the Mayan societies and many others all collapsed either as a result of unsustainable harvesting of natural resources or from inability to adapt to a changing climate.

Sustainable development embraces a range of approaches: focus on renewable energy rather than on finite reserves of fossil fuels; water conservation; reduction in human population growth; an end to poverty; recognition that ecological resources need to be conserved. Given these limits, how best, then, can we forge a new development path?

In 1987, the World Commission on Environment and Development released a report entitled "Our Common Future" which listed a number of environmental concerns, including toxic waste pollution, ozone depletion, and global warming as a result of the greenhouse effect. In putting the case for sustainable development that would address poverty and environmental degradation

while allowing human society to progress the report offered a definition of sustainable development as "an approach to progress which meets the needs of the present without compromising the ability of future generations to meet their own needs" (Report of the World Commission on Environment and Development, 1987). This definition continues to be popular although it is less than clear just how it should be implemented, or what precisely constitutes sustainable development. Perhaps this very vagueness helps to explain the concept's enduring popularity – it can mean all things to all people. Cock (2004) raises the objection that sustainable development is overly vague and fails to privilege the environment which is necessary for human society itself. In addition, the sustainable development discourse is often marked by "technicist, pragmatic and reformist attempts to bring environmental externalities into the marketplace through ecological modernisation" (Cock 2004: 4).

In contemporary discourse, sustainable development has come to mean a "green economy", which, like its predecessor, is a rather vague and overarching term. In the South African context, a green economy appears to be a capitalist economy built around the supply of renewable energy, the manufacturing of renewable energy components, and the jobs that it can create. We can think of this concept as a form of green neoliberalism, or environmental capitalism.

In contrast, many other accounts have been proposed of what sustainable development could look like. Daly proposed the concept of sustainable development as a steady-state economy, with both population and capital or stock to be held constant at levels which are "sufficient for a good life and sustainable for a long future" (1980: 325). Growth, according to Daly, refers to an increase in service resulting from an increase in stock and throughput (the flow of energy from natural sources through the human economy and back to nature), whereas development refers to an increase in efficiency, with either stock or throughput held constant.

Daly also criticises the goal of development through economic growth: “Economic growth is essentially a phenomenon of the last 200 years, and only in the last 50 years has it become the dominant goal of nations. Growth is an aberration, not the norm” (1980: 329).

A related critique of modern economies is set out by Schumacher, who takes issue with what he terms “the almost universally held idea that the rich societies set the norm and demonstrate what can and ought to be achieved by everybody” (1980b: 130), noting that the United States, with 5,6% of the world’s population, consumes almost 40% of the world’s output of raw materials, many of which are non-renewable. He argues that a value system is needed to evaluate the present development path (1980a; 1980b).

While individuals may wish to make different choices and consume less, it is the entire structure of society which is at fault and which must be changed. Schumacher is particularly critical of modern production systems, which, though themselves a product of society, in turn have the power to shape society:

> Although it is, of course, society that produces the production system, once a particular system has come into existence it begins to mould society; it, as it were, insists that the members of society respect the immanent logic of the system and adapt to it by accepting its implicit aims as their own. Man then becomes captive of the system whether he approves of its aims or not, *and he cannot effectively adopt different aims or values unless he takes steps to alter the system of production.* (1980b: 132; emphasis in the original)

Schumacher makes it clear that he refers to industrial production systems, but I would argue that this sentiment has broader implications for the nature of capitalist society.

While modern economics uses consumption as a proxy for human well-being, Schumacher argues that this assumption is misplaced: “Since consumption is merely a means to human well-being, the aim should be to obtain the maximum of well-being with the minimum of consumption” (1980a: 141). The effect of this would be similar to the change in focus advocated by Stiglitz (2006): from an obsession with national income, as measured by gross domestic product, or GDP, to a broader concept of wellbeing, or “gross national happiness” (Stiglitz 2006:45), in a term coined by the king of Bhutan.

Looking at GDP figures in isolation can present a misleading image of a country’s wealth, Stiglitz argues: “Growth must be sustainable... You can get GDP up by despoiling the environment, by depleting scarce natural resources, by borrowing from abroad–but this kind of growth is not sustainable” (2006: 45).

Stiglitz’s lament was earlier expressed by Repetto, Magrath, Wells, Beer and Rossini (1992), who criticise the national accounts system for ignoring natural resources: “A country could exhaust its mineral resources, cut down its forests, erode its soils, pollute its aquifers, and hunt its wildlife and fisheries to extinction, but measured income would not be affected as those assets disappeared” (1992: 365). This leads to a false dichotomy between environment and economy, which in turn leads policymakers to depreciate environmental assets in order to generate income.

Schumacher criticises modern economics for failing to distinguish between renewable and non-renewable materials, and using cost as the only allowable difference. In this he raises a similar objection to that voiced by Repetto et al:

> Nonrenewable goods must be used only if they are indispensable, and then only with the greatest care and the most meticulous concern for conservation.... The Buddhist economist would insist that a population basing its economic life on non-renewable fuels is living parasitically, on capital instead of income. Such a way of life could have no permanence and could therefore be justified only as a purely temporary expedient. (1980a: 143)

Other writers have suggested that the entire development process is itself fundamentally flawed. Shiva (1988) asserts that development, in the conventional sense, should be characterised as maldevelopment, based on patriarchal domination over both women and nature: "Activity, productivity, creativity... are transformed into the exclusive qualities of man" (1988: 6). Nature's survival processes are not recognised as factors in economic development. As a result, when resources are transferred or destroyed, the political issues are shrouded.

Shiva's contribution recognises the gendered and classist nature of development. Development requires the taking of natural resources; too often, these resources are taken from rural and marginalised communities, deepening local poverty. In addition Shiva questions the conventional understanding of poverty, noting that many are labelled poor because they participate to a limited extent in the market, while in fact these communities satisfy basic needs through self-provisioning. Labelling such communities as poor justifies a development process which destroys sustainable lifestyles and creates real material poverty, she says (Shiva: 1998).

This is a valid point which should give us pause for reflection, although at the same time I would say that many communities are not merely labelled as poor. They are in fact poor in a material

sense, and this can further deplete their natural resources – as in the case of deforestation resulting from firewood collection.

For Shiva, poverty, the market, and development are all interconnected:

> Demands for natural resources are restricted to those demands registering on the market; the ideology of development is in large part based on a vision of bringing all natural resources into the market economy for commodity production. When these resources are already being used by nature to maintain her production of renewable resources and by women for sustenance and livelihood, their diversion to the market economy generates a scarcity condition for ecological stability and creates new forms of poverty for women. (Shiva 1988: 9)

Shiva's work is particularly useful in the South African context. While policymakers push towards a green economy, based on renewable energy capitalism, Shiva reminds us that natural resources are not necessarily free for the taking, and that even actions we perceive as "green" can have important consequences for poor and rural communities, particularly women.

Though much has been said about the benefits of a green economy there is not that much clarity on what a green economy actually is. Looking at the outcome of the Rio + 20 conference – or to give it its full name, the United Nations Conference on Sustainable Development, held in June 2012 – delegates seem to have been hedging their bets while pledging a virtual shopping list of sustainability goals, including human rights, democracy, environmental protection, and jobs. Poverty eradication "is the greatest global challenge facing the world today and an indispensable requirement for sustainable development" (UN Conference on Sustainable Development, 2012: 1). In addition, sustainable development requires sustainability in consumption and production, and

the protection and management of the natural resource base for economic and social development. Delegates agreed that the integrated and sustainable management of natural resources and ecosystems would support development while facilitating ecosystem conservation.

A green economy is an "important tool" for sustainable development (UN Conference on Sustainable Development 2012: 10). While not a rigid set of rules, it should eradicate poverty, grow the economy, improve human welfare and social inclusion, create jobs, and maintain healthy ecosystems. Green economies help to manage natural resources sustainably, efficiently, with lower environmental impacts and less waste. There is no prescribed approach to implementing a green economy; rather, this should be done in accordance with national policy and goals (UN Conference on Sustainable Development 2012).

Presumably, this means that it should be possibly to implement a green economy based on socialism rather than capitalism, as markets are nowhere listed as a precondition for such an economy. Further, it is not clear how a green economy differs from sustainable development: their goals and impacts appear to be almost identical, even though they are referred to as different beasts.

Recently, some activists have suggested another approach to sustainable development – one which would guarantee certain rights to nature itself, within human legal systems. The rights of nature movement goes unmentioned by the Rio+20 delegates, but it offers a potential tool for sustainable development. In such a situation, polluters would not, for instance, have to pay to release dirty gases into the atmosphere. Rather, pollution itself could be made illegal – although if this was done, it is likely that certain loopholes would exist to allow pollution in the service of an overriding public interest. There are no silver bullets, but this approach would force human decision makers

to balance economic, environmental and long-term interests while elevating the status of the environment. It is also in keeping with Shiva's approach, as described above, in offering the possibility of a legal framework which guarantees the dignity of the natural environment and indigenous or otherwise marginalised communities who live close to the land.

In Cullinan's view, legal systems are used to transmit value: "Communities have always used laws to express the ideals to which they aspire and to regulate how power is exercised" (Cullinan 2008). Cullinan points out that law is wielded most effectively by the powerful, and thus tends to entrench a society's fundamental idea of itself and the world. Modern American law–and that of most other countries–regards most non-human life as property or resources to be exploited, bought and sold. As a result, there is poor regulation of actions that damage the environment upon which life depends.

Cullinan suggests limiting the rights of humans "so they cannot unjustifiably prevent nonhuman members of a community from playing their part". Humans must be prohibited from driving species to extinction and disrupting major ecosystem functions. Further, he suggests re-examining corporate law to include responsibilities towards the natural world. Individual and collective human rights should be balanced against those of other Earth communities (Cullinan 2008).

Climate change

Sustainable development is sometimes seen as a kind of magic bullet, capable of resolving a host of problems in a single stroke, including poverty, food security, and environmental degradation (witness the Rio + 20 declaration referred to above). One such problem in particular that has been steadily ascending the international agenda is climate change.

Industrial activity around the world in the last two hundred years has caused the release of ever-increasing quantities of carbon dioxide and other gases into the atmosphere, where they retain heat from sunlight. This is commonly known as the greenhouse effect (Joubert 2006), and gases responsible for this effect are categorised as greenhouse gases. Natural variation in climate does also occur, but in this research report I deal only with the human-caused climate change which dates from the beginning of the industrial era.

Ninety-seven percent of publishing scientists agree that climate change is occurring and that it is caused primarily by human activities (Centre for Climate Change Communication, George Mason University 2011). Climate change is accepted as a real threat to biodiversity and human civilisation.

In 1992, a number of countries agreed to form the United Nations Framework Convention on Climate Change, and in 1997 many of these countries also chose to sign the Kyoto Protocol which for the first time placed limits on the amount of greenhouse gases industrialised countries could emit. However, the United States – the world's largest polluter at the time – refused to ratify the Kyoto Protocol, leading to a stalemate in international environmental governance. Since then, international action on climate change has been limited. As yet, the Kyoto Protocol is the only international agreement which forces some countries to limit the amount of greenhouse gases they emit.

The problem of climate change and environmental degradation is frequently seen as a tragedy of the commons of the kind described by Hardin (1992). Because the atmosphere belongs to all, no individual nation has an incentive to pollute less than other nations. On the contrary, each nation is

instead incentivised to maximise pollution (a by-product of industrial development) in order to gain as much as possible.

It is easy to forget that previous societies have also faced climate change, since climate is never static and alters continually in response to changes in a range of natural factors, including the amount of heat put out by the sun, volcanic eruptions which inject dust into the atmosphere, alterations in the axis of the Earth itself, and changes in the distribution of land and ocean over the Earth's surface (Diamond 2005). Particular instances include the Ice Ages which began two million years ago, and the global cooling which followed the volcanic eruption of Mt Tambora in Indonesia in 1815 (Diamond 2005). Climate can vary not just from year to year, but also from decade to decade, which can make it especially difficult to distinguish human-caused climate change from natural variation.

Previous human societies met these climate challenges with varying degrees of success. Some societies, such as the Viking colony in Greenland, were not able to adapt and their culture was lost. Others, such as the Inuit who likewise settled in Greenland, thrived upon the challenge (Diamond 2005).

Unlike the societies cited in Diamond's case studies, the threat which climate change now poses faces the whole of global human society, and on a scale so large and so abrupt that some commentators see it as the most serious challenge that has ever faced humankind. And because it is largely the consequence of industrial development and economic growth, tackling climate change will require the establishment of a new development path for emerging economies, together with substantial finance for poorer nations (Stern 2007).

The influential *Stern Review: The Economics of Climate Change*, commissioned by the British government, concluded that the benefits of early action on climate change outweigh the costs. The cost of an average temperature rise of five degrees Celsius, according to Stern, could be up to 20% of per capita consumption if the indirect impact on human health and the environment is added to capital losses.

> The current level or stock of greenhouse gas emissions in the atmosphere is equivalent to around 430 parts per million (ppm) CO_2, compared with only 280ppm before the Industrial Revolution. These concentrations have already caused the world to warm by more than half a degree Celsius and will lead to at least a further half a degree warming over the next few decades, because of the inertia in the climate system. (Stern 2007: 2)

Even if growth in emissions remained constant at 2007 rates, the stock of greenhouse gases in the atmosphere would reach 550ppm–double the concentration from pre-industrial times–by 2050. But growth is accelerating and the 550ppm level could be reached by 2035, putting the world on course for a five degree increase in global average temperatures (Stern 2007). The Stern review estimated the cost of stabilising global greenhouse gases at the 500-550ppm level as being 1% of annual global GDP by 2050, with net benefits on the order of $2,5 trillion over time (Stern 2007).

International climate change negotiations have yet to gain substantial momentum, however, although signatory countries to the Durban Platform for Action, agreed upon in December 2011, pledged to come up with a comprehensive agreement for climate change by 2015, which would come into force by 2020.

The lack of consensus on how climate change should be tackled reflects the shortcomings in sustainable development theory. Few countries are willing to make a substantial economic commitment to sustainable development, whatever their ostensible declarations in its favour (a notable exception being the Maldives, which under former president Mohammed Nasheed pledged to achieve carbon neutrality). The attitude of many developing countries (South Africa included) where poverty and unemployment are most pressing is to persist with development-as-usual. This suggests that confidence in sustainable development, or in the ability of the international community to adequately finance the transition, may not be very high.

Perhaps some of this paralysis is due to competing visions of potential environmental solutions. Clapp and Dauvergne (2011) cite four environmental philosophies which differ in their proposals according to divergent understandings of the underlying causes of environmental degradation. Until now, market liberal and institutionalist causes have prevailed at major environmental conferences, with a trend towards institutional oversight of global environmental governance. This is because institutionalists tend to offer compromise solutions to difficult problems–although such policy, in the eyes of more left-wing environmental advocates, "may only slow down, but not reverse, the current crisis" (Clapp and Dauvergne 2011: 248).

Climate change finance

Climate finance has been left to bilateral agreements between countries, support disbursed through institutions such as the World Bank (which has a Clean Technology Fund) and the Global Environment Facility, and both voluntary and formal manifestations of the carbon market. The formal carbon market, known as the Clean Development Mechanism, is regulated by the United

Nations Framework Convention on Climate Change and has been legally enabled by the Kyoto Protocol (Bond 2009a).

Market mechanisms for combating climate change received support in the Stern review (mentioned above), which argued that markets allow society to find least-cost options for combating climate change:

> Both for equity reasons and from domestic financial pressure, developing countries are likely to seek external finance for the investments involved in their contribution to mitigation. The magnitude of the challenge and limits to overseas aid indicate that scaling up market mechanisms for promoting such investments is likely to be crucial. (Stern 2006: 8)

The positions on climate finance which I outline below are related chiefly to the Clean Development Mechanism, as I discovered in preliminary interviews that the popular understanding of climate change finance is about market mechanisms. The CDM certifies clean development projects in developing countries and issues Certified Emission Reductions, or, in general parlance, carbon credits. These credits can be freely traded, thus incentivising developers to use cleaner technology and reduce emissions. By using the CDM, developed countries can reduce their emissions by investing in projects in developing countries (Bond 2009a).

There is a diversity of views on carbon finance that reflects the diversity to be found within the environmental movement itself. Cock (2004: 2, citing Sklair 1994) observes that "'Dry greens' believe in the manipulation of the market place through benign self-regulation; 'shallow greens' criticise this reinforcing of the status quo and focus on community based reform, eco-auditing, and environmentally benign consumerism; 'deep greens' reject 'the culture-ideology of consumerism

and the whole global capitalism project'." This diversity of environmental positions is also played out in the debate on climate change finance. Cock makes a further distinction between the mainstream environmental movement and the environmental justice movement, in that the latter asks, "What is morally correct?" rather than, "What is legally, scientifically, and practically possible?" (Cock 2004). This, too, is a useful way of thinking about positions on climate change finance.

Much of the criticism of the carbon market is on moral grounds. Those opposed to market mechanisms argue that they lead to the commodification and privatisation of common resources such as the atmosphere, and that the "polluter pays" principle which is inherent in emissions allowances can be distorted by companies paying in order to continue polluting. According to Bachram (2009), emissions trading "parcels up the atmosphere and establishes the routine buying and selling of permits to pollute, as though they were like any other international commodity" constituting a failure of international democracy that is "attributable to the arm-twisting tactics of the richer nations and their constituencies of corporate polluters whenever global treaties are hammered out" (2009: 100). Likewise, the climate justice movement, led by the Climate Justice Now! Coalition and the Durban Group for Climate Justice, rejects carbon markets as a false solution to climate change, and carbon trading as the commodification of the right to pollute. According to Bond (2009b), while capitalism externalises the cost of greenhouse gas emissions, the neoliberal, capitalist response to the problem of climate change (namely, carbon trading), rather than internalising this cost, simply displaces it. In addition, carbon trading fails to address broader problems with neoliberal policy and capitalist exploitation. In the view of the climate justice movement, carbon trading and its associated mechanisms are not merely flawed, but fundamentally wrong.

Bachram (2009) warns that emissions trading can exacerbate environmental injustice, in that buying carbon credits for a remote project relieves polluting factories of the need to clean up their act locally. This, she says, could result in the creation of pollution ghettoes.

Erion et al. categorise CDM actors in South Africa into four groups: frontline communities, who they say are frequently opposed or indifferent to CDM projects; the project developers, who fervently support the CDM; environmental NGOs who recognise that the CDM is flawed, but believe that it can be reformed; and NGOs who believe that carbon trading is inherently flawed and should be abandoned in favour of alternative solutions.

Those who support carbon trading and the use of markets to deliver clean energy readily admit that the CDM is flawed. One project developer quoted by Erion et al. complained that applying for CDM status can take years and cost tens of thousands of rands.

CDM projects tend to be registered disproportionately in the larger developing economies, particularly India and China, with poorer countries and Africa in general losing out. Africa now hosts 269 CDM projects, or just 3% of all projects, while Latin America and the Asia-Pacific region together host 95% of projects (UNEP Risoe 2013).

Earlier research on CDM implementation in South Africa found that foreign direct investment, income from carbon credits, the development of new environmentally friendly markets, corporate social responsibility, sustainable development, and environmental conservation were seen as key benefits. Constraints on CDM implementation included lack of resources, the time involved in the process, and the complexity of the process (Du Toit 2007). In addition, renewable energy projects–some of which may have been eligible for CDM status–were stymied initially by the lack of an

appropriate policy framework and later by uncertainty surrounding tariffs (Business Day 2011a; Creamer 2011).

In 2009, Bolivia called for developed countries to finance adaptation by developing countries to the effects of climate change and bear the cost to developing countries of mitigating their greenhouse gas emissions. Because developed countries are historically responsible for most of the greenhouse gas emissions now in the atmosphere (a resource that belongs to all) they owe a "climate debt" to poorer countries:

> Developing countries are not seeking economic handouts to solve a problem we did not cause. What we call for is full payment of the debt owed to us by developed countries for threatening the integrity of the Earth's climate system, for over-consuming a shared resource that belongs fairly and equally to all people, and for maintaining lifestyles that continue to threaten the lives and livelihoods of the poor majority of the planet's population. This debt must be repaid by freeing up environmental space for developing countries and particular (sic) the poorest countries. (Government of Bolivia 2009: 4)

This proposal offers an alternative means of financing the cost of climate change without resorting to carbon markets, but while it has widespread support among developing countries and environmental lobby groups, industrialised countries have yet to accept the idea of climate debt.

It is important to note that the most recent round of climate negotiations, at COP18 in Doha, did accept a proposal to include compensation for loss and damage due to climate change in the final negotiating text (UNFCCC not dated). This is still a developing area of law and is closely allied to the concept of climate debt.

The South African situation

The post-apartheid government which came to power in 1994 inherited a country marked by widespread inequality, exploitation and poverty, where the majority of the population lacked basic amenities such as electricity and housing. Understandably, subsequent policy has prioritised rollout of services and protection of labour while attempting to woo investors with fiscal prudence and business-friendly policies. This alone is a delicate balancing act, and perhaps we should not be surprised if the environment has been relatively low on the agenda.

Nevertheless, South Africa has also been active in multilateral forums, including international climate change negotiations, as it seeks to increase its international standing. At the 2009 United Nations Climate Change Conference in Copenhagen, it made a voluntary offer of a 34% reduction by 2020 in the growth of its emissions trajectory by and a 42% reduction by 2025, conditional upon receiving financial, technical and capacity building assistance (Zuma 2009).

South Africa is both particularly vulnerable to the effects of climate change and one of the world's largest emitters of greenhouse gases. Africa as a whole is expected to warm 1,5 times faster than the world average, due to its equatorial location and large land mass; climate change is predicted to affect water availability and rainfall patterns, while temperature increases will determine what crops are commercially viable, as well as their yields. Climate change will also have a very substantial impact on South Africa's biodiversity (Joubert 2008). There are obvious implications here for food security and commercial agriculture, but in addition many industries are dependent on water availability, including coal-fired electricity generation.

Climate change is already impacting South Africa. Between 1960 and 2003, the national temperature average rose by 0,5 degrees and in the Western Cape by 1 degree, with concomitant changes in the distribution of quivertrees in the Northern Cape and in the quality of apple production in the Western Cape (Joubert 2008). Fish stocks appear to have been affected by warming ocean temperatures, with the distribution of species such as sardines changing and moving further east, along with the breeding sites of the birds which prey on them (Joubert 2008).

In addition, the country's natural resources are already constrained. Demand for water is expected to outstrip available supply by 2025, by which time the combined population of South Africa, Swaziland and Lesotho will have risen from 47 million to between 70 and 90 million (Joubert 2008). Early climate modelling predicts a 10–20% decline in maize production by 2050 (Government of South Africa, 2000).

Until recently, environmental concerns have not been a mainstream priority in South African policy discourse. The most urgent challenges are commonly listed as job creation, HIV/Aids, education, and service delivery, rather than, say, water scarcity and food security; a recent high-profile volume (Parsons 2009) on economic challenges facing President Jacob Zuma's administration made no mention of environmental challenges, access to energy or climate change. Urban and industrial concerns take precedence, while environmental issues have historically been marginalised.

More recent policy documents consider green issues in greater depth. The New Growth Path cites the green economy as an avenue for job creation (totalling a predicted 300 000 new jobs by 2020). The Industrial Policy Action Plan (IPAP2) recommends support for the renewable energy manufacturing sector, and although the National Development Plan barely mentions

environmental or green issues in its executive summary, an entire chapter is devoted to a detailed discussion of the environment and climate change.

The uneasy relationship in South Africa between politics and environmental issues has a long history. In the apartheid period, environmental concerns centred mainly on conservation of endangered species and their habitats rather than human development and sustainable management of resources. This type of model has been termed "fortress conservation", where nature conservation is seen as incompatible with human development (Cousins et al. 2008). Still earlier, in colonial times, conservation ideas and practices focussed on maintaining stocks of game for colonial hunters, extended subsequently to the preservation of rare species. Indeed, "For many Europeans the open savannah landscapes of Africa needed to be 'de-peopled' in order to accord with narratives of a lost Eden or pristine wilderness in need of protection and preservation" (Cousins et al. 2008). Under colonial, and later apartheid laws, black communities were forcibly removed from areas designated as conservation areas, separating them from natural resources and territories they relied on for survival and plunging them into poverty (King 2006, Ramutsindela 2000).

While conservation was an environmental priority in apartheid South Africa, the regulation and control of pollution was not. Papu-Zamxaka et al. (2010) point out that prior to 1994 South Africa was excluded from international environmental treaties which prohibited the trans-boundary movement of hazardous waste and these authors note that progressive environmental laws implemented since 1994, such as the National Environmental Management Act (1998), have failed to clean up decades-old problems of environmental contamination. A particularly obvious instance was Thor Chemical's 1994 dumping of mercury.

More broadly, the apartheid government failed to provide electricity, clean water and sanitation to many black communities. In 1994, the new democratic government inherited a country where only a minority of households had access to electricity and most South Africans were denied the benefits of modern amenities and had to rely on extracting energy through manual labour from biomass and coal for cooking and heating.

In addition, one of the country's most prominent CDM projects, the Bisasar Road landfill-gas-to-power project, registered in 2009, has been dogged by persistent concerns of adverse health impacts for residents living in close proximity to the site, while few jobs have been created (Sharife and Bond 2012). The project does not comply with additionality criteria set by the CDM Executive Board, the ultimate regulatory authority for CDM projects worldwide, as it was being planned even before the CDM system was introduced (Sharife and Bond 2012). A police corruption investigation is underway following concerns that Durban's former mayor may have improperly benefited from one of the incineration contracts (Sharife and Bond 2012). These allegations raise serious questions about the regulation and oversight of CDM projects at both a national and international level.

Given this history, perhaps it is not so surprising that environmental issues are frequently dismissed by activists concerned with social upliftment and poverty alleviation. Protection of the environment happened at the expense of oppressed communities, and environmental issues were seen as a middle-class white concern. In turn, environmental concerns affecting mainly poor people had been marginalised, creating a significant faultline in the modern environmental discourse in South Africa (Cock 2004).

In the early 1990s, 'brown' issues such as clean water and sanitation were reframed by a newly evolving environmental justice movement as issues of environmental justice – what Cock (2004)

refers to as connections between red issues (of social justice), brown issues, and green issues. Communities' concerns around issues such as access to land, housing, clean water, energy, and health and safety, which previously were seen as social issues, were now reframed as issues of environmental justice and human rights, often coupled with critique of global capitalism and privatisation (Cock 2004).

Cock sees sustainable development and environmental justice as two separate discourses in the South African environmental movement. As a result, local environmentalists tend to belong to one of two camps: either the pro-corporate, pro-capitalist sustainable development lobby, or the pro-poor environmental justice movement, which itself is sympathetic to socialism. This has not always been a helpful division, with perceptions that environmental concerns are elitist and inimical to development. Even former President Thabo Mbeki has been known to complain that environmental regulations delayed development and slowed the economy (McLeod 2006).

South Africa's post-apartheid economy exhibits continued reliance on fossil fuel and energy-intensive industry. Although the government has committed itself to reducing growth in emissions, in practice it is taking steps to actively increase emissions with the construction of two new coal-fired power stations (Medupi and Kusile), and has issued an Integrated Resource Plan which sees coal and nuclear dominating South African energy for the next twenty years.

A recent policy brief (Atteridge 2011) found that economic and political factors constrained climate change action in South Africa, concluding that "Expanding energy access has become an urgent political priority, while the dominant minerals-energy complex sets powerful corporate interests and potentially the labour movement against ambitious efforts to tackle GHG [greenhouse gas]

emissions." Because CDM projects are primarily about energy, in the local context they may well extend rather than reduce dependence on the minerals-energy complex.

Du Toit and Van Tonder (2009) comment that South African economic policies have so far done little to reduce social inequality or create jobs. An average annual growth rate of 5% between 2004 and 2007 was accompanied by higher employment, but this was primarily in the informal sector. The formal sector of the economy is unable to absorb more labour, and the poverty rate fell only marginally during this time, from 47,5% to 46,5% (Du Toit and Van Tonder 2009). In another critique of the country's economic performance, Bond (2009a) argues that growth in GDP since 1999 fails to take into account the depletion of non-renewable resources: "If this factor plus pollution were considered, South Africa would have a net *negative* per person rate of wealth accumulation" (2009a: 53, emphasis in original).

Methodology

My first attempts at writing this report began, haltingly, in 2011. Inevitably, in the two-year process of conceptualising and producing this relatively short research report, current events raced ahead. International movement in climate change policy tends to occur at a glacial pace, but, for once, the last two years have seen significant movement in both the domestic and (somewhat less so) the international policy space. This has prompted me to re-evaluate some features of my original research proposal.

In 2011, I envisaged a detailed compare-and-contrast report looking at three case studies of particular projects. By 2012, it was clear that carbon developers faced massive uncertainty with South Africa, and other large developing economies, being cut out of the largest existing market for carbon credits, the European Union, in favour of least developed countries. During this period, the South African government made its strongest pronouncements yet on climate change, renewable energy, and the need for a green economy. The opportunity to present a larger overview of the sector as it operated in South Africa, perhaps in its dying days, was a compelling one. Consequently my case studies are somewhat more impressionistic than originally anticipated, while my sections on international and local policy are, I hope, weightier.

By using both primary and secondary document analysis and interviews with professionals working in the sector, I have aimed to produce a qualitative analysis of carbon finance as it is currently employed in South Africa.

It is true that qualitative methods are often the default analysis choice for humanities scholars who lack confidence with numbers, and in this I plead guilty. But as a working journalist and

communications professional, I also have great respect for the power of narrative to enable understanding of intricate and detailed phenomena. Climate change is already an immensely technical subject, with a jargon that is too often impenetrable to outsiders. I felt it was time to rediscover some of the human elements in all the paperwork, to probe causes as well as symptoms, and for these purposes quantitative investigation would not have been adequate.

As of June 2012 (the most recent data posted on the website), 326 projects in South Africa had been submitted to the Designated National Authority (DNA), which must approve all local projects before final registration is granted by the Clean Development Mechanism's executive board. Of these projects, 228 are listed as "project idea notes" meaning they are still at an early stage, while 98 are listed as having "project design documents", meaning they are at a more mature stage of the project cycle. Only 21 projects out of 326 have been registered as carbon offset projects and just nine are receiving carbon credits (Department of Energy, 2012).

This does not appear to be a particularly good success rate, particularly as some projects were submitted in 2004 and still have not been approved.

Although carbon offset projects should promote sustainable development, according to UN regulations, many projects have been criticised for their lack of sustainability and the adverse effects communities suffer. The same is true of South African projects. For instance, much has been written about the conflict over the Bisasar Road landfill-gas-to-power site in Durban, particularly by Bond and Sharife (as an example, see Bond and Sharife: 2012). Part of the problem, as discussed in the previous chapter, is that sustainable development can be defined in many different ways. So it is important to ask whether local carbon projects are meeting their own sustainable development criteria. I discovered, in the course of my interviews, that these criteria are flexibly

applied in the first place; and secondly, that it is not very instructive to measure a non-existent project against sustainable development criteria.

I originally planned to include three case studies to showcase various aspects of CDM projects. The first case study, looking at a municipal solar water heating project, was scrapped when the city in question withheld permission for the study unless it was granted the right to veto information in my report. The remaining two case studies would include one relatively successful CDM project, and one which had not yet been implemented.

Much of my research time was in fact spent reading through published works and sifting through the theories of more accomplished scholars than I, and so my final study is an attempt to describe, in general, the South African carbon finance landscape from a theoretical point of view, supplemented by interviews I conducted with carbon professionals. In doing so I found it was instructive to set the local sector within the context of international developments and debates in the market, as the two are, by necessity, interlinked.

In this I have drawn upon the Upington Solar Park proposed by state-owned electricity producer Eskom; and the Enviroserv Chloorkop Landfill Gas Recovery Project, a private-sector initiative. It is typical of the projects which have been registered to date in that fully 29% of the registered projects are capturing methane, while another 19% are fuel switch projects which are mainly industrial. I made a deliberate choice to investigate projects about which relatively little has been written in academic terms.

Although energy efficiency and renewable energy projects make up 58% of the total pipeline, they account for only 14% of registered projects (Department of Energy 2012), despite an electricity

sector which is responsible for around half of South Africa's emissions. Eskom's renewable energy project was chosen to help me to understand this disparity.

In choosing this method I reflected on Skocpol and Somers' (1980) analysis of the different methods of comparative history and case selection, particularly the "Comparative" method they describe. They note that "Practitioners of Contrast-oriented comparative history stand squarely in the middle between the characteristic disciplinary concerns of social scientists and historians" (1980: 192). The Comparative method, as they describe it, focuses on "the cases themselves and the contrasts between and among them that underline the uniqueness of each" (1980: 192). I have not sought to describe and contrast various projects in detail, although that was my original intention. Rather, I hope the projects impressions I have given within this report may shed light on some aspects of carbon finance as a sector.

When it comes to government policy on climate change, there is certainly no shortage of paperwork. Most of my analysis deals with the long-term policy framework produced by the National Planning Commission in 2011: the National Development Plan Vision to 2030. Idealism is not always influential, but in this case the Vision to 2030 is expected to shape South Africa's policy for decades to come, and provides detail and insight into the way development challenges are being conceptualised by government. I have given it a starring role in my analysis, supported by many other official documents in cameo roles. These are: South Africa's Second National Communication under the United Nations Framework Convention on Climate Change; the Long Term Mitigation Scenarios; the National Climate Change Response White Paper; the White Paper on Renewable Energy; the New Growth Path; the Integrated Resource Plan 2010; the Industrial Policy Action Plan 2011/2012.

As discussed by Mariampolski and Hughes (1978), contemporary documents allow the researcher to pursue specific lines of questioning with living persons, thus increasing the validity of interpretation. Documents may yield important background and contextual information which can support the interviewing process.

I have employed a semi-structured interviewing technique which allows me to probe for greater detail in answers and to tailor the interview in order to take account of the particular experiences and knowledge of the professional I interview. In this, I agree with Weiss (1995) that quantitative surveys can yield fragmentary information and that qualitative interviews are necessary to achieve fuller responses. This method also requires greater interpretation, summary and integration (Weiss 1995).

No serious ethical issues arose as a result of this work, as my study relied on interviews with professional people who freely (and generously) gave of their time, and on information from publicly available documents. In total, four interviews were conducted: with Matthew on 3 October 2011; with Allison on 19 December 2011; with Jane on 12 January 2012; and with Ben on 27 January 2012. Names have been changed to protect their confidentiality. The interview protocol is available in Appendix A.

As noted earlier, my research report has been written over the course of two years–a longer timeframe than most. As a part-time student and full-time freelancer, I found that my research and writing time was sometimes squeezed, while the content gained from my interviews is, of necessity, time-bound. I hope that my findings may nevertheless be of interest to other students of South African policy and those interested in trade-offs between environment and development.

The international carbon market

Before we examine the state of the carbon market in South Africa, let us first take a look at international events.

It is clear from the science that climate change is already underway. In the summary of its fourth assessment report for policymakers the Intergovernmental Panel on Climate Change (IPCC) stated in 2007 that "Warming of the climate system is now unequivocal, as is now evident from observations of increases in global average air and ocean temperatures, widespread melting of snow and ice and rising global average sea level" (IPCC 2007).

Action on climate change is particularly urgent for Africa. In its Fourth Assessment Report the IPCC predicts impacts for Africa, as a result of climate change, on freshwater, food security, human health, and coastal populations. By 2020, scientists predict that between 90 million and 220 million people would be exposed to increased water stress due to climate change–in a region which is already beset with water-related problems. Yields from rain-fed agriculture could halve by 2020. Climate change will affect growing seasons and will reduce the area of land suitable for farming, particularly in regions bordering semi-arid or arid areas. The total area of arid and semi-arid land is expected to increase by between 5% and 8%, or by 60 to 90 million hectares. This would affect food security and increase malnutrition. Wheat production is likely to disappear from Africa by the 2080s. Malaria is expected to spread, with malaria distribution increasing by between 5% and 7% by the end of the century. Previously malaria-free areas in Ethiopia, Kenya, Rwanda and Burundi could also experience malaria from around 2050 onwards (IPCC 2007).

By 2015, Africa will have at least three coastal megacities with 8 million inhabitants each. Sea-level rise is expected to affect low-lying coastal areas with large populations towards the end of the century. The cost of adapting to this phenomenon could be between 5% and 10% of GDP.
One study quoted by the IPCC which examined the impact of climate change on South Africa's agriculture found that crop net revenues would be likely to fall by as much as 90% by 2100, with small-scale farmers the most affected. However, adaptation could reduce this effect (IPCC n.d.).

South Africa's economy is largely dependent on climate-sensitive sectors, including agriculture, tourism and forestry. Higher temperatures and reduced rainfall will reduce already scarce water resources and lead to more frequent droughts. Desertification as a result of climate change could reduce biodiversity, threatening the tourism industry. Increases in sea temperature could affect fisheries and increase algal blooms which harm marine stocks. Malaria and schistosomiasis could be exacerbated by climate change (Adaptation Learning Mechanism, n.d.).

Despite years of negotiations and an international agreement to rein in greenhouse emissions from developed countries (the Kyoto Protocol), overall greenhouse gas emissions have continued to increase. Worldwide emissions reached 31.6 gigatons (Gt) in 2011, according to preliminary estimates from the International Energy Agency (IEA)–a 1 Gt increase on the previous year (IEA 2012).

The IEA has developed an energy pathway which would be consistent with a 50% chance of limiting the increase in the average global temperature to two degrees Celcius. This requires CO_2 emissions to peak at 32.6 Gt by no later than 2017–and we are almost at that threshold. But the agency warned that much still had to be done to decouple CO_2 emissions growth from economic

growth. As recently spelt out by IEA chief economist Faith Birol, “The new data provides further evidence that the door to a 2 degree trajectory is about to close” (IEA 2012).

According to politicians, lobbyists and environmental activists, the transition to a post-carbon economy is both technologically and economically feasible (Wiseman 2012), and this feasibility has been demonstrated in a study by global consulting firm McKinsey (2009). Climate science is nevertheless clear that we have only a few years in which to take decisive action on climate change. Much of this action has historically been left to the carbon market, ostensibly to achieve the lowest-cost reductions. After all, if we have only one atmosphere, in theory it should not matter if a particular country increases its emissions in one territory but pays others to reduce less somewhere else. In practice, as Tickell (2008) makes clear, the context has been somewhat different.

Furthermore, there remains a danger that sustainable development becomes a concept exclusively linked to climate stabilisation and climate change, whereas the world's carbon resources are not the only resources which must be managed responsibly; water and biodiversity are examples of other resources which require attentively directed policy-making.

The response of the international community–with few exceptions–has been to endorse carbon trading as a major part of its action against climate change. In this regard, the Clean Development Mechanism is a vital institution. It has historically sought to accomplish two competing objectives, described by its parent body, the United Nations Framework Convention on Climate Change (UNFCCC) as follows: (i) to assist developing countries in their pursuit of sustainable development and in climate stabilisation; and (ii) to assist developed countries to reduce their emissions.

A recent UNFCCC report (UNFCCC 2012) based on analysis of project design documents for some 4 000 projects registered on or before 31 July 2011 describes sustainable development benefits accruing to countries as a result of CDM projects and found that most projects claimed several sustainable benefits. Of these, “The most prominent benefit claimed is stimulation of the local economy through employment creation and poverty alleviation, followed by reduction of pollution and promotion of renewable energy and energy access” (UNFCCC 2012: 7). Social benefits tended to be cited less often than environmental and economic benefits.

An obvious problem here is project developers are aware that they must claim sustainable development benefits for their projects to pass muster, while governments may have their own reasons for endorsing CDM projects. In one sense, it can be argued that all development is sustainable. I was once asked, in all seriousness, to write an article on the mining sector's contribution to sustainable development. Proponents of this view held that although mining is undoubtedly unsustainable, based as it is on the extraction of finite resources, it can nevertheless act as a catalyst for other forms of development. Johannesburg, for instance, is a city founded on the promise of gold, but has developed as a financial services and commercial hub for the southern African region. Mining can thus act as a vehicle for foreign direct investment and skills creation.

In the UNFCCC report cited above total investment in registered or soon-to-be registered CDM projects, as of June 2012, was estimated at USD 215.4 billion. Investment in projects known to be operating was USD 92.2 billion. The average investment per project was USD 45 million. China and India accounted for 65% of total investment, with 45% of the projects. Renewable energy projects undertaken through the CDM were frequently much larger and less capital-intensive than similar projects carried out in developed countries which were signatories to the Kyoto Protocol. In other words, CDM projects tended to have a lower cost per MW of electrical capacity (UNFCCC 2012).

So far, powerful countries have proved reluctant to take on ambitious measures to cut emissions and transform their economies, and international negotiations on climate have repeatedly devolved into a standoff between China and the United States. Currently developing countries, which now account for the bulk of emissions, are not required to cut their emissions although many have announced plans to reduce growth in emissions.

Climate change is controversial because it is fundamentally an issue of power. If one country aggressively cuts its emissions while its peers do not, the prevailing wisdom is that companies in that country will be disadvantaged, by higher taxes, higher costs of investment and impaired competitiveness, and jobs will be put at risk.

Climate change is also bound up with development. When the Kyoto Protocol was signed in 1992, the constraints it imposed on developed countries covered 64% of global greenhouse gas emissions (Point Carbon, not dated). Since then, China has overtaken the US as the world's highest emitting country and other countries such as India and Brazil have likewise become large emitters as their economies have grown. As a result, developing economies now account for a substantial portion of global greenhouse gas emissions, yet under the Kyoto Protocol they are not required to take on any caps.

A persistent dilemma, until recently, has been that carbon-intensive development was the only path countries could take in alleviating poverty and increasing standards of living. Indeed, if the world's carbon emissions had remained at the same levels as, say, 1950, the race to take action on climate change would be somewhat less urgent, but the sum of human misery would arguably be greater, with many more living in poverty, unable to find work or provide for their families. Carbon-

intensive development was perhaps necessary at the time, but, low-carbon and renewable-energy technologies have since emerged which offer new hope of sustainable future development.

Carbon trading has certainly not been problem-free. Gains from the market can be at risk from carbon fraud, as in one case which I mention below. Even so, malpractice of one kind or another will probably always be a likelihood, and the appropriate response would be to tighten up carbon policy and regulations.

It is clear from Tickell (2008), however, that the problems with the carbon trade go well beyond loopholes and deception. Tickell criticises the system of territorial accounting for international emissions. Generally, the country of emission production is held responsible. Tickell discusses the example of a Japanese company which owns a factory in China that manufactures goods for the US: "Adding to the complexity of the problem, the factory might be burning Australian coal or Iranian oil, produced by corporations domiciled in Europe or Singapore, owned by shareholders scattered across the globe" (Tickell, 2008:32).

Under international law, it is clear that the emissions belong to China. But this approach has undesirable consequences. Richer countries outsource their manufacturing base to developing countries, taking advantage of lower labour costs while lowering their own emissions. Meanwhile, rich-world consumption remains unchanged (Tickell 2008). Maybe then, as former UNFCCC chief Yvo de Boer suggested in December 2011, we should pay more attention to emission consumption, rather than focusing solely on the production side, as is currently the case (Business Day 2011b).

One 2007 study cited by Tickell found that under the UNFCCC rules the United Kingdom's greenhouse gas emissions fell by 15% since 1990. But on a consumption basis, emissions actually

rose by 19% over the period. For 2003, UK emissions by consumption-based measurement were 72% higher than the total measured by UNFCCC rules.

> This is a dramatic reversal of fortune... It suggests that the decline in greenhouse gas emissions from the UK economy may have been to a considerable degree an illusion. Trade may have displaced the UK's greenhouse gas appetite elsewhere. (Helm, Smale and Phillips, in Tickell, 2008: 32-33)

The case Tickell makes can well be applied to the South African mining sector, so long the engine of this country's economic growth. On the one hand coal, a resource which belongs to the old, carbon-intensive way of doing things, generates the electricity that powers an extensive mining sector and is even exported to neighbouring countries. Platinum, on the other hand, is the metal of the low-carbon economy, the metal of the future, and South Africa, by an accident of geography, happens to control the vast majority of the world's platinum resources. In a logical extension of the territorial accounting system for greenhouse gases, South Africa, as the platinum producer, bears the penalty for the emissions associated with platinum mining, while the rest of the world enjoys the benefits of catalytic converter technology which substantially reduces air pollution in cities and overall carbon emissions from the transport sector. It seems contradictory to penalise a country for making available its supply of a mineral so critical to the green sector when the demand in fact emanates from other countries.

A similar argument can be made for minerals beneficiation, which is an energy-intensive sector. Like many developing countries, South Africa exports mainly raw materials to its trading partners, and imports finished goods. For a country so desperately in need of jobs, the logical response is to support a manufacturing sector in labour-intensive processes which increase export value. It would

be difficult to make sense of a policy choice to forgo this sector in favour of reducing carbon emissions, especially as one could argue that trading partners such as China would have no similar qualms. After all, the world still needs steel, aluminium, catalytic converters, pacemakers, and the like–even without green economy considerations.

Carbon as a fictitious commodity

The argument for a carbon price is a simple one. In order for markets to operate efficiently, the true cost of goods must be known. Until recently, this cost was calculated without reference to the atmospheric damage incurred. By pricing in the cost of carbon, markets are able to operate more efficiently and reward production methods which incur the lowest overall cost. In this equation, coal-fired power stations, which are less expensive than renewable energy if the carbon cost is not considered, become much less attractive. This, in turn, catalyses a transition to low-carbon economic growth.

There are some philosophical objections to pricing carbon. Firstly, while most people would agree that polluters should pay for the damage they cause, the corollary is that it becomes possible for companies to pay to pollute–by paying the fine, they absolve themselves of wrongdoing.

By extending capitalist thinking to the goods and services nature provides, we can also lose sight of the non-monetary benefits. Do we want to live in a world in which everything has its price? In many ways, climate change represents a fundamental failure of the market system. The philosophy of free markets holds that, left to its own devices, the market would find the most efficient allocation of resources and would reward the lowest-cost producers. Only minimal regulation is needed for the market; indeed, more regulation would interfere with its efficiency.

Free-market advocates responded to the climate change crisis by bringing it into the market in an apparently logical solution: since the cost of a significant input turned out to have been ignored in making prices, it should therefore be included henceforth. But drawbacks persist.

Polanyi discusses the creation of fictitious commodities in the market economy, which he identified as land, labour and money (2001). Although they operate as essential elements of the market economy, unlike other goods they have not been produced for sale–which makes them fictitious. The inclusion of land and labour in the commodity system subordinates "the substance of society itself to the laws of the market" (Polanyi 2001: 75). Money itself is only a token of purchasing power which exists only through the banking and finance system, and is perhaps the most fictitious commodity of all, according to Polanyi's rules.

The creation of carbon markets yields yet another fictitious commodity: carbon. In this sense, carbon is fictitious because it is not produced for sale. Inclusion of carbon commoditises not the fabric of society (as in the case of labour and land) but nature itself. And like other fictitious commodities, the value we assign to carbon in this market system, is not the same as its intrinsic value. Whatever the monetary valuation of CO_2, its true cost is much higher and is paid in climatic terms. Carbon is thus a twice-fictional commodity: it represents the value we give to the air, but it also constitutes a form of currency.

This development has several implications. Firstly, it implies that the market is paramount over both society and nature, because it controls both. Secondly, it suggests that value itself can only be found within a monetary system. The carbon market thus feeds into the dominant, neo-liberal free-market philosophy. It does not challenge existing power relations between countries and it elevates private sector business as an agent of change, releasing governments from their duty to

pursue justice and equality. It makes it difficult for decision-makers to consider values that are not monetary. Perhaps it is human nature to be more interested in our own money–which affects us directly–than in other people's lives. But it is one thing to have a bias towards certain actions, and another to enshrine and codify this basis in decision-making. Lohmann (2010) makes the point that by commoditising carbon, we encode various contradictions into our economy.

The carbon market presents us with the creation of a new commodity and the beginnings of a new market for it (Gutierrez 2007), but in South Africa we may also be observing the death of a market as a result of the European Union's decision to restrict its purchases of carbon credits to least developed countries.

Widespread abuse in the carbon market has already been reported. Hydropower accounts for around a quarter of projects submitted to the CDM Executive Board, and the NGO International Rivers (in Tickell, 2008) reports that 96% of Chinese hydropower projects submitted for CDM registration, or already registered, are expected to start generating credits within two years of their validation comment period, while 35% of projects were complete by the time of registration. This is suspicious as it takes several years to prepare for sizeable hydro projects and between four and eight years for construction. According to International Rivers, there was no increase in the number of hydro projects under construction compared to years when hydropower did not receive credits. Most of the carbon credits generated this way should therefore be considered "hot air"–fake credits which would increase global greenhouse gas emisssions (Tickell: 2008).

The CDM has also created a perverse incentive for developing countries to profit from the manufacture of industrial gases used for refrigeration and cooling. Hydroflurocarbons (HFCs) as a class are greenhouse gases many times more powerful than carbon dioxide. Tickell describes how

a relatively small sum–around USD 100 million–can be invested to abate emissions of the most important of these gases, HFC-23, producing carbon credits worth USD 4.7 billion. This accounted for around 30% of the entire carbon market. It would cost less than 100 million euros to pay refrigerant gas producers in developing countries to install technology needed to capture and destroy HFC-23, saving billions of dollars which could be spent on other climate-protecting uses (Tickell 2008).

Lohmann (2010) discusses the reselling of used carbon credits by European company Hungarian Energy Power in a further abuse of the market where market participants failed to ask significant questions relating to these CERs (certified emission reductions):

> For example, it was never thought necessary to ask whether CERs are in fact climactically 'equivalent' to the European industrial emissions that they license. It was never asked whether the pollution rights from the diverse carbon offset projects that made up the pool of 800,000 used commodities that Hungary sold were themselves climactically equivalent to each other, nor even where those carbon projects were located. (2010: 9)

Carbon markets were set up with the express intention of enabling poorer countries to fund sustainable development. In practice, carbon offset projects have been unevenly distributed, with the bulk of projects located in the larger developing economies. China, Brazil and India in particular have benefited. This is partly a design issue, with the mechanism benefiting industrial development, and partly a cost issue, as the transaction costs are so high that only the larger projects can afford to apply for credits.

South African context and policy framework

Climate change is already affecting South Africa. On this point, policymakers are unequivocal. According to the 2011 National Climate Change Response White Paper, climate change is already a measurable reality, and the country is particularly vulnerable.

At an international level, South Africa has demonstrated admirable leadership. In the 2009 Copenhagen Pledge, President Jacob Zuma promised that South Africa would reduce its emissions growth by 34% by 2020, and 42% by 2025. As a developing country, South Africa is not forced to limit either its absolute emissions or its emissions trajectory. Its offer to limit this trajectory was a voluntary pledge, in keeping with the objective recommended by the Long-Term Mitigation Scenarios (LTMS) approved by Cabinet in 2008. This study suggested that South Africa's emissions trajectory should continue to rise until 2020–2025 (500–550 million tons of carbon dioxide equivalent), remain at that level until 2035, and thereafter decline to between 200 and 400 million tons of carbon dioxide equivalent (LTMS, in Marquard et al., 2011). This is known as the peak, plateau, and decline trajectory.

The National Planning Commission (2011) acknowledges the need for South Africa to be flexible and resilient enough to be able to respond to a future global agreement to reduce emissions. This means aggressive promotion of local manufacturing and technical capacity in a broad range of renewable energy and other clean technologies, in anticipation of carbon constraints. The commission paints a bold picture of a vibrant green economy and aggressive deployment of renewable energy, with a new domestic market for climate offsets to be developed by government and the Johannesburg Stock Exchange (National Planning Commission 2011).

But on examining domestic policy on energy and climate, we can discern rather more hesitation, and cost estimates for climate change policies are scarce. The central question South African leaders must answer is the following: How does a country, wedded to coal, nonetheless respond effectively to climate change?

For most of the electorate, environmental issues are unlikely to be a priority. Job creation, poverty, economic growth, HIV/Aids and crime all occupy more newspaper space and more dinner table discussions. A BBC survey found that climate change, a technical issue, was understood by relatively few residents (BBC World Trust 2010). Despite South Africa's categorisation as an upper middle-income country, with a GDP of US$364 billion (World Bank 2012), poverty, inequality and unemployment remain endemic. The Gini coefficient, which measures inequality, stood at 0.70 for income in 2008, and 0.63 for consumption in 2009 (World Bank 2012). The official unemployment rate which measures the number of people actively looking for work stands at 25.5% for the third quarter of 2012 (Statistics South Africa: 2012). The expanded unemployment rate which includes people who have stopped looking for work stands at 36%, (Statistics South Africa: 2012). The World Bank overview for the country (2012) concludes that "South Africa… displays strikingly high and persistent levels of inequality, exclusion and unemployment for an upper middle-income country".

This political reality has in turn affected environmental policy making. Coming to power after the end of apartheid in 1994, the African National Congress inherited a mining-based economy with sizeable gold, platinum and coal deposits. Plentiful, cheap electricity from coal-fired power stations favoured energy-intensive industry such as aluminium smelting and steel making. South Africa has historically exported raw materials for beneficiation overseas, and more recent economic policies such as the Industrial Policy Action Plan and the New Growth Path now seek to support industries which have the greatest potential for job creation. Unfortunately, these are also industries associated with high energy usage and high emission levels.

South Africa is considered a relatively high-emitting country, with estimated emissions of between 520 and 540 million tons of carbon dioxide equivalent (Marquard et al., 2011) for 2010 – the upper range of the trajectory forecast by the LTMS. This figure is based on estimated inventory of 461 million tons of carbon dioxide equivalent (CO_2e) for 2000, contained in the 2011 Second National Communication on Climate

Change. South Africa is the 12th largest emitter in the world (National Treasury 2010) and the 42nd largest emitter per capita (NPC 2011). Energy accounts for 48% of emissions, making it the most important and most challenging sector to transform, according to the National Planning Commission. Industrial energy consumption makes up 9% of emissions, with a further 14% from industrial processes and product use, particularly as a result of coal to liquid fuels, and the minerals industry. Transport contributes 9% of emissions, the same proportion as fugitive emissions. Agriculture, forestry and land use contribute 6% of total emissions. Waste contributes 2% of emissions, and the residential sector a further 1%.

Existing government policy acknowledges that climate change is a serious threat to sustainable development (National Climate Change Response White Paper). But in some ways, climate change mitigation helps to sell itself, creating both jobs and wished-for inclusive growth. A study carried out by Greenpeace found that up to 152,000 jobs could be created by 2030 through widespread adoption of renewable energy and energy efficiency programmes. Many of these jobs would be in rural areas where poverty is particularly high. If the Greenpeace scenario was adopted, the group claims that South Africa's carbon dioxide emissions would be reduced by 85% below 1990 levels by 2050 (Greenpeace 2011).

Both the New Growth Path (2010) and the updated Industrial Policy Action Plan (2011) consider how renewable energy can benefit the country, particularly in terms of job creation. These documents exhibit a tension between climate mitigation – becoming less reliant on carbon-intensive growth – and heavy industry, such as mining and beneficiation, which unfortunately tends also to be carbon heavy.

A closer reading of government policy reveals that South Africa's leaders have consistently sought ways to include future coal use despite carbon constraints. The 2003White Paper on Renewable Energy – the first document to consider what role renewable fuel sources could play in the economy – acknowledged that "coal is, and is likely to remain... an attractive source of energy for South Africa" (2003: vii). The NPC's National Development Plan: Vision for 2030, released in 2011, seeks to provide a 20-year framework for

national policy. The document is, for the most part, unyielding in its belief in the primacy of coal, as exemplified in two characteristic statements (emphasis added):

> Given fixed investments and low direct costs, coal will continue to be the dominant fuel in South Africa for the next 20 years. (2011: 165)
>
> *Cleaner coal technologies will be supported* through research and development and technology-transfer agreements in ultra-supercritical coal power plants, fluidised-bed combustion, underground coal gasification, integrated gasification combined cycle plants, and carbon capture and storage, among others (2011:167).

By 2030, according to the plan, South Africa's electricity sector needs to promote environmental sustainability by reducing pollution and carbon emissions, while also promoting economic growth and development and enhancing energy affordability.

Historically, coal has played a crucial role in South Africa's development, as the country's largest economically recoverable resource and as one of its three top mineral earners. It also produces more than 70% of primary energy and over 90% of electricity, as well as a third of liquid fuels. The NPC warns that South Africa needs to balance growing coal exports with its own domestic energy needs and that new coal power stations should make use of the latest technology. Significant carbon reductions can be achieved if older, more polluting, power stations are replaced with newer, more efficient coal stations– particularly if they happen to make use of some of the technologies listed above, including carbon capture and storage: "Given South Africa's dependence on coal, it makes sense to investigate carbon capture and storage that takes into account economic, environmental and technological feasibility" (2011: 207).

Carbon capture and storage (CCS) is clearly envisaged as an important way to reduce South Africa's carbon emissions, although the technology has not yet reached commercial feasibility, and there is little discussion, in South Africa at least, of its potential environmental effects.

A 2008 special issue of the Science for Environment Policy newsletter published by the European Commission maintained that sufficient CCS technology could be implemented in time to contribute to the EU's target of a 20% reduction by 2020, and that new CCS technology offered even more potential benefits. But the same edition warned that regulators should also consider the environmental impact of these technologies – particularly with regard to water.

> Water consumption, however, may be an issue for carbon capture systems which rely onsolvents to remove CO_2 from flue gases. A new study estimates that the amount of water used for thermal cooling at US pulverised coal plants with CO_2 capture equipment could double by the year 2030. This increase in water consumption may make these systems less suited to dry regions. New technologies that reduce the demand for water need to be developed in the longer term. (Science for Environment Policy, 2008: 4).

South Africa could also substitute some of its coal demand with gas, particularly shale gas, in order to reduce its carbon intensity and emissions. With regard to shale gas, "the national value of this resource needs to be maximised," (2011: 167).

South Africa will need to meet about 29 000MW of new power demand between 2012 and 2030, while a further 10 900MW of old power capacity will be retired. This means that more than 40 000MW of new power capacity needs to be built. Currently, according to the plan, Eskom has committed to bringing 10 000MW of new generating capacity on stream. (This capacity is largely made up of 9600MW from two new coal power stations, Medupi and Kusile, which will be among the largest in the world). In order to follow the peak, plateau and decline trajectory, the balance of new capacity should come from gas, wind, solar, imported hydroelectricity, and possibly nuclear. In terms of the Integrated Resource Plan 2010–2030, a total of 21 500MW of new renewable energy capacity should be in place by 2030 (NPC 2011).

South Africa could look to its neighbours for fossil fuel imports, as Botswana, Zimbabwe and Mozambique have considerable undeveloped coal reserves and low per capita carbon emissions. According to the NPC, these countries are likely to contribute at least part of 6 000MW of new coal capacity contracted by 2030. Ultimately, however, the desire for a greener energy sector must be balanced against potentially higher costs and variable supply associated with renewable energy, and the NPC authors make a plea for pragmatism:

> Ultimately, South Africa's electricity plan needs to balance increased use of new and renewable energy technologies with established, cheaper energy sources that offer proven security of supply… South Africa needs to remain competitive throughout the transition to a low-carbon future. (2011: 169)

Taken out of context, this paragraph sounds like a reasonable statement, but nowhere in the document is the term "low-carbon" explained. Although it may be more sustainable to include some renewable resources in an energy mix, it does not automatically follow that the sector is therefore low-carbon. Rather, it depends on the numbers, which the Vision for 2030, being a descriptive document, tends to lack. The risk here is that our policy choices are made with an eye to emotiveness rather than information and awareness. In fact the energy scenario outlined above remains dependent to a large degree on coal, rather than transitioning to a low-carbon future.

Rather startlingly, the section on environmental sustainability opens with a tribute to South Africa's mining heritage:

> South Africa has a rich endowment of natural resources and mineral deposits, which, if responsibly used, can fund the transition to a low-carbon future and a more diverse and inclusive economy. (2011: 197)

In addition, the mining sector is a "significant" (2011: 201) component of the economy, providing jobs and foreign exchange.

The report argues that competitively priced energy is needed to exploit mineral resources. Proceeds from mineral exploitation will fund South Africa's social transformation, as well as a more diverse and inclusive economy. Solar resources and regional hydropower opportunities should be leveraged to these ends, in parallel with the responsible exploitation of fossil fuels and minerals. South Africa should be able to continue mining because the sector's emissions profile is not all that bad, the NPC authors contend. According to government projections, mining accounts for 13.5% of carbon emissions. Of this, only 3.6 percentage points are directly incurred by the industry, while the remaining 9.9 percentage points mainly derive from the purchase of dirty electricity. These indirect emissions can be reduced by introducing more energy-efficient industrial processes to the sector, as well as by increasing the contribution of renewable energy to electricity generation. Retrofitting, clean coal technologies, and carbon capture and storage can further reduce the carbon footprint of existing and planned coal-power stations. But even the authors admit that the scope for increasing energy efficiency within the mining sector is limited, "underscoring the need to transform the electricity sector" (2011: 201-2).

Aluminium smelting operations are likely to relocate once existing preferential pricing agreements expire, further reducing the sector's footprint.

How best to reconcile economic development with the peak, plateau and decline trajectory? The NPC suggests a carbon budget and carbon tax approach, in line with National Treasury's carbon tax proposal. (A tax on the sale of new vehicles, based on their carbon emissions, has already been introduced). A carbon tax should be introduced alongside direct low-carbon policy actions, the NPC argues. A conditional exemption could be applied to the electricity sector, provided it moves towards a lower carbon generation mix. Both employment and the environment would be affected by measures such as the carbon tax, which should be implemented with flexibility and sensitivity. Poor people and workers must be shielded from adverse effects.

South African planners and policy-makers must consider potential environmental consequences of their actions, including the risk of a significant increase in the cost of carbon. Carbon emissions will form part of environmental assessment procedures for infrastructure investment decisions at all levels of government and in all government agencies and parastatals. Emissions targets will be developed for each economic sector, in terms of the carbon budget, that are aligned with the country's mitigation trajectory, the plan states.

Somewhat unexpectedly, the NPC authors voice some ambivalence over Eskom's decision to build new coal power stations. Medupi and Kusile, each with a capacity of 4 800MW, are singled out as an example of a decision "that could potentially lock South Africa into an unsustainable and carbon-intensive path" (2011: 211). The report warns that

> Although these are more efficient than existing coal power stations, they lack flexibility in operation and they will commit the country into significant carbon-dioxide emissions over their projected lifespan. This will limit the available carbon space for the rest of the industry and the economy and society as a whole. (2011: 211)

The two power stations are not necessarily incompatible with the national greenhouse gas emissions trajectory, but would impose corresponding constraints on other industrial sectors. The authors note that they could also affect future decisions on exploitation of other renewable energy sources and transitional fossil-fuel resources such as shale gas. Despite these concerns, Eskom has been investigating whether it could earn carbon credits for using supercritical coal technology at Medupe (Business Day, 2010).

Notably, none of the documents referred to in this chapter make any mention of the Clean Development Mechanism as a potential source of financing for the low-carbon transition or the green economy. However, should National Treasury plans for a carbon tax be implemented, a domestic carbon market may be introduced at some point in the future. Noting that a carbon tax would adversely impact poor South Africans in particular, Treasury suggests targeted mitigation measures such as personal tax relief, an improved rollout of free basic services such as water and electricity and block tariffs for consumption (National Treasury 2010). It may also result in an increasing demand for

domestic carbon offset projects as companies seek to reduce their tax liability.

Empirical Findings

Over a period of about five months in late 2011 and early 2012 I was able to conduct interviews with various professionals who worked in South Africa's climate change mitigation sector and dealt with the local carbon market in one form or another. In analysing the content of these interviews, I found certain contradictions, or anomalies, with official climate change policy.

Regulating carbon

Jane, a carbon regulator, discussed her work with me in early 2012. South Africa's DNA was formed in 2005. Somewhat unusually, it operates under the Department of Energy, rather than the environmental department as is more common elsewhere in the world. Jane noted however that almost 80% of South Africa's emissions come from the energy sector, and so most CDM projects would likely be implemented in this sector. She also made it clear that the South African DNA took its role very seriously and strove to maintain the highest possible standards:

> *We've been commended by most project proponents to say... we are one of the best DNAs in the world.*

Before a project can be approved by the DNA it must meet a set of requirements defined as the South African development criteria. These are derived from the National Environmental Management Act (NEMA):

> *It's linked to NEMA. Because NEMA says your sustainable development issues should integrate (with) your social, your environment, and your economic issues. So when we*

review projects we review them along those lines. So what we've done is to create indicators in each of these.

Foreign investment and job creation, for instance, would be seen as potential economic benefits. Community development and healthcare or health benefits are classified as social issues. There are no minimum standards for projects – rather, the entire project is considered. If projects were rejected for non-compliance with minimum standards, there would be no projects in the system, but all projects must show some benefit to the country.

This approach is in marked contrast to that of China, which, according to Jane, approves all projects regardless of sustainability criteria but taxes the projects heavily so that government-driven sustainable development projects can be implemented on the proceeds.

The South African DNA is nevertheless able to exercise considerable discretion and recognises that some CDM projects can help to fulfil government targets for energy efficiency and renewable energy.

So we're not too stringent and we don't score your contribution to each of those criteria, but we use our discretion to say yes we're happy, yes we're not.

She acknowledged the relative paucity of South African projects compared to China. "*To start with we had challenges in implementing some of the renewable energy projects*." These included problems with power purchasing agreements and grid connections, as well as environmental impact assessments (EIAs).

It takes an average of two years to register a CDM project, but delays in the early years impacted on interest. Those who observed the delays early developers faced were thus less likely to attempt to register their own projects. An aggravating factor was the lack of industry interest. "*There's no pressure for them to do anything, so for them they just sit and not do anything.*"

Businesses preferred the status quo and resisted change. In addition, energy-efficient technologies were frequently more expensive, with uncertainty surrounding government's own policies.

> *There was an issue of renewable energy tariffs–the uncertainties and all that. It has been changed from being a REFIT to being a competitive bidding processes.*

South Africa needed appropriate direction from government to ensure renewable energy projects were developed:

> *There was limited intervention from the government's side to be able to make sure that renewable energy would be able to penetrate the market. So some of those were also contributions to us not getting projects.*

Most CDM projects were initiated by the private sector, and Jane noted that would-be developers received comparatively little support from government. The DNA supplied guidelines for investors, indicating potential opportunities, but offered no financial or technical support or help with project implementation – another dissimilarity between Chinese and South African practice, said Jane.

Finally, the CDM's own reputation was itself an obstacle to participation, giving rise to the perception that "*CDM is too much effort for too little reward*".

If I were to give you an example, I mean our first project that was listed in 2005 it hasn't earned a CER. So that as well for someone who hasn't started its discouraging.

…Remember with CDM you're spending that money upfront and you only get it once you have done what you are required to do.

Eskom concentrates on solar

According to Ben, an Eskom official, a major stumbling block for the planned Upington concentrated solar park was a lack of finance. Background documents show that the park would eventually generate 5 000MW of solar electricity. Eskom itself would kick off development with a 150MW concentrating solar plant, which would be partly funded through carbon credits (Eskom 2011). A project information note (PIN) was completed by 2006 and Eskom received a letter of no objection from the Designated National Authority (DNA). Although environmental authorisation was received in 2007, construction has not yet begun.

Carbon credits provide a means of downstream financing, but are not enough in themselves to finance new plants using innovative technology, said Ben, explaining the lack of progress on the project. He added that it appeared there was a lack of awareness among local businesses and parastatals regarding the opportunities offered by the carbon market. Although Eskom had received the go-ahead to apply to the Clean Development Mechanism's (CDM) Executive Board for funding, it did not at that stage have the financing in place to build the commercial-scale plant it had planned for.

It is not surprising that Eskom should have struggled to access finance for such a costly project – although funding does seem to have been readily available for the 4800MW Medupi coal power

station, with an estimated price tag of R91 billion. Further, building a solar plant in this location also required the construction of new power transmission lines at a cost of billions of rands. We have to ask why the utility, with no previous track record in solar power, wanted to develop a 150MW plant in the first place.

According to Ben, this was because Eskom's mandate was to build big projects. Eskom is a large utility, with state ownership, and is therefore perceived as a vehicle for delivering mega projects. Its coal power stations, such as Medupi, are the biggest in the world. Eskom's role was to deliver large projects, with municipalities and the private sector developing smaller projects, Ben told me. He cited two landfill gas-to-power plants built by eThekwini municipality as evidence of this approach. Each plant has a capacity of 15MW or less. If Eskom began building smaller plants, people would complain that it was doing everything, with no room for other players in the power sector. Ben readily admitted that there were disadvantages to this approach, with long lead times associated with project development and higher risk. As a result, thorough research was needed before the project could go ahead.

Eskom had aspired to build a concentrated solar plant for over a decade. But in order to build a plant of the magnitude it planned for, it had to improve on technology in use elsewhere in the world, while ensuring that the new technology was sufficiently tested. As he said, Eskom would be using a lot of public money, and it needed to have confidence that it would work.

Eskom's own ambition had stymied progress on renewable energies. If it had set its sights lower, it could possibly have had three operational plants of 10MW each, Ben said. True, this would only amount to 30MW, but it would at least have been a start.

At the time of our interview, Ben was nevertheless optimistic that Eskom's board would give its final approval to the project, and the development would go ahead – especially now that the World Bank had become involved through its loan to Eskom. He and others were in the midst of a technical study to evaluate their technology, and were hoping to build a pilot plant. He told me they were getting closer to their goal. Since then, media reports last year suggested that the project is still on the drawing board after the proposed location was moved from Upington to the nearby Siyathemba municipality (Engineering News 2012).

Enviroserv chases hot air

Eskom's experience of the CDM contrasted with that of Enviroserv, a private company which was among the first to successfully apply for CDM registration for its project, a landfill gas recovery scheme. Enviroserv's Chloorkop site, in Gauteng, receives around 1 000 tons a day of general household waste. Pipes have been sunk into the site in order to extract methane released by decomposing organic matter. When the gas is burnt, it breaks down into carbon dioxide and water, which is then released into the atmosphere. The project's environmental benefit derives from the destruction of the methane, which is a greenhouse gas 21 times more potent than carbon dioxide.

According to an interview I conducted with Matthew, an Enviroserv employee who had recently become involved with the project, Chloorkop was originally designed as a landfill gas to energy plant which would have generated around 4MW of electricity from the captured methane. This part of the project was abandoned because government policy at that time did not support the purchase of renewable energy from private suppliers. As Matthew described it, there was not enough financial incentive and no mechanism to sell the electricity.

CDM registration had resulted in extra costs for the company, as methane capture needed to be continuously monitored. An online system enabled gas production and flaring to be monitored remotely by an independent company based in the United Kingdom. Because the site manager worked day shifts only, overnight problems such as computer or flaring errors meant a potential loss of credits for the affected period. Had electricity production gone ahead, Enviroserv would have outsourced this function to another company in exchange for a royalty agreement. It would also have received a different amount of carbon credits as the project would have used a different methodology. Registration was granted in 2007, but Enviroserv had found the process far from trouble-free. At the time of the 2011 interview it had received only one year of credits – for 2008.

Matthew attributed this time-lag to excessive CDM auditing requirements, which must be executed by an independent firm known as a Designated Operational Entity (DOE), compounded by various minor problems experienced by the company. Enviroserv had had to change its DOE subsequent to its 2008 submission because the company had lost its UNFCCC accreditation. After finding a second firm to act as its DOE, a report for 2009 was prepared and submitted to the CDM Executive Board, but reporting templates had changed in the interim and Enviroserv's report had to be updated in the new format. Although I spoke to Matthew in October 2011, the 2009 report had not yet been submitted and the company was almost ready to submit its 2010 results. Enviroserv had had a bad experience, in Matthew's opinion, although it seemed that other companies had experienced similar problems.

> *It's a long time to wait… to get your credits. Whether it's actually financially feasible at the end of the day is something we're still looking at... Our gut feeling now is that it's just too much admin.*

Depending on the carbon regime in place, Matthew explained, Enviroserv could begin to make money out of the project after 2012, except that it was difficult to find a buyer for post-2012

credits. The company would also be prepared to accept a lower carbon price, through the voluntary carbon market rather than the trade in certified emission reductions (CERs), if this reduced the load of paperwork.

Chloorkop was chosen for the project as it was one of Enviroserv's biggest sites and one of the few landfills large enough in scale to offset the costs of CDM application and ongoing monitoring. While it had not, eventually, resulted in electricity generation, Matthew said this would not be the case if the project was to be repeated. At the time of Chloorkop's planning, no mechanism had existed for the state to buy renewable energy from private producers. This had now been rectified, but too late to adapt the project.

Other options, such as methane recovery, could also be feasible, with recovered methane used as an energy source for public transport vehicles, and carbon dioxide recovered through the same process could be put to work in softdrink manufacture.

Matthew noted further that the waste sector in South Africa differed substantially from its counterpart in Europe. In the United Kingdom use of landfill sites was taxed at of more than £50 (R600 at then-current exchange rates) per tonne of waste, whereas the equivalent charge for general household waste in South Africa was between R100 and R150 per tonne. In addition, land values were higher in Europe than in South Africa. The overall higher pricing structures in Europe provided greater impetus for alternative waste technologies than was the case in South Africa.

Matthew indicated that although the Chloorkop site was likely to close in 2013 or 2014 the landfill gas capture could continue for another 14 years as methane production gradually abated.

Reviewing Enviroserv's experience, Matthew was unconvinced that the philosophy behind the CDM process was sound.

> *At the end of the day I'm not convinced carbon credits are doing what they're meant to be doing... At the end of the day you're still putting it up in the air… You're changing it from methane to CO_2 but you're still generating emissions.*

Banking on carbon

While Jane and Ben both speak from a government or parastatal perspective, and Matthew offered a project view from a non-carbon specialist, my interview with Allison, a sustainability expert at a large bank, offered a glimpse perceptions held by the private finance sector.

Allison began by asserting that South Africa, like other African countries, was politically sceptical of the CDM and consequently invested less time in exploring its value than had been the case in other developing countries. China, India and Brazil had shown particular interest in the financial benefit, with Chinese universities offering masters degrees focused on the CDM, and industries being established by governments to maximise CDM benefits. South Africa meanwhile had been slow to even set up the mechanisms. The DNA was not given the requisite mandate to be proactive in getting projects off the ground, projects were met with confusion, and both support and political will were in short supply.

Allison was critical of the additional sustainable development requirements that local project developers had to meet, noting that the CDM itself was already complex. In contrast, there was a perception in other countries that a change in energy trajectory was already a contribution to sustainable development.

In the early years, the CDM at an international level was not sufficiently defined. The first project to be considered battled to get approval from the CDM executive board. Even after local approval was granted, methodology had to be considered. The Mondi fuel switch project had taken years to get through the CDM board. The board would find a problem and ask the developer to fix it, and once the first issue was resolved, another flaw would be identified. It was a tortuous process, which discouraged many companies. Transaction costs were particularly high and benefits were uncertain since no one knew how the carbon price would move once the project was operational.

But by the time of the interview, in her judgement, the DNA had grown confident and DNAs were also beginning to function better in the rest of Africa.

The methodology had always been a difficult process, requiring technical skill of a type that had sometimes been available in South Africa but had been applied instead to other areas. Some projects had bad reputations. Since then, however, she thought control mechanisms had improved. Projects based on industrial gases such as hydroflurocarbons had since fallen out of favour with buyers, who now viewed them with suspicion, she said. In recent years, it had become difficult for that type of project to find buyers.

The CDM board had significantly improved its accounting, processes and methods. There was more clarity on monitoring, baselines, and testing. It was an expensive and difficult process, but given that the board needed certainty the project marked a change in behaviour. She felt it was inappropriate for the process to be too easy, but costs could be lowered over time by repeating methodology and project types.

In apparent reference to the climate justice movement, she said there was much anti-capitalist and anti-globalisation feeling. In response, she acknowledged that there was profit to be made, and sometimes developers had made too much profit. However, they had taken the risk upfront, spending more than two years developing the projects, paying for baseline studies, and doing the project design documents. They had not been paid for this, but had anticipated carbon credit funding down the line, the exact amount of which was uncertain. "*They take the risk upfront, and for that they are rewarded*."

Alison noted a prevailing perception that because someone was "doing good", they should not be rewarded; from an ideological point of view, the first world caused the problem, so they should pay, with the funds coming from institutional organisations such as the DFID. But it did not work like that, she said.

There was a definite trend towards programmatic approaches to the CDM which allowed projects to achieve scale while paying only one set of transaction costs and making it possible for small projects to be linked. This had enabled developers to look at activities which were logical but would not otherwise have been viable.

Some 80 000 low pressure solar water heaters had already been financed in this way. Compared to typical CDM projects, low pressure solar water heaters were a pure development initiative, and the carbon savings were calculated on the basis of suppressed demand for fossil fuels at a point where poor people could afford to boil kettles for hot water, and where a contribution was made to sustainable development through improved living standards in poor communities. Such a project could only qualify because of South Africa's dependence on fossil fuels; if hydropower had been the dominant source of electricity, it would not qualify, Allison observed.

Any market mechanism would, she felt, take a long time to bed down, develop rules and get the market functioning smoothly. This was one reason why her colleagues wanted the CDM to continue. If a new mechanism were now to be introduced it would take ten years before it was operational, wasting time and human energy in the process.

Financing remained an important issue. Banks and financial institutions were able to treat a CDM project as a business product, evaluated with the same risk lens as other projects. There was risk it would never be delivered despite upfront capital costs, and there was also risk that rules would change. Banks dealt with such risks on a daily basis, calculating the size of the earnings needed to make those risks worthwhile.

The price of carbon also remained a risk, as it continued to fluctuate. Europe's economies were not using their full carbon allowances, and so did not need to buy so many carbon credits. Secondly, the allowances allocated were too large. For calculating risk, price stability was more important than the price level itself.

Allison criticised government plans for a green economy, which would include solar manufacturing, saying that not all of their wishes were logical. An NGO had suggested that South Africans should consider what was logical to manufacture locally. South Africa should not attempt to manufacture all solar power components, as it could not compete with China in the production of evacuated tubes, and producing at a premium would be unsustainable. She suggested coming to an agreement with China to share component manufacturing.

Given the structure of South Africa's economy, reducing carbon intensity was difficult. This was partly because mining would always be energy intensive, and partly because South Africa had coal reserves. Policy made between 1960 and the mid-1990s had chosen to maximise the benefits of South Africa's coal reserves and cheap electricity. Those decisions ensured South Africa's economy followed an energy-intensive route with the establishment of smelters and steel works.

Mineral beneficiation was frequently energy-intensive, but if South Africa did not beneficiate, it would give away its competitive advantages. Industries such as steel-making tended to be energy-intense. But it made sense to have those industries, because of South Africa's natural resource base. Otherwise, the raw material would be exported for beneficiation elsewhere, with the benefits accruing to another country. The likelihood, she said, is that South Africa's economy would always be energy intensive, and so it needed to look elsewhere to reduce its energy intensity.

South Africa had some of the best resources in the world for solar radiation, and should make sure it derived the maximum amount of power from this source. Government's programme to roll out one million solar water heaters was not far-fetched.

Medupi and Kusile could help South Africa to eliminate inefficient generation from its energy system. With the new capacity these stations would represent, Eskom would be able to mothball older, inefficient, power stations which were even more polluting than newer plants.

Many CDM projects, such as solar water heaters, addressed basic aspects of development: health, wellness, education, jobs, and access to energy. But at a commercial or industrial level, large-scale projects could also make an important contribution to development. They might lack feel-good

appeal but could create thousands of jobs, while putting less stress on the national grid for future energy planning.

According to Allison, sustainable development included economy-wide actions, among them avoidance of spending on new power stations, which in turn freed up state resources for infrastructure development. We should recognise that CDM projects might make different contributions to sustainable development, she said. Finally, while sustainable development was possible without the CDM, carbon credits reduced the amount of local capital deployed and sped up implementation, bringing forward the commercial viability of clean technology. This was what it was designed to do.

Conclusion and Way Forward

As luck would have it, some months after I handed in my research proposal for this topic in 2011, the European Union, fed up with subsidising industrial development in its competitors, took a decision which is likely to have far-reaching consequences for South Africa's carbon projects. After 2012, carbon credits for the European market would be sourced exclusively from Least Developed Countries. With Europe the largest buyer of credits, many countries including South Africa will need to look elsewhere to finance their carbon projects. The moral of the story? I should have finished my research project on time.

Europe's decision will have a large effect on developing countries, but 2012 saw several landmark events during the year. The world carbon market witnessed its first annual contraction, as its value fell by 36% in 2012, according to Bloomberg news service (2013), from 95 billion euros in 2011 to a reported 61 billion euros. This was caused by a drop in the value of carbon allowances for polluting companies.

Meanwhile trading is set to expand. Bloomberg (2013) also reported that Australia, China, Thailand and South Korea are all setting up their own markets, while California has already begun auctioning carbon allowances. India will begin trading in energy efficiency in 2014.

At an international level, countries have begun negotiating a new market-based mechanism to run in parallel with the Clean Development Mechanism. Such a mechanism may represent the first steps towards binding targets for developing countries, and they may also be linked to national

mitigation programmes (Castro et al, 2012). At any rate, discussions are continuing and a compromise would have to be found between diverging country positions.

The extent of South African participation in such future initiatives is at present unanswerable. But given the research I have presented above, interest in carbon credits as they are currently defined appears to be waning. Matthew, representing a private sector developer, suggested that his company would not be interested in further involvement in the carbon market. New government policy on renewable energy has made it possible for the corporate sector to develop clean electricity projects for the national grid without recourse to the CDM, although opportunities remain in the industrial and commercial sectors.

It seems there are three broad problems which have afflicted the carbon market. Firstly, carbon credits have not historically resulted in a reduction of carbon emissions, and may in fact distort accounting for emissions. Carbon trading cannot be a substitute for real emission reductions.

Secondly, the costs of carbon registration can be exorbitant, particularly for poorer countries. Linked to this problem is the fact that the technical nature of the process requires highly skilled consultants in relatively short supply. This means projects have tended to be developed in richer economies – notably India, China and Brazil – on a large scale, particularly within the industrial sector. The CDM process has thus exacerbated existing divisions in the world economy, with the richest states acting as carbon colonisers, the large developing countries scoring most of the carbon gain, and the very poorest excluded from this market.

As a result, the CDM now includes “programmes of activities” or programmatic CDM, where carbon-reducing activities can be replicated on many sites and counted as one project. This is a relatively new development which will need to be closely observed.

Thirdly, the carbon market reproduces corporate capitalism. Relatively few carbon projects are devoted to poverty alleviation activities, encourage entrepreneurship, or community ownership. Most, in fact, are linked to dominant local companies or multinationals – if not by ownership or investment, then by advisory services offered by providers such as KPMG and Deloitte.

One criticism of black economic empowerment in South Africa is that it has had a dampening effect on small business. The same is true of the local carbon market, where most projects have been undertaken by large – even hegemonic – companies such as Eskom and Sasol, as well as large municipalities such as eThekwini.

A fourth problem concerns fraud in the market. I agree that fraud erodes trust and effectiveness, but it does appear to be ubiquitous to all forms of human endeavour. Combating fraud requires better monitoring and regulation, which of course adds to the costs experienced by those seeking to register clean development projects.

Most of my report has dealt with the carbon market in South Africa. I have sought to give an impression of how the carbon market is (dys)functioning in the country, as well as the government’s official views on economic development over the next 20 years. At times, for the reader, this may have appeared an uneasy juxtaposition. My central concern has revolved around sustainable development – a concept looking for a definition. Both the carbon market and South African policy documents attempt to give voice to potential solutions, but in different ways.

For me, sustainability is fundamentally a question of trust, particularly as we build ever more complex societies. Sustainability cannot be selfish. Environmental and social factors have to be balanced with economic imperatives for inclusive and cooperative development. This requires us to think about the long term rather than the short term, and to sometimes give up gains for present generations so that future generations may benefit. Meeting the challenges of climate change will form part of this environmental dimension, which also requires us to protect biodiversity and global resources such as water, air and soil.

I undertook to provide answers to three questions which I believe are central to South Africa's economic and sustainable development policy. These are:

- What role do carbon offset projects play in the South African economy?
- What explains South Africa's embrace of such carbon offset projects?
- What is the relationship between these carbon offset projects and sustainable development?

It is clear that carbon offset projects have so far played only a limited role in South Africa's economy. Carbon developers have encountered several barriers to their participation, including, at times, a lack of enabling government policy – particularly in the renewable energy arena – as well as daunting and costly bureaucracy, as described by Matthew and Allison.

Allison's contribution particularly emphasised the role of finance in such projects. In response to the view that carbon profits were immoral, she noted that private developers must take on all the upfront costs of developing projects in anticipation of a downstream income, which itself

fluctuates. There were risks that projects would not be delivered or that rules would change. While the rewards were potentially great, the risks of projects failure has likewise been high, as Enviroserv's experience demonstrated.

The business sector tends to pragmatism, as does, I suspect, Allison herself. Her contribution, for the most part, steered clear of morality and justice. She supported the continuation of the CDM, because the alternative would be to spend ten years developing and understanding a new mechanism.

South Africa has not, exactly, whole-heartedly embraced carbon offset projects, unlike some of its peers, notably China. Although the mechanism is being used by both state and private capital, local developers do not benefit from the support levels both Allison and Jane described from other countries. Though South Africa is cautiously opening the door to private sector involvement in electricity generation, this is in line with existing policy to encourage foreign investment in partnership with South Africans, particularly black-owned companies. In contrast, the Chinese government facilitated the establishment of specialist degree courses and entire industries in order to ensure it received the maximum benefit.

Carbon projects have tended to reproduce existing patterns within South Africa's economy, such as its tendency to interlink the energy and minerals sectors. Out of all the projects submitted to the DNA, in all stages of development, 44% fall into the category of renewable energy, and a further 18% are classified as energy efficiency. The remaining projects are classified as cogeneration (30.9%), waste management (28.9%), fuel switch (27.8%), methane recovery and flaring (19.6%), industrial processes (6.2%), biofuels (5.2%), nitrous oxide (5.1%), and transport (3.1%). In this

sense, most projects appear to be continuing existing economic trajectories, rather than offering truly new or innovative solutions.

Ironically, Eskom's 150MW concentrated solar plant, part of a total project costing between R150 and R200 billion, is one of the developments which appears furthest from fruition. The Guardian newspaper reported in 2010 that the park would begin contributing to the grid by the end of 2012 (Guardian 2010), but so far Eskom has not yet broken ground. We can scarcely blame a lack of ambition for the project's failure – quite the opposite. Upington represented Eskom's first-ever concentrated solar power plant, but it was always conceived as being one of the world's largest plants of this nature. To me, this story illustrates the impact of perceptions. Politicians, technocrats, and Eskom's own employees saw the parastatal's role as delivering fewer, large, centralised power stations for feeding into the national grid, rather than many small stations. Unfortunately the first option requires enormous technical expertise and carries greater risk, even if the cost per kilowatt of installed capacity is reduced. This is the way Eskom has always done things. And looking at the broader energy landscape, this is the type of decision South Africa has always made. It is worth noting, too, that the new conventional coal power stations, Medupi and Kusile, have not faced the same type of difficulties. Medupi may even eventually receive a carbon credit boost.

Looking at the National Planning Commission discourse more broadly, as set out by the National Planning Commission, national energy policy is unambiguously directed at ensuring the continuation of industrial development on the back of mineral resources. As a result of the sector's historic dominance, planners have sought out ways to preserve current development trends in the face of climate change. At times this leads to tortuous logic. "Coal will continue to be the dominant fuel in South Africa for the next twenty years," the commission declared (NPC 2011:

165). As part of its transition to a low carbon society, South Africa should implement cleaner coal technologies and carbon capture and storage (CCS). The value of shale gas, as a national resource, should be maximised. And no one quite knows what concepts such as the green economy, or low-carbon development, actually refer to.

Perhaps this is what happens when "sustainable development" is understood to be synonymous with "low carbon economy". My interview with Allison examined perceptions of sustainable development. While poverty alleviation projects are necessary, on their own, they are not enough to ensure the sustainability of an entire economy. We need to go beyond emotional appeal to focus on transformation. This is an important point to make, and at times I have fallen into the trap she describes. In Allison's view, South Africa should seek to reduce its carbon intensity while recognising that mineral development should continue – a technocratic view of sustainable development.

Carbon cannot be the only measure of sustainability. All choices carry both costs and benefits, and there is evidence that both shale gas and CCS can further impact a limited water supply. It is too soon to pronounce that the benefits of these controversial technologies outweigh the costs.

Sustainability must balance social, economic and environmental concerns, the Rio+20 delegates emphasised. In my research report I have dealt mainly with the last two dimensions, although in South Africa poverty alleviation and job creation remain pressing concerns. Widespread labour unrest in the mining sector during 2012 highlighted social issues in particular. South Africa's economy has performed abominably on both social and environmental measures. It is not clear how the mining sector in particular will resolve these issues.

Of course, it is enormously difficult for government departments to effectively change the way policy is implemented, particularly in a sector such as energy, where power stations continue to operate for decades, even, sometimes, after their official retirement. Mistakes in this sector are not merely embarrassing, but highly public and very expensive. Five years later, middle class South Africans still dread the return of 2008's rolling blackouts, and the tight power supply has continued to constrain development (Sapa 2012), while the unit costs of electricity have risen annually.

Does the continuation of the minerals-energy complex represent a failure of the imagination for South Africa's body politic? In my theory and literature review I briefly surveyed some alternatives to business-as-usual development. The widespread use of GDP as a measure of national accounting actively rewards resource depletion inherent within minerals-driven development, as Stiglitz and other authors make clear. Stiglitz (2006) emphasises that growth at all costs is not good enough. Growth is not sustainable if it is the result of resource depletion, environmental destruction, or foreign debt. (In South Africa, growth has resulted from all three factors, with an economy based on mineral extraction, and a ballooning in foreign debt to $136 billion in the first quarter of 2013 (South African Reserve Bank 2013).)

Likewise, Schumacher (1980a) recommends abandoning the use of consumption as a measure of human well-being. Daly's (1980) steady-state economy might well be a workable solution, but, in the absence of an authoritarian world government, faces insurmountable barriers to implementation. Schumacher (1980b) wrote his essay with individuals, not nations, in mind. But entire societies – not only individuals – are imprisoned by inappropriate production systems. Systems mould societies to their own ends and societies cannot effectively adopt different aims or values without altering the system of production.

In contemplating bold changes to policy, countries frequently have limited room to manoeuvre, with commitments to multilateral finance institutions, bilateral agreements and – not least of course – the expectations of their citizens, particularly in democracies.

Despite these constraints, countries need to recognise that development-as-usual can be gendered and classist, aimed at forcing nature and marginal communities into line. Development ideology is based on a vision of bringing all natural resources into the market economy (Shiva 1988). Such fictitious commodities are valued solely in terms of the market and their intrinsic value can go unrecognised.

Most legal systems regard non-human life as property or resources to be exploited, bought and sold. As a result, there is poor regulation of actions that damage the environment, upon which societies and economies depend. By encoding rights of nature, humans can be prohibited from driving species to extinction and disrupting major ecosystem functions. Individual and collective human rights should be balanced against those of other Earth communities (Cullinan 2008).

Ecuador's inclusion of the rights of nature in its constitution in 2008 may put Cullinan's theory into practice. Nature is recognised as holding several rights, including the right to integral respect for its existence and the right to be restored. Everyone is able to call upon public authorities for the rights of nature to be enforced, and incentives should be given for the protection of nature. The state must prevent and restrict species extinction, ecosystem destruction, and the permanent alteration of natural cycles.

There are no silver bullets. Operationalising the rights of nature will demand continued vigilance from civil society, as with human rights. While adopting such rights as a legal framework is a good

start, implementation will require considerable political will. But it will certainly be interesting to see how Ecuador manages the difficult balancing act sustainability can require.

Like Allison, I too am a pragmatist. South Africa has limited flexibility to abandon GDP accounting. Although it could lobby for the adoption of a parallel system of accounts which rewards resource conservation, this would be an unusual move for a mining nation. South Africa has shown clear allegiance to the minerals and energy complex and is unlikely to move away from this sector in the next few decades – the most crucial in terms of climate action. While South Africa may not be satisfied with global production systems rewarding global supply chains and cheap labour, it also has limited influence to present an alternative model.

I hope one day South Africa follows Ecuador in embracing the rights of nature approach. The environment will always be political, as vested interests tussle over development, and environmental guardians can be ineffective, as they are now. But constitutional protection will help to give more power in deciding these issues to the justice system, with space for green advocates to act as amicus curiae, or friends of the court.

The research is unequivocal. Carbon trading has not reduced greenhouse gas emissions – the very thing the CDM was designed to do. For developing countries, it was also supposed to bring forward the commercial viability of cleaner technology, through finance and technology transfer. In South Africa the evidence for these positive benefits is limited, at least in the projects I surveyed. Local interest in carbon offsets has been far lower than in China, but those developers who have engaged with the CDM have found it a costly and frustrating process. It may be that these frustrations will diminish over time, but the National Planning Commission and other technocrats have not placed much hope in future carbon credits.

Truly sustainable development demands more from us than the carbon trade. The market will continue, but we should focus on lowering our own emissions, protecting ecosystems, and extending the benefits of cleaner environments to all communities – along with food security, safe electricity, sanitation services, education and rural development. And that surely is enough to keep us all occupied enough for now.

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Appendix A: Interview Protocol

I have reproduced below the interview protocols used in my interviews.

Interview protocol for project developers:

Can you describe the project you are currently working on? Where will it take place, how will it work?

What benefits does this project hold?

What constraints / bottlenecks have you encountered so far?

In your opinion, how could these be alleviated?

How is the project being financed?

Interview protocol for other stakeholders:

What finance is currently available for reducing carbon emissions in South Africa?

Who can apply? How does one apply for this finance?

What are the sources of these funds?

South Africa has few registered CDM projects compared to its peers Brazil, India and China. What do you think is the reason for this?

It appears that there is no shortage of project ideas, but that it is difficult to register projects. How do you think this could be improved?

How is government trying to alleviate this situation?