Future trajectories of climate change negotiations and their implications for South Africa

Two of a series of four expert papers on aspects of climate change and economic development commissioned by the Centre of Development and Enterprise

Written by Smith School of Enterprise and the Environment
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About the Smith School

The Smith School is an interactive research hub within Oxford University that engages with, educates and equips public and private enterprise with the solutions, knowledge and networks needed to address the major environmental challenges facing our planet. The School strongly believes that the only way to address the environmental challenges we face is by convening and partnering with both public and private enterprise.

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Climate Change Mitigation: An emerging market perspective

CDE Series Introduction

The South African government has voiced a clear commitment to mitigating the impact of climate change by reducing green house gas emissions and facilitating the development of low-carbon growth. In 2009, President Zuma outlined an ambitious trajectory for emissions reductions, subject to international financial assistance. Ahead of last year's COP17 in Durban, cabinet approved the National Climate Change Response White Paper, which includes a proposal for a carbon tax that could come into effect as early as the next financial year. Government has already begun to invest heavily in renewable energy, and the recently-released National Development Plan envisions the 'transition to an environmentally sustainable, climate-change resilient, low-carbon economy' to be well underway by 2030.

By international standards, these are relatively ambitious commitments to fighting climate change. But, as a developing country with high levels of poverty and perhaps the world's most serious crisis of unemployment, South Africa needs its economy to grow as rapidly as possible. In light of this, it is necessary to consider whether our economic development goals are compatible with our climate change commitments. Is it possible for South Africa to meet the potentially contradictory goals of promoting industrial development and employing millions of people while at the same time committing to the reduction of carbon emissions? Do we have the necessary policies in place to facilitate this and are they aligned with each other? What other countries can we look to as models for aligning these two agendas? What potential is there for low-carbon growth in South Africa?

With support from the Friedrich Naumann Foundation, CDE has commissioned four papers from international and local experts to address some of these questions. These papers are intended to promote a more informed debate regarding the interaction of our climate change mitigation strategies and our developmental challenges. The views presented in these papers are those of the authors and do not necessarily agree with those of CDE or the Friedrich Naumann Foundation.

- Paper one: *Future Trajectories of Climate Change Negotiations* by Oxford University's Smith School of Enterprise and the Environment.

  This paper describes United Nations Convention on Climate Change (UNFCCC) negotiations to date and presents possible scenarios for future global or bilateral agreements. Although South Africa's emissions are high relative to our GDP, we contribute less than 2 per cent of global emissions. It is necessary, therefore, to consider our position within global negotiations and how decisions taken by other countries and in global forums might impact our development goals. This paper situates South Africa within the complex terrain of global mitigation agreements and considers which possible scenarios would be in our best interest.

- Paper two: *The Response of China, India and Brazil to Climate Change*, also written by the Smith School.

  This paper addresses the approaches of other emerging economies toward climate change mitigation and adaptation. With South Africa, these countries make up the BASIC negotiating group in the UNFCCC and share similar concerns regarding poverty alleviation and economic growth. The authors describe actions being taken in each of these countries, analyse the strengths and weaknesses of each approach, and suggest lessons South Africa can learn from their experiences.

- Paper three: *Growing a Green Economy* authors Dr Nick Segal and Brent Cloete

  This paper examines the rationale and potential consequences of 'greening' the South African economy in line with the government's climate change mitigation goals. This think piece reviews the alignment of the country's economic development and climate change objectives, and consider to what extent green growth is feasible in South Africa. The authors assess the trade-offs and economic costs of mitigation, as well as the coherence of policies governing the transition to a green economy.

- Paper four: provisionally titled *South Africa's Energy Needs* by Dr Emily Tyler.

  This paper assesses policies that impact on energy planning and carbon emissions in South Africa. Dr Tyler highlights the convergences and inconsistencies in these policies, as well as their costs and consequences. The paper profiles the country's energy supply and consider the feasibility of lowering its carbon intensity. It examines how the government's energy plans might affect energy-intensive sectors of the economy, such as mining and minerals, and, in turn, economic growth.

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Executive Summary

International climate negotiations started in 1991 and over the past three decades they have brought climate change to the forefront of political debate. The United Nations Framework Convention on Climate Change (UNFCCC) has provided a platform for every country in the world to voice their concerns, while the Intergovernmental Panel on Climate Change (IPCC) has given us the scientific evidence that anthropogenic greenhouse gas (GHG) emissions are warming the planet and changing the climate. The focus has shifted from unambitious mitigation by developed (Annex I) countries to a much larger-scale global effort on mitigation and adaptation, with equity at the core of the debate.

Since 2009, the BASIC countries (Brazil, South Africa, India and China) have become a powerful negotiating group and, along with the US will determine whether a global agreement is possible. The most recent Conference of the Parties – COP17 in Durban – saw the EU build an alliance with developed and developing countries to produce the Durban Platform – the first agreement with all countries signing up to some form of mitigation commitments from 2020. The current mitigation pledges in the Cancun Agreements of COP16 do not come close to meeting what is required by science, however, and developing countries insist that the onus is on developed countries to meet the ambition gap from 2012 to 2020. With the economic crisis in Europe, lack of political support in the US and fossil fuel reserves being exploited in Canada, the 25-40% emissions reduction target for 2020 recommended by the IPCC for developed countries seems a long way off.

As negotiations progress towards mitigation targets for all, the measurement, allocation and pricing of emissions will become even more contentious. The BASIC countries have proposed various methodologies for allocating emissions to individual countries, all of which imply large financial transfers from developed countries based on historical responsibility. Developed countries in contrast focus on the present large and growing GHG emissions of India and China. Meanwhile on the pricing side, the EU has taken unilateral measures to reduce GHG emissions by including aviation in its Emissions Trading Scheme (EU-ETS). This has caused much debate and anger from developing countries who feel it undermines the multilateral process of the UNFCCC. This will weaken the EU's ability to build alliances with developing countries in future negotiations, and may hinder a global agreement.

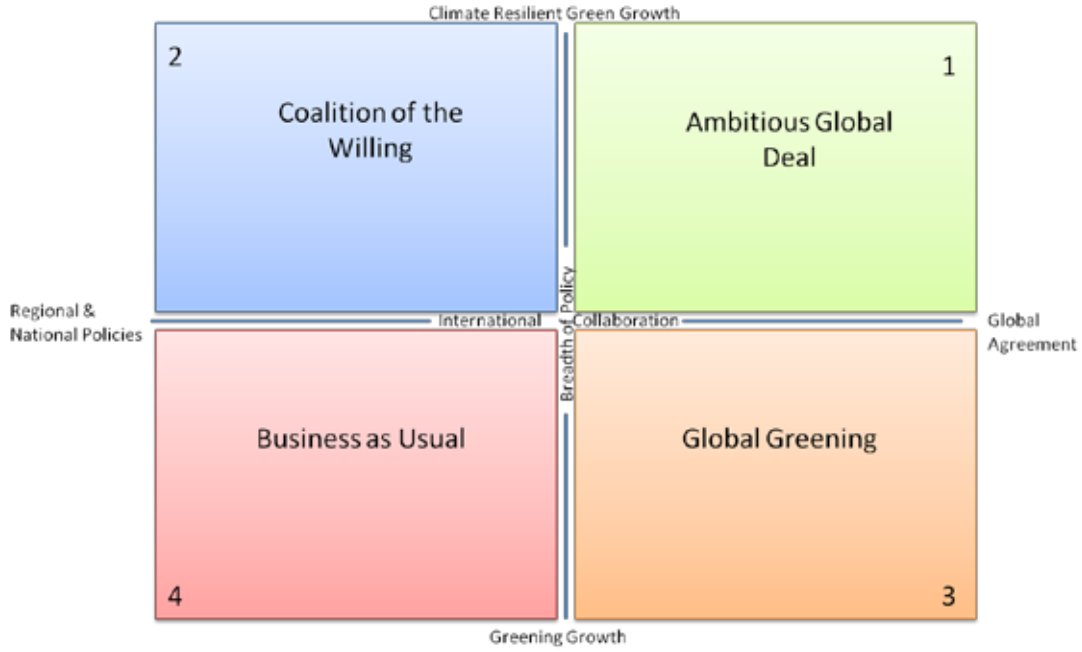
Climate finance has become a key bargaining chip at the negotiations. As the climate changes, adaptation is becoming more necessary and urgent, and many vulnerable developing countries need the support of the rich countries in finance, technology and capacity building. Despite these three areas being the focus of many negotiating sessions, not much progress has been made. Nearly USD 30 billion in Fast Start Finance (FSF) has been pledged however a significant proportion is redirected development assistance. The Green Climate Fund (GCF) was made operational at COP17 but there is disagreement on its mode of operation and where the promised USD 100 billion funds will come from. This is unlikely to materialise for another few years.

Although progress has been made through the UNFCCC negotiations, the drivers for action on climate change are likely to come from other places. Climate impacts ranging from floods and hurricanes, to sea ice and glacier melt, to heat waves and spread of disease, are already having

economic and social impacts around the world. As the climate changes, the motivation to mitigate and adapt will increase. At the same time, as the population grows and pressure on natural resources rises, resource scarcity will increase food and energy prices and could cause migration and conflict. Climate change will exacerbate the situation which will provide another driver for action to mitigate and adapt. As conventional oil runs out or becomes more difficult and expensive to exploit, oil prices will rise and create the economic reasons to invest in alternative energy sources.

While the UNFCCC is a conference for government representatives, civil society and the private sector can attend as observers and give statements. More importantly they can lobby their governments at a local, national and international level. This can push governments both towards action and away from it. Non-Governmental Organisations (NGOs) have had varying levels of success in lobbying governments, and the youth are playing an increasing role in this. The fossil fuel industry on the other hand, has spent millions of dollars on hindering progress in the climate negotiations and in national legislative processes. It will take strong political leadership to ensure that a global agreement is signed.

It is difficult to predict the future of the negotiations due to the complex multi-scale nature of climate change and the numerous uncertainties surrounding the negotiating process. The global economic uncertainty and the emotional issue of equity are key factors in its future. Without progress on these two fronts, we will be continuing with Business as Usual. Recent trends show some progress in climate policy and investment in clean energy and they give us an indication of what possible scenarios we face. This report proposed four scenarios that consider international collaboration and breadth of policy as the two parameters in a 2x2 matrix shown below. Scenarios 3 and 4 assume varying ambition for mitigation, with insufficient effort on adaptation and sustainable development. Scenarios 1 and 2 assume ambitious mitigation and adaptation efforts that incorporate a new economic growth model that promotes sustainable development. While we are currently on a Business as Usual trajectory, Scenario 4, we need to be aiming for Scenario 1, with a global agreement resulting in climate resilient green growth.



South Africa finds itself at the heart of the climate negotiations as a member of the BASIC group. While this gives the country influence, it also highlights her emissions-intensive economy and brings increased pressure to mitigate. With millions living in poverty and without access to

electricity, this is a challenge for the South African government. South Africa is highly vulnerable to climate change which could hinder development, and therefore needs to do what it can to support the climate negotiations to reduce emissions and future impacts. Recent national strategies and plans promote climate resilient green growth and economic analysis shows that this can create jobs, save money and grow the economy. Depending on which scenario plays out, there could be serious trade implications that require South Africa to diversity its markets. South Africa needs to use its unique position in Africa and in the BASIC group to drive action that results in fair and equitable global agreement that promotes inclusive sustainable development.

Acronyms and Abbreviations

AAU	Assigned Amount Unit
AGF	High Level Advisory Group on Climate Finance
ALBA	Bolivarian Alliance for the Peoples of Our America
AOSIS	Alliance of Small Island States
AR1	First Assessment Report
AWG-DPA	Ad Hoc Working Group on Durban Platform for Enhanced Action
AWG-KP	Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol
AWG-LCA	Ad Hoc Working Group on Long-Term Cooperative Action Under the Convention
BASIC	Brazil, South Africa, India, China
BAU	Business as Usual
CACAM	Central Asia, Caucasus, Albania and Moldova
CBCL	Carbon Border Cost Levelling
CBDRRC	Common But Differentiated Responsibilities and Respective Capabilities
CDM	Clean Development Mechanism
CEM	Clean Energy Ministerial
CER	Certified Emissions Reduction
COP	Conference of the Parties
DAU	Development As Usual
ERU	Emission Reduction Unit
ETS	Emission Trading Scheme
EU-ETS	EU Emissions Trading Scheme
FAO	Food and Agricultural Organisation
FSF	Fast-Start Finance
FTA	Free Trade Agreement
FTT	Financial Transaction Tax
G-77	Group of 77
GCF	Green Climate Fund
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HDI	Human Development Index
HFC	Hydrofluorocarbon
HLP	High level Panel
IEA	International Energy Agency
IFPRI	International Food Policy Research Institute
INC	Intergovernmental Negotiating Committee
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
KP	Kyoto Protocol
LDC	Least Developed Country
LULUCF	Land Use and Land Use Change and Forestry
MATCH	Modelling and Assessment of Contributions to Climate Change
MEF	Major Economies Forum
MRV	Monitoring, Reporting and Verification

NAMA	Nationally Appropriate Mitigation Actions
NGO	Non-governmental organisation
NZ-ETS	New Zealand Emissions Trading Scheme
ODA	Official Development Assistance
OPEC	Organization of the Petroleum Exporting Countries
PFC	Perfluorocarbon
QELROS	Quantified Emission Limitation and Reduction Objective
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RGGI	Regional Greenhouse Gas Initiative (US)
SARI	South Africa Renewables Initiative
SBSTA	Subsidiary Body on Scientific and Technical Advice
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WCC	World Climate Conference
WCI	Western Climate Initiative (US)
WMO	World Meteorological Organisation
WRAP	Waste and Resources Action Programme

1. Introduction

International climate negotiations have been underway for three decades. They have raised global awareness, supported scientific research and pushed governments to develop policies and strategies to address the challenge of climate change. Despite significant progress, they have not achieved what is required to avert catastrophic climate change. The current international commitments and domestic plans for future economic growth fall short of what is required by science. The next two decades are crucial in the international negotiations. They will determine whether we can turn a corner and take serious steps to reduce greenhouse gas emissions to prevent catastrophic climate change. To do this we need to reduce emissions by 5% per year until 2030. In the next eight years until 2020, the onus is on developed countries to reduce their emissions by 25-40% and support developing countries to adapt and mitigate. After 2020, developing countries need to take on their responsibility to mitigate and increase their ambition.

This thinkpiece will explore various scenarios regarding the way international climate change negotiations may unfold over the next 10 to 20 years. They will address global, regional and national agreement and action relating to ambition, emissions targets, carbon markets, trade and finance. These scenarios will then be reviewed to determine the implications for South Africa. In order to explore different scenarios, the background and context of the negotiations and related issues will first be described. Addressing climate change is highly complex as it involves every country in the world, every aspect of the environment, every sector of the economy, and the past, present and future wellbeing of humanity. It has to engage with emotional issues of equity and responsibility, and fundamental issues of finance and economics. These factors have to be understood in order to make a judgement on possible future scenarios.

To provide this background, Chapter 2 will provide a brief overview of the negotiations, focussing particularly on the past three years where significant progress has been made. Chapter 3 will provide a brief summary of the different methods of measuring and allocating emissions budgets which may be used in the future to determine levels of commitment and action taken. Chapter 4 will explain how a price can be put on emissions and used to constrain them while Chapter 5 will describe the role of climate finance. Chapter 6 will explore the drivers of action which will affect the nature and degree of action that is taken in the coming years. Based on this broad and complex foundation, Chapter 7 will describe possible scenarios for the negotiations and related action on adaptation, mitigation and green growth. These will be applied to the South Africa context in Chapter 8 and conclusions will be made in Chapter 9.

2. Overview of Climate Negotiations

The international climate change negotiations began in 1991 as indicated in Figure 2.1 which outlines the timeline of key events in the negotiations. The Intergovernmental Panel on Climate Change (IPCC) had been created in 1988 by the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO) in recognition of the need for a scientific platform on climate change in international politics. The IPCC's first Assessment Report was released in 1990 and highlighted the imperative for international action on climate change. The international climate negotiations were initially concerned with the creation of a framework of governance (Bodansky, 1994). This succeeded in 1992 when the United Nations Framework Convention on Climate Change (UNFCCC) was adopted following debates, largely dominated by the US and the rest of the Umbrella Group[1] and the EU, as to whether there would be a loose framework (preferred by the former) or a legally binding agreement with timeframes and targets (preferred by the latter). Evidently, the US was successful in influencing the formation of the UNFCCC which was based on a bottom-up process whereby countries report their nationally-defined policies and measures to mitigate climate change (Bodansky, 1994).

Figure 2.1 Timeline of UNFCCC negotiations

[1] The Umbrella Group is a loose coalition of non-EU developed countries which formed following the adoption of the Kyoto Protocol. Although there is no formal list, the Group is usually made up of Australia, Canada, Japan, New Zealand, Norway, the Russian Federation, Ukraine and the US.

2.1 The Kyoto Protocol

Despite this initial success for the US, it became increasing apparent that further action on climate change was needed. As such, the negotiations soon developed a mandate that expressed the need for the formation of a more binding agreement (Depledge, 2005). This occurred at the first Conference of Parties (COP) in Berlin in 1995. This binding agreement came in the form of the Kyoto Protocol. The Kyoto Protocol was adopted in 1997 and the rules for its implementation were finalised in 2001 (Bodansky, 2010). The protocol established emissions reduction targets for 37 developed countries and the European community for the period of 2008 to 2012. Combined, the targets were intended to reduce absolute GHG emissions from developed countries by 5% against 1990 levels. This group of developed countries did not include the US who did not ratify the Protocol. There were also no emissions reduction targets for developing countries.

There are a number of noteworthy aspects of the Kyoto Protocol and its formation. Firstly, that only developed countries are legally bound to reduce their emissions represents a strong reading of the concept of 'common but differentiated responsibilities and respective capabilities' (CBDRRC) which was introduced in the text of the UNFCCC (Okereke, 2008). This reading of CBDRRC put the focus of the negotiations squarely on the developed countries and because of this focus developing countries played a very minor role in the initial negotiation process. Secondly, the Kyoto Protocol introduced, along with legal commitments to reduce emissions, a series of 'flexible mechanisms' through which the emission reductions could be enabled. These 'flexible mechanisms' were market-based instruments modelled on the Montreal Protocol on Substances that Deplete the Ozone Layer which had been implemented successfully ten years earlier. The Kyoto Protocol allowed for Emission Trading Schemes (ETS), the Clean Development Mechanism (CDM) and Joint Implementation (JI). The latter two instruments were aimed at reducing emissions cost effectively whilst also building capacity, transferring technology and generating foreign investment in the recipient country (Bodansky, 2010). The CDM allows countries with emissions reduction targets to implement an emission-reduction project in a developing country which would not otherwise have taken place. These projects generate certified emission reduction (CER) credits, equivalent to one tonne of CO_2, that can be sold or counted towards meeting the emission reduction targets (UNFCCC, 2005). JI allows Annex I countries with emission reduction commitments under the Kyoto Protocol to earn emission reduction units (ERUs) from projects in other Annex I countries that reduce or remove emissions. Again each ERU is equivalent to one tonne of CO_2 (UNFCCC, 2005).

Following the negotiation of the Kyoto Protocol, efforts shifted to deciding what would happen when the first commitment period ended in 2012. These negotiations have taken place essentially along two different tracks. The first track is known as the Ad hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol (AWG-KP). This track was established in 2005 with the aim of negotiating improvements to the Kyoto Protocol and further commitments for post-2012 for the developed countries with Kyoto targets (UNFCCC, 2006).

The second track was launched at COP13 in Bali in 2007 under the Bali Action Plan and is known as the Ad hoc Working Group on Long-Term Cooperative Action (AWG-LCA) (UNFCCC, 2007). The aim of this negotiating track is to work in parallel with the AWG-KP to develop long-term cooperative action under the UNFCCC including all countries. The goal is to reach a comprehensive outcome that addresses mitigation actions for developed countries and nationally

appropriate mitigation actions (NAMA) for developing countries, adaptation, finance, technology transfer and a monitoring, reporting and verification (MRV) system.

2.2 Copenhagen and Cancun

The finalisation of the outcomes of the AWG-KP and AWG-LCA tracks was intended to occur in 2009 in good time for the end of the first commitment period of the Kyoto Protocol in 2012 (Bodansky, 2010). However, when the event came the political situation did not permit a legally binding agreement (King, 2009). A deadlock was reached between developed and developing countries. Developed countries, particularly the US, refused to sign up to legally-binding emissions targets without similar targets from the largest developing countries, especially China. These developing countries on the other hand maintain that for them to sign up to legally binding emissions targets would be a break from the pivotal concept of CBDRRC (Rajamani, 2010). Throughout the negotiations process their stance has been that responsibility for action lies with the developed countries; developing countries need to focus on the main priority of reducing poverty.

The negotiations at COP15 instead produced the Copenhagen Accord. The Accord was formed by a group of 28 countries in the final hours of the negotiations. It consisted of 12 operational paragraphs covering issues including finance, reducing emissions from forests, adaptation and technology transfer (Rajamani, 2010). The document included reference to the target to maintain temperature increases below 2 °C, or 1.5 °C following a scientific review. It also called for the creation of a Green Climate Fund (GCF) that would be funded with fast-start money of USD 30 billion over the period of 2010 – 2012, increasing to USD 100 billion per year in 2020. In addition, the Accord requested mitigation target submissions marking a move away from the top-down approach of the Kyoto Protocol towards a voluntary, nationally defined approach. In total, 76 countries, including all developed countries and 39 developing countries, representing over 80% of global emissions, submitted targets or actions (UNFCCC, 2009a). The submissions to the Accord were the first time that developing countries had put forward mitigation targets. Despite this, due to the irregularities in how the Accord was produced, when it was presented to the COP for adoption it was rejected and as such was not taken formerly into the UNFCCC process leaving its status confused (Rajamani, 2010).

This uncertainty surrounding the Copenhagen Accord was removed at COP16 in Cancun. The main points from the Copenhagen Accord were taken into the UNFCCC process in the form of the Cancun Agreements. They were also built upon substantially making the 12 paragraphs into a workable proposal. The mitigation commitments submitted to the Accord were formalised in the UNFCCC process. In addition, a registry for developing country NAMAs was established. Other practical steps forward were taken, including, establishing a High Level Panel (HLP) and board to manage the GCF; establishing a framework for reducing emissions from deforestation and forest degradation as well as halting and reversing forest loss (REDD+); setting in place provisions on adaptation in the Cancun Adaptation Framework and creating an associated Adaptation Committee; establishing a Technology Mechanism to facilitate technology development and transfer; and finally, the Cancun Agreements also built upon previous monitoring, reporting and verification guidelines (UNFCCC, 2011a, UNFCCC, 2011b).

Although many practical steps were taken, the Cancun negotiations did not make any progress on the legal form or the post-2012 regime, postponing the decision until the next COP. The deadlines of the two negotiating tracks were extended for another year.

2.3 Durban COP17

In the run up to COP17 at Durban the politics surrounding the negotiations remained largely unchanged leaving expectations of the COP low. The reaction to the outcomes of Durban from various governments, Non-Governmental Organisations (NGOs) and media seem to vary between two stances; the first, that the outcomes mark a considerable step forward, probably reflects these low expectations (Stavins, 2011). The second position is that the talks failed to deliver what was needed. This latter reaction is reasonably justified as the outcome comes nowhere near close to limiting global warming to under 2°C. However, it does put the path of the negotiations on a slightly more favourable route in relation to this goal.

There were four main outcomes from COP17 in Durban. Firstly, technical details of the Cancun Agreements were built upon and finalised. This includes a decision on the governing instrument of the GCF, making it effectively operational (UNFCCC, 2011f). Although the GCF is now officially launched, only three countries – The Republic of Korea, Germany and Denmark – offered initial funding to cover the operational costs over the next year. The sources of the fast-start finance and longer-term funding of USD 100 billion a year by 2020 remain unclear (Boyle, 2011). In addition, rules on transparency and reporting for developed and developing country pledges were finalised. Progress was made on specifics for technology transfer mechanisms and reducing emissions from deforestation (Stavins, 2011). The mitigation pledges under the Cancun Agreements were also reaffirmed. These steps forward will enable more successful bottom-up cooperation on climate change.

Secondly, a second commitment period to the Kyoto Protocol was agreed. The second commitment period will begin on 1st January 2013 and end either on 31st December 2017 or 31st December 2020, to be decided later this year at the seventeenth session of the AWG-KP (UNFCCC, 2011g). However, Canada, Russia and Japan will not be signatories, leaving the EU, New Zealand and Australia. Decisions relating to the governing methodological and accounting rules for the second commitment period under the Kyoto Protocol were also made. Rules relating to land use, land-use change and forestry (LULUCF) as well as a finalisation of the list of greenhouse gases to be covered were particularly important to clarify (UNFCCC, 2011e, UNFCCC, 2011d). There has been some criticism over the lack of information included in the second commitment period of the Kyoto Protocol. Most significantly, the decision does not include the quantified emission limitation and reduction objectives (QELROS) that the countries will commit to under the second commitment period. Annex 1 parties were 'invited' to submit targets for emissions reductions by 1st May 2012 (UNFCCC, 2011g). This has led some (Boyle, 2011) to claim that the second commitment period will be weaker than the first as it will be based upon voluntary proposed commitments rather than tied to an aggregate global mitigation target. In addition, there are still clarifications needed on the subject of the carry-over of assigned amount units (AAUs) from the first to the second commitment period.

Thirdly, the AWG-LCA was extended for another year to reach the agreed outcome of the Bali Action Plan (UNFCCC, 2011h).

Fourthly, and finally, a new negotiating track entitled the Ad Hoc Working Group on Durban Platform for Enhanced Action (AWG-DPA) was established. This platform is mandated to 'develop a protocol, another legal instrument or an agreed outcome with legal force under the Convention applicable to all parties' (UNFCCC, 2011c). The AWG-DPA is to complete its mandate by 2015 and the outcome should come into effect and be implemented from 2020. The AWG-DPA will cover mitigation, adaptation, finance, technology development and transfer, transparency and capacity-building (UNFCCC, 2011c). It is thought that much of the work under the AWG-LCA will be folded into the Durban Platform (Boyle, 2011).

This final outcome has prompted much debate around two main areas; what the eventual legal form of the AWG-DPA will look like; and the potential implications for the principle of CBDRRC.

CBDRRC

The negotiation of the AWG-DPA infamously went over-schedule by 36 hours, with negotiators refusing to leave without a final outcome. In the late hours, a great deal of wrangling over the intricacies of the language in the text occurred and a few of the final changes have become widely discussed. Notably, specific references to CBDRRC were removed. This is significant because it is this concept that has underlined the dichotomy of the negotiations over the past 20 years. The term was introduced in the text for the UNFCCC in 1992. However, its precise interpretation remained ambiguous. The Berlin Mandate gave the term its first precise interpretation in 1995 when it launched a process requiring emission reduction commitments from developed countries whilst stating that the process should "not introduce any new commitments for Parties not included in Annex 1" (Stavins, 2012). Developing countries have used this interpretation since then as defence for their focus on development over emissions reductions. This stance began to change in 2009 at the COP15 negotiations in Copenhagen when developing countries voluntarily put forward emission reduction commitments for the first time. This trend continued at Cancun in 2010 and appeared to have again moved forward with the Durban Platform (Stavins, 2012).

The optimism that the so called 'firewall' between developed and developing countries has started to ease may have been over-eager. In its submission to the AWG-DPA India clearly expressed its view that although there was no specific mention of CBDRRC in the Durban Platform text, it does state that it would be "under the Convention" and therefore in line with the rules of the UNFCCC, including the principle of CBDRRC (India, 2012). China's submission also supports India's interpretation of the Durban Platform mandate (China, 2012). That said, the recognition of the need for CBDRRC in the outcome of the Durban Platform mandate does not mean that a new interpretation cannot be made to replace that made under the Berlin Mandate (Stavins, 2012).

Interpreting the Durban Platform Mandate

The mandate of the Durban Platform allows for three outcomes: a legally binding protocol; a legal instrument that would most likely come in the form of an amendment of the Convention or a new or amended annex to the Convention; or another "agreed outcome with legal force". All three options must be agreed "under the Convention". Although the outcome must apply to "all Parties" the principle of CBDRRC can still be maintained through differentiation between the commitments made by each Party under the agreement. As stated above, whilst the text of the mandate does not refer to the concept of CBDRRC specifically it does state that the outcomes must come under the rules of the Convention, which do include the concept of CBDRRC (Rajamani, 2011). In submission to the AWG-DPA both India and China made it clear that the concept is still of central importance.

A legally binding agreement may or may not have legally binding commitments within it; both the Kyoto Protocol and the UNFCCC are legally-binding agreements, but only the Kyoto Protocol has legally binding commitments. The Durban Platform mandate does not refer to the legal nature of the commitments within the outcome (Werksman, 2011a).

The third option of "an agreed outcome with legal force" is the most ambiguous. Its insertion was key to securing the Durban Platform. The term was inserted at the insistence of India who, as a high emitting (in absolute terms) but developing country, is reluctant to sign up to any

legally binding obligations. The language used in the third option appears to be designed to allow for a legal instrument that would not traditionally be contemplated in the Convention yet would still, in this instance, be under the Convention. Parties reluctant to sign up to legally binding commitments may call for an outcome not traditionally viewed as legally binding such as a COP decision (Rajamani, 2011). Another aspect in which the final option may differ is that it may not require ratification. This means that the agreement would not become binding under the domestic law of each country (Werksman, 2011b).

2.4 Enforcement

A key question in regards to legal agreements is whether or not they can be enforced. The Kyoto Protocol has one of the strongest compliance systems in international environmental agreements (Hovi et al., 2007). Central to the Kyoto Protocols compliance system is the Compliance Committee. The Compliance Committee is made up of two branches: a facilitative branch and an enforcement branch. The facilitative branch is designed to assist countries to comply. The enforcement branch is authorised to apply penalties to countries that fail to comply with their emission reduction obligations, methodological and reporting requirements for greenhouse gas inventories and eligibility requirements. Should a country exceed its assigned emissions target it must cover this deficit plus an additional 30% in the next commitment period. It also loses its eligibility to sell emission permits (UNFCCC, 2006). It is feasible that a similar mechanism could be adopted for the outcome of the Durban Platform.

Despite the fact that Kyoto Protocol has one of the most comprehensive compliance systems within international environmental law, many have raised questions over its effectiveness. Five main weaknesses have been identified (Barrett, 2003). Firstly, the compliance mechanisms assume that the non-compliant country will accept its punishment and does not have any additional enforcement provisions should it not cooperate. Secondly, the compliance regulations allow for penalties to be postponed to a later commitment period, this could in fact be done indefinitely. Thirdly, the compliance system is not legally binding. Fourthly, the threat of a penalty should emission targets not be met gives countries an incentive to push for less ambitious targets. Lastly, any party is able to withdraw from the Kyoto Protocol with 12 months notice. Although this latter option has consequences in that a party that withdraws will be unable to participate in the Kyoto Protocol flexibility mechanisms. In addition it will suffer reputational damage and a loss of influence in the negotiations (Barrett, 2003). Given Canada's recent withdrawal from the Kyoto Protocol these negative consequences may not be significant enough to ensure compliance.

Enforcement is difficult to ensure not only in environmental agreements. For example, the EU in 2005 was unable to enforce fines against France and Germany for exceeding fiscal deficit limits, despite Germany being one of the main advocates for introducing the fine system (Keohane and Raustiala, 2009). A lesson here is that it is extremely difficult to force powerful nations to comply with international rules. Enforcement mechanisms such as trade measures may in fact prove discriminatory against poorer countries (Keohane and Raustiala, 2009) and therefore not achieve their intended goal.

2.5 Negotiation Groups and Standpoints

At the negotiation sessions, each country, or Party, is represented by a national delegation. These delegations consist of one or more officials that negotiate on behalf of their government. The number of representatives often varies between countries; countries with high levels of technical capacity and financial resources are able to send a much larger number of delegates. For example, at

COP6 the US was represented by 99 official delegates, the EU 76. Many of the Small Island and African countries on the other hand, were represented by delegations of one, two or three people at the most (Roberts, 2007). The Parties are organised into five regional groups, based on the tradition of the UN; African States, Asian States, Eastern European States, Latin American and the Caribbean States and the Western European and Other States (Other States includes Australia, Canada, Iceland, New Zealand, Norway, Switzerland and the US). These groupings, however, are largely for the purposes of electing the Bureaux and the Parties often negotiate in other groups that are able to reflect their interests more effectively.

The Group of 77 (G-77)[2] is the main grouping that developing countries work through to establish negotiating positions. The country holding the Chair of the G-77 can often speak for the G-77 and China as a whole. Given the large number of countries encompassed in this grouping, it represents a wide variety of interests. This diversity has led to a number of other developing country groups. The Alliance of Small Island States (AOSIS) are united due to the threat that climate change presents to their existence and are consistent in calling for ambitious and rapid action on climate change. Likewise, the Least Developed Countries (LDCs) have become increasingly vocal in pushing for support for adaptation to climate change, reflecting their intense vulnerability. The Bolivarian Alliance for the Peoples of Our America (ALBA) nations are associated with some of the most radical positions in the negotiations. Box 1 outlines the numerous other groupings in the negotiation process.

Box 1. UNFCCC Negotiating Groups

EU - 27 members of the European Union
Umbrella Group - loose coalition of non-EU developed countries: usually made up of Australia, Canada, Japan, New Zealand, Norway, the Russian Federation, Ukraine and the US.
G77 + China - all developing countries
Africa Group - all African countries
BASIC group - Brazil, South Africa, India, China
LDCs - 50 countries defined as Least Developed Countries by the UN
ALBA - Bolivarian Alliance for the Peoples of Our America: Bolivia, Cuba, Ecuador, Nicaragua and Venezuela
AOSIS - coalition of 43 low-lying and small island countries that are particularly vulnerable to sea-level rise
Environmental Integrity Group - Mexico, the Republic of Korea and Switzerland
League of Arab States – 22 Arab states in North Africa and the Middle East
OPEC - Organization of the Petroleum Exporting Countries: 12 states in Africa, Middle East and South America
CACAM - Central Asia, Caucasus, Albania and Moldova

Since its inception in 1992 the dynamics of the climate change negotiations have changed markedly over time. This reflects both the growing awareness of the threat of climate change as well as the changes in global economic and political dynamics. The early negotiations period was dominated by the US, the Umbrella Group and the EU as the negotiations revolved around the emission targets for the countries within these groups (Roberts, 2007).

This dynamic began to change when the subject of adaptation was increasingly raised by developing countries. Developing countries made a big push for recognition of the need for adaptation measures at COP7 in Marrakesh. Since this point adaptation, and developing countries,

[2] The G-77 was founded in 1964 in the context of the UN Conference on Trade and Development (UNCTAD) and now functions throughout the UN system. It has over 130 members.

have had a bigger role in the negotiations. This may be in recognition that mitigation efforts remain at inadequate levels and adaptation measures will very likely be necessary (Okereke, 2010).

A trend in the negotiations since inception has been a developed and developing country divide. Developed countries, notably the US, have consistently demanded that the large developing countries undertake mitigation efforts. Developing countries in return have refused under the principle of CBDRRC and in respect of their need to reduce poverty. Over time though, the level of pressure on the largest developing countries has increased. This is fuelled by the fact that developing country emissions now make up a large proportion of those emitted each year (den Elzen and Schaeffer, 2002). China has now overtaken the US as the largest emitter. It has become clear that action to mitigate climate change will be futile without the largest of the developing countries (den Elzen, 2005).

The negotiations in 2009 and 2010 in Copenhagen and Cancun, respectively, represented a very slight break down of these two positions with developing countries putting forward voluntary mitigation commitments.

At the Durban negotiations, there was a notable shift in the political dynamics to what has been characterised as a 'big vs. small' divide. The 'small' category comprised an 'alliance of the ambitious' made up of the EU, AOSIS and the LDCs. The US and the BASIC countries formed the 'big' category. The new 'alliance of the ambitious' managed to persuade the more reluctant parties included in the 'big' category to sign up to the Durban Platform, against all odds given the lack of support in the latter camp for a legally-binding agreement (Bodansky, 2011).

2.6 Industry Standpoint

The standpoint of industry in the climate change negotiations is not a single unified position. Opinions will clearly differ depending upon the industry, location and vulnerability to climate change. Although an attempt to generalise 'an industry standpoint' in the climate change negotiations can hide this diversity of opinions, it is possible to split industry position into two rough categories: those who see climate change as a threat to their survival or an opportunity for growth and those that see action on climate change as a threat. The actions that companies within each category push for at the negotiations, again is diverse. In general, the two categories create a dichotomy whereby one group of businesses demand that governments put in place regulatory policies that would reduce uncertainty and risk, enabling them to make large investments in the low carbon economy, whilst the other seeks to undermine these attempts by governments (Blyth et al., 2007). One of the most prominent examples of the latter is the fossil fuel industry lobby in the US that seeks to undermine climate science (Gelbspan, 1997). Specific examples include Exxonmobil and Koch Industries, both companies fund think tanks that misrepresent climate science and policies.

Industry has been involved in the international climate change negotiations as both an actor and influencer and as implementers of climate change rules. Businesses have direct access to national governments and in many occasions have been assigned roles as official members of national delegations. The private sector has also been identified as a key source of emission reductions and finance for low carbon investment. The flexible mechanisms that make up the enabling architecture of the Kyoto Protocol mean that the private sector plays an important role in delivering national emission reduction targets (Hahn, 2009). One of the main reasons behind the use of the flexible market mechanisms is that the use of the private sector will enable the most economically efficient reductions in emissions. However, due to these dual positions in industry, those that depend on high emitting processes or resources have an incentive to undermine attempts to put in place stringent climate regulations (Hepburn and Stern, 2008).

3. Measuring and Allocating Emissions

The central purpose of the UNFCCC is to negotiate the quantity of greenhouse gases (GHGs) that each country is permitted to emit, with the objective of "stabilisation of GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." It is acknowledged in the Convention that this allocation of this atmospheric space should be made on the "basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof." Interpretations of these objectives and principles vary widely, as do formulae for allocating responsibilities. This section will outline a few factors influencing interpretations of the principles of equity and CBDRRC. The ultimate allocation of responsibilities will likely not be based on a normative formula, but on a political decision made by the COP. Normative scenarios can simply provide a benchmark for analysis. The following four methods highlight the complexity and challenge of assigning responsibility and taking action on climate change, and gives some indication as to why the process has been so slow.

3.1 Per Capita Emissions

The level of climate change that we will experience is based not upon the rate of emitting but on total emissions. It is therefore possible to estimate the total amount of CO_2 that, when emitted, would most likely generate a temperature increase of 2 °C above pre-industrial levels – the level at which the risk of dangerous climate change rises significantly. This amount has been calculated as 1 trillion tonnes of carbon dioxide, with a standard uncertainty of 1.6-2.6 °C (note that this does not include other greenhouse gases) (Allen et al., 2009). Around half of this amount has already been emitted. One way of distributing this remaining CO_2 budget is on a per capita basis; every person is entitled to emit equal amounts of CO_2 per annum.

This concept has its origins in the 'contract and convergence' principle that was proposed in the early 1990s by the Global Commons Institute. The system works by setting a figure for per capita emissions per annum at a point in time in the future (King et al., 2011). The target per capita would be the same for every country. As can be seen in Figure 3.1, CO_2 emissions per capita per annum vary widely across nations at present. Therefore, to reach the same level at a future point, trajectories for each individual country would need to be calculated. In theory the overall emissions level is reduced over time whilst the per capita emission levels converge. Developed countries generally have much higher per capita emissions than developing countries. Their trajectories would therefore need to steeply decline. Developing countries on the other hand would need trajectories that could allow for an increase in per capita emissions before eventually declining (King et al., 2011).

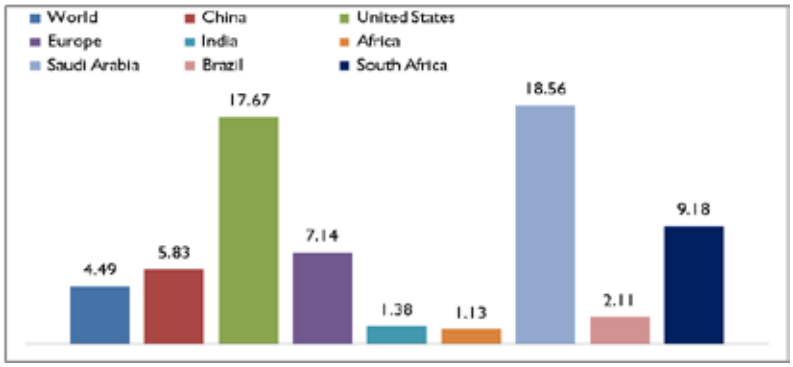


Figure 3.1. Per capita CO_2 emissions in 2009. Source: (EIA, 2010)

3.2 Historical Responsibility

As indicated in Figure 3.2, the Annex 1 countries were responsible for 73% of global CO_2 emissions from 1850-2008 (WRI, 2011a). In 1994, Brazil proposed that each country's future responsibility to mitigate GHG emissions under the UNFCCC should correspond to their historical contribution to global warming. This so-called Brazilian Proposal was based on the fact that because GHG emissions have a long residence time in the atmosphere, it is the cumulative global stock of GHG emissions that causes climate change, rather than "an instantaneous 'snapshot' of [emission levels] in an arbitrary calendar year."[3] Brazil's Proposal was designed to counter the emerging understanding that the principle of CBDRRC could be addressed by simply dividing Parties into Annex I and non-Annex I countries, and ascribing emission reduction commitments to the former under the Kyoto Protocol, and also to institutionalise the concept of historic responsibility into the UNFCCC process (Miguez and Oliveira, 2011).

Although the Brazilian Proposal was not adopted into the Kyoto Protocol, it was supported by developing countries, and COP3 assigned the Subsidiary Body on Scientific and Technical Advice (SBSTA) the task of further analysing the proposed methodology to measure historical responsibility for climate change (Elzen et al., 2005). As a follow up, an ad hoc group for the modelling and assessment of contributions to climate change (MATCH) was set up and submitted a final report to SBSTA in November 2007. MATCH generated the 'scientific underpinnings, historical datasets and modelling tools' to enable the accurate evaluation of contributions to climate change by regional, national, or sectoral breakdown, except for emissions from land-use change and forestry. The report highlighted how the choice of base year and gases affects the results, as does the published datasets used. The uncertainty of ±30% in contribution to temperature increase rises the further back in time the analysis goes.

[3] Approximately 20% of CO_2 emissions remain in the atmosphere for over 800 years; around 10% has a lifespan too long to estimate, but for practical purposes is considered 200,000 years

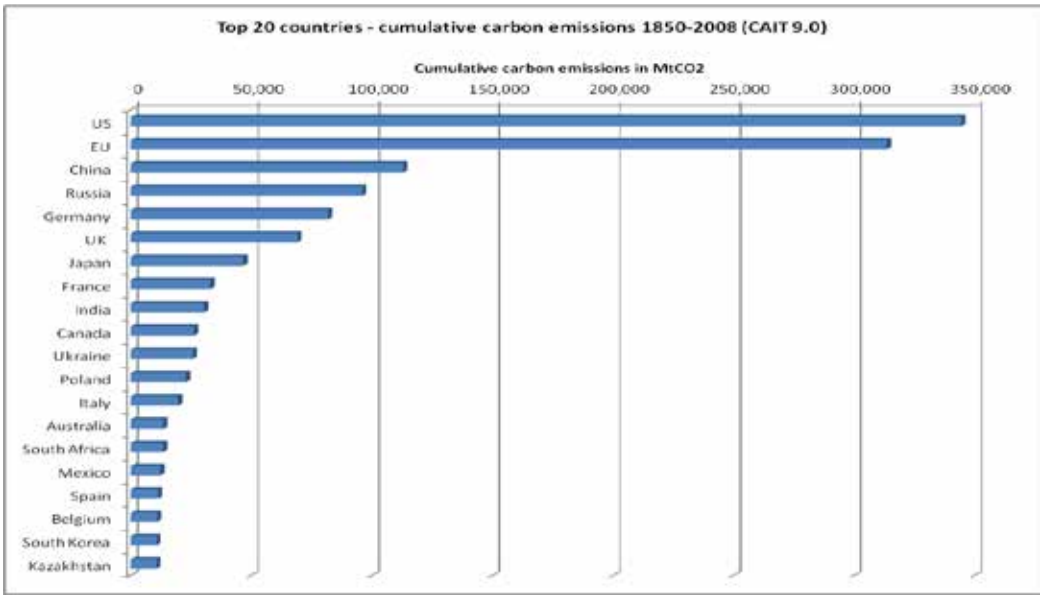


Figure 3.2. Cumulative CO_2 emissions of top 20 countries 1850-2008 Source: (WRI 2011)

A recent report by the BASIC Expert group (Winkler et al. 2011) outlined a number of approaches for allocating the global GHG emissions budget from 1850-2049 according to equal per capita cumulative emissions, with a target of maintaining global temperatures below 2 °C. It found that developed countries had already surpassed their entitled emissions by a considerable amount, and as a result their remaining entitlement to 2049 is negative. The report argues that Annex I countries' over-occupation of the atmosphere prevents developing countries from attaining their entitlement: "Equity can only be achieved if the loss of the equitably allowed carbon space for the majority of developing nations is made up by providing access to technology and finance…" (Winkler et al., 2011). The implied financial transfer varies substantially depending on the starting year of measured historical emissions and the price allocated to emissions. The paper argues that with 1900 as a starting point, a one-time financial transfer of USD 8.04 trillion at a price of USD 20/tCO_2e and USD 20.1 trillion at a price of USD 50/tCO_2e would be required to compensate for developing countries' lost atmospheric space (Winkler et al., 2011). With the higher end of this estimate equalling a third of current global GDP, financial transfers of this magnitude are impossible, however they do highlight the need for negotiation and compromise.

3.3 Human Development

The BASIC countries maintain that 'equitable access to sustainable development will be the core of and foundation for any climate change agreement and that this will be the prerequisite for setting up any global emission reduction target.' The perception that mitigation targets threaten development is supported by Costa, Rybski and Kropp (2011) who found that a country's per capita CO_2 emissions from fossil fuels are exponentially correlated with its human development index (HDI) (Figure 3.3). Costa et al (2011) argue that an equitable allocation of atmospheric space should not limit developing countries emissions until they reach an HDI score of 0.8 or 0.9, representing high and very high development standards respectively. The results, which are summarised in Table 3.1, are that 200-300 $GtCO_2$ emissions are necessary for developing countries to reach the HDI 0.8 threshold, based on per capita emissions in 2000. This is approximately 30% of the 1 trillion tonnes CO_2 budget necessary for keeping global warming below 2 °C. If developing countries want to achieve an HDI score of 0.9, representative of the lifestyle in 'western countries', they would need to emit 700-900 $GtCO_2$, 90% of the same carbon budget and three times the quantity required for

an HDI score of 0.8. According to Costa et al.'s (2011) projections, the 1 trillion tonne CO_2 budget will already be exhausted by 2030 if human development proceeds along a 'development as usual' (DAU) trend.

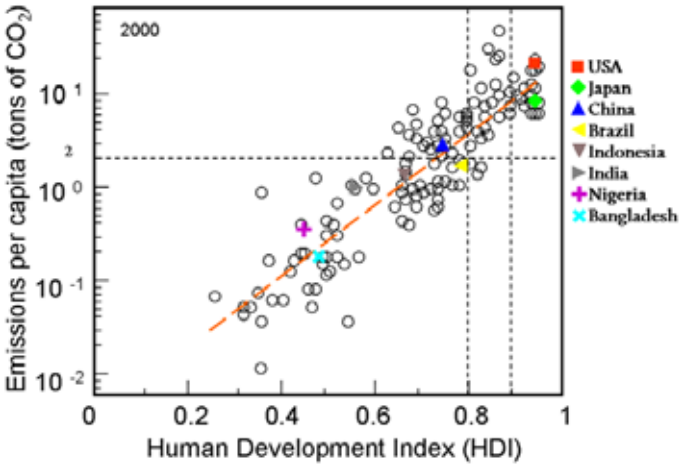


Figure 3.3 Correlation between countries' CO_2 emissions per capita and Human Development Index in the year 2000. The dashed line is a best fit line through all values. Vertical lines represent the HDI values of 0.8 and 0.9. The horizontal line represents the 2 tonnes per capita CO_2 emission target to limit global warming to 2 °C by 2050. Source: (Costa et al., 2011).

It is likely that India, in particular, would support such an approach to allocating atmospheric space. However, others will argue that through innovation, technology transfer, and financial support from developed countries, developing countries will be able to decouple development and emissions, and pursue a 'low carbon development path'.

Table 3.1. Projected cumulative CO_2 emissions for the period 2000-2050 compared to CO_2 emission budgets for warming potential and atmospheric concentrations (Costa et al., 2011)

	Cumulative CO2 emissions by 2050
Necessary for HDI of 0.8	200 – 300 GtCO2
Emitted after HDI=0.8	1500 – 2000 GtCO2
...from countries crossing HDI 0.8 between 2000 and 2050	700 – 1000 GtCO2
...from countries already developed in 2000	800 – 1000 GtCO2
Global emissions under DAU	**1700 – 2300 GtCO2**
Emissions under proposed framework	**850 – 1100 GtCO2**

3.4 Embedded Carbon

All the above methods of calculating a country's emissions use production-based accounting. That is, they are based on the emissions produced within the country's boundaries. However, this method does not take into account the emissions that are generated, either directly or indirectly, from the production of goods and services in one country which are then consumed elsewhere. In 2004, around 6.2GtCO_2 (23% of total CO_2 emissions from fossil fuels) were emitted in the production of goods that were then consumed in a different country. Taking imports and exports emissions into account can either positively or negatively affect a country's overall emissions. For example, it was found that in 2004 in developed countries, such as Switzerland, Sweden, Austria, the

UK and France, over 30% of consumption-based emissions were imported. When calculated on a per capita basis these imports add just over 4tCO_2 (50% of total emissions per capita) to those countries emissions accounts (Davis and Caldeira, 2010), making them bigger contributors to climate change. In China on the other hand, a net 22.5% of the emissions produced in 2004 were exported to consumers elsewhere, which reduces its contributions to global emissions – to the point where it is no longer the world's biggest emitter. Figure 3.4 demonstrates these large-scale global transfers, showing how exports from China to the US and Europe dominate 'emissions trade'.

In a number of developed countries the main cause of reduced CO_2 emissions over the past few decades has not in fact been climate policy implementation. For example, in the UK the decrease in emissions has largely been driven by a drop in manufacturing as a share of Gross Domestic Product (GDP), from 28% in 1971 to 11% in 2006, and a switch from coal to gas-fired electricity generation in the early 1990s. Consumption-based emissions have, however, been increasing. Since 1990 CO_2 emissions from imports have almost doubled from 166MtCO_2 to 331MtCO_2 in 2009 (Energy and Climate Change Committee, 2012). It is unlikely that the current method for measuring emissions from individual countries will change as the production-based accounting method is now deeply entrenched in the UNFCCC system. However, given the large amount of carbon embodied in trade, changes in consumer behaviour in importing nations towards less carbon intensive products and services could have a negative impact on countries that have high carbon intensities of GDP and large exports (Davis and Caldeira, 2010). The UK Energy and Climate Change Committee recently submitted a report highlighting the problem of the rise in consumption-based emissions and policy measures that would reduce the problem in the UK. Given the increasing attention given to the problem it is a possibility that changes in developed country consumption patterns may well begin to be seen.

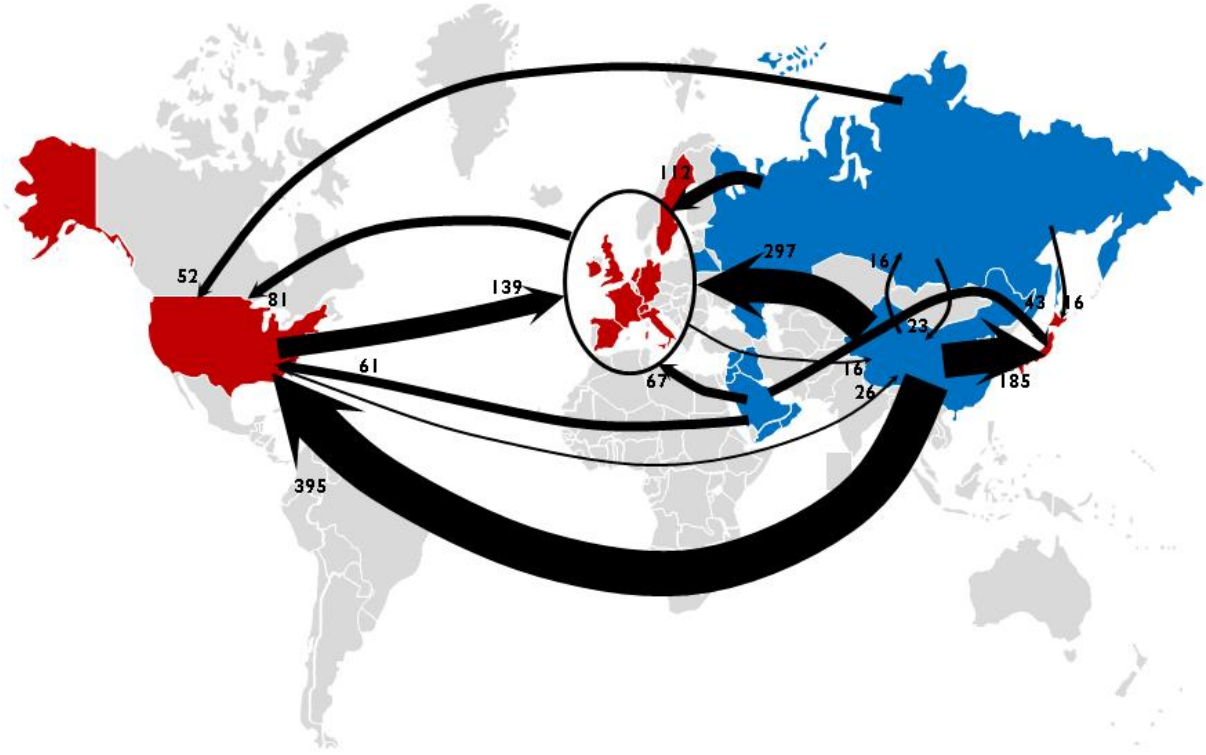


Figure 3.4 Largest interregional fluxes of emissions embodied in trade (Mt CO_2 y^{-1}) from dominant net exporting countries (blue) to the dominant net importing countries (red). Fluxes to and from Western Europe are aggregated to include the United Kingdom, France, Germany, Switzerland, Italy, Spain, Luxembourg, The Netherlands, and Sweden. (Davis and Caldeira, 2010)

4. Pricing Emissions

Putting a price on the social and environmental damage caused by GHG emissions is crucial for any policy regime to address climate change. Without a price on emissions, those engaged in highly polluting activities, such as burning coal, do not pay for the full cost of their actions and are effectively receiving a subsidy from society at large. With a price, households and firms will be incentivised to reduce emission-intensive activities, and invest in low carbon alternatives. Pricing emissions is generally achieved through two policy instruments: by levying a carbon tax; or by implementing a cap-and-trade system. In the latter, a regulatory cap is placed on the amount of emissions permitted in an economy, 'emission rights' are auctioned or allocated to private actors, and those facing more expensive emission abatement choices are permitted to purchase emission rights from actors with excess. The price on emissions is determined by the cost of abiding by the cap.

Emissions trading schemes have become the dominant form of pricing since the Kyoto Protocol introduced market mechanisms as a way of reducing emissions. In 2008, emissions trading markets were worth around USD 120 billion and it is estimated that within a decade trading volumes could reach USD 1 trillion. This would be similar to trading in commodities like oil, gas and gold (Fankhauser and Hepburn, 2010). The most developed cap-and-trade system is the EU Emissions Trading Scheme (EU-ETS), however a number of others have been created or are in the pipeline. These include the New Zealand-Emissions Trading Scheme (NZ-ETS), a proposed Australian Emissions Trading Scheme, the Northeast United States Regional Greenhouse Gas Initiative (RGGI) on the electricity generation sector, and the potential Western Climate Initiative (WCI) of California and much of Canada, a forthcoming scheme in South Korea, and pilot schemes in two states in India and six provinces in China. A major development would be if the United States implements a national cap-and-trade system, as was specified in the American Clean Energy and Security Act, which passed through the House of Representatives in 2009, but was never approved by the Senate.

The future prices of emission allowances in these markets are difficult to forecast, because they are highly dependent on government policies. For instance, EU emission allowances[4] were traded at €20–25 per tonne for most of 2008, but plummeted to €8 in February 2009 in the wake of the financial crisis and after COP15 in Copenhagen failed to come to a binding emission reduction commitment to replace the Kyoto Protocol. At the time of writing, the price had yet to recover.

To put these prices in context, the European Commission (EC, 2009) estimated that in order to limit the increase in global temperature to 2ºC the price of GHG emissions must reach €37 per tonne CO_2e by 2030, and €64/tCO_2e by 2060. This estimate is based on the fact that many carbon abatement technologies become profitable at a price of €30-90 per tonne. For example, offshore wind is estimated to become profitable at a carbon price of €35/tCO_2e, while carbon

[4] One emission allowance represents one tonne of CO_2 emissions, or a reduction of a specific quantity of another greenhouse gas that has an equivalent global warming potential as one tonne of CO_2, termed CO_2e.

capture and storage does not become profitable until the carbon price reaches €70-90/tCO_2e (EC, 2009).

The development of emissions pricing is important to emerging markets like South Africa for two reasons. First, as developed nations impose prices on emissions of domestic industries, it is likely that they will try to 'even the playing field' by pricing emissions embodied in imported products and taking unilateral action in international industries like aviation, which could have implications for global trade. Second, through flexible mechanisms such as the CDM of the Kyoto Protocol, emissions trading offers a potential source of finance. These issues are discussed in more detail in the following sections.

4.1 Carbon Border Cost Levelling and Unilateral Action on International Industries

According to the pollution haven hypothesis, if a country takes unilateral action to make polluting more expensive for firms, those firms will be outcompeted at the global level and an incentive will be created for firms to (re)locate in countries with less stringent regulations. Not only will the competitiveness of the domestic economy be damaged, but the pollution reduced by the imposed taxes or regulations will be offset by an increase in pollution in other countries, a phenomenon referred to as 'carbon leakage.'

To prevent industry flight thus far, European countries have tended to provide tax exemptions and free allocation of emission allowances to vulnerable sectors. This measure, of course, is counterproductive to the aim of curbing emissions. From 2013 to 2020, allocation will be centralised with the European Commission, with auctioning as the default allocation rule. While the power sector must buy 100% of the quotas, other sectors will continue to receive 80% for free, decreasing annually to 30% in 2020.

Without an agreement in place requiring other large economies to implement carbon-reducing regulations in unison, the EU will be under increasing pressure to protect the competitiveness of domestic industries by implementing carbon cost adjustments at the border. Carbon border cost levelling (CBCL) involves extending carbon-pricing systems to include carbon embodied in products as they enter and/or exit an economy. To ensure domestic products are competitive at home, goods being imported into the country would be charged a tax or required to purchase emission allowances equal to a measure of embodied carbon; and to ensure that domestic products are competitive abroad, exports would be rebated the carbon taxes or emission allowances paid.

CBCL has become a heavily debated issue in both the EU and the US. In Europe, French President Sarkozy and German Chancellor Angela Merkel have led the call for tax adjustments at the EU's borders in order to protect industries and jobs in high polluting sectors such as steel and chemical from cheaper imports. Thus far, no country has gone through with such regulations. Were CBCL to be implemented in Europe, it would likely be challenged by other countries through the World Trade Organisation dispute settlement mechanism. It is ambiguous as to whether, and in what form CBCL would comply with the General Agreement on Tariffs and Trade (Fischer and Fox, 2009, WTO., 2011).

Ominous of such debates is the current row over the EU's recent mandate to incorporate aviation into the EU-ETS. To the chagrin of the US, Russia and numerous developing countries, airlines will now need to purchase emission allowances upon landing and takeoff at a European airport. The EU has further plans to incorporate shipping into the EU-ETS in 2013. Due to the

international scope of aviation and shipping, emissions from these industries are inherently difficult to tackle. Thus far, they have been excluded from national targets under the UNFCCC. Although aviation only accounts for 3% of global greenhouse gas emissions, it is the fastest growing source of emissions. Furthermore, aviation contributes disproportionally to the greenhouse effect due its release of nitric oxide, nitrogen dioxide, sulphur oxides, water vapour and soot.

Those opposed to the EU's scheme contend that in order for pricing measures to be implemented on an intercontinental scale a new multilateral treaty would need to be signed under the International Civil Aviation Organization. Moreover, India argues that the scheme would entail additional economic burdens for developing countries that are not compliant with the principle of CBDRRC, and that carriers registered in developing countries should be exempt from the ETS. In contrast, Müller (2012) has argued that the principle of CBDRRC applies to national, not sub-national actors, and that rather than exempt airline carriers registered in developing countries, the revenues from the airlines should be repatriated to their respective countries with the recommendation or requirement that they be spent on climate change activities. This approach is supported by many NGOs.

4.2 Clean Development Mechanism

The CDM was established as a flexible mechanism of the Kyoto Protocol. It has two aims: to allow Annex 1 countries to achieve compliance with their quantified emission reduction commitments under the Kyoto Protocol by purchasing CERs from offset projects in non-Annex 1 countries; and to promote sustainable development in non-Annex 1 countries. The EU-ETS allows CERs to be traded as offsets for European companies striving to achieve compliance with their emissions reduction target, which has opened up a whole new source of private revenue for GHG emission-reduction projects in developing countries. The CDM acts as a "linchpin of the international carbon market, supporting a community of innovative investors and compliance credit buyers, and providing important lessons for scaled-up carbon trading mechanisms" (Streck, 2009). It has been more successful than any other international mechanism at leveraging private finance for mitigation in developing countries.

However, it is not without critics. First, the CDM has had little influence in the forestry sector of developing countries, which is arguably the sector with the most abatement potential. Carbon trading offers a potentially innovative approach to finance forest conservation and reforestation efforts. However, due to a worry that CERs from forestry would flood the market and reduce emissions prices, REDD+ projects are not eligible in the CDM. While afforestation and reforestation projects are eligible, credits from these projects are not allowed to be sold in the EU-ETS.

Second, as seen in Figure 4.1, most of the CDM projects are located in China and India. Only 2.11% of traded CERs have originated from Africa. This failure has been attribute to an overly complex CDM process, the lack of private and public sector capacity in LDCs to navigate this complex process, and to the lack of large scale emission sources in small economies. The new Programmatic Approach to the CDM, as well as simplified procedures for small scale projects, may increase the opportunities to generate CERs from small scale emission reductions.

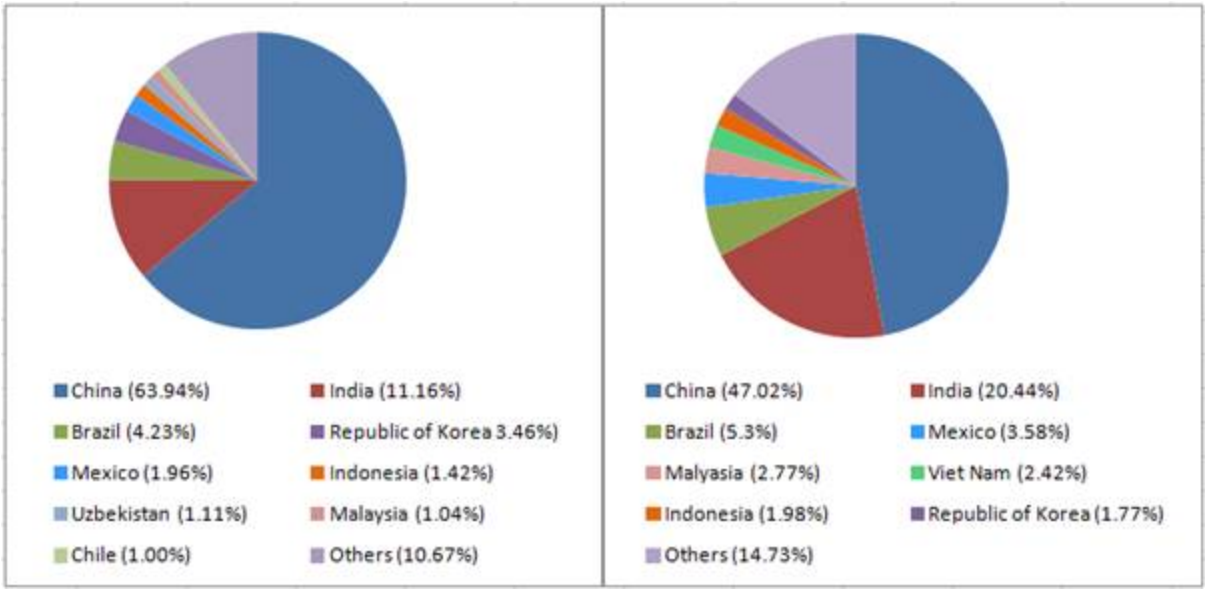


Figure 4.1 Registered CDM projects by host country (left); Expected average annual CERs by host country (right) (UNFCCC, 2012)

Finally, many have argued that the CDM has failed to fulfil its second aim, to promote sustainable development in non-Annex 1 countries (Streck, 2009). As seen in Figure 4.2, although most registered CDM projects are in the renewable energy sector, most CERs issued are for projects that reduce hydrofluorocarbons (HFCs), perfluorocarbons (PFCs) and NO_2, which typically have little development benefits.

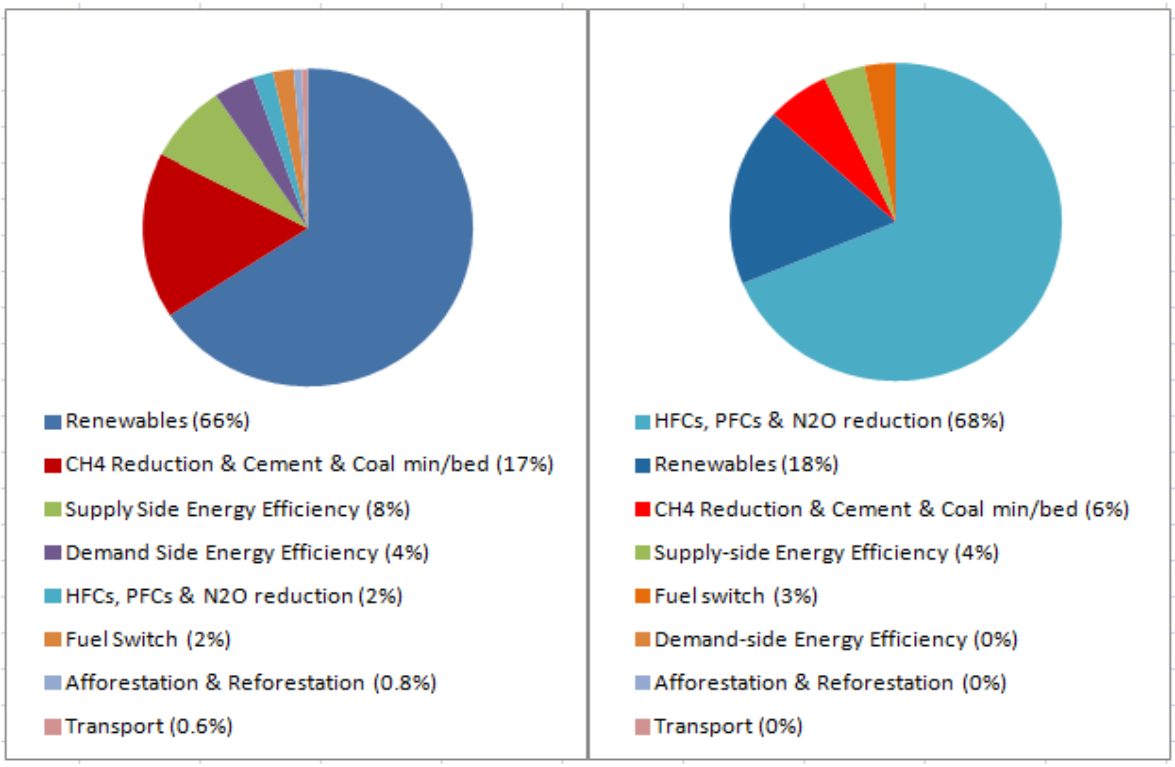


Figure 4.2 Registered CDM projects by sector (left); CERs issued by sector (right) (CD4CDM, 2012)

At the international level, sectoral- or NAMA- crediting mechanisms are being discussed as potential methods of increasing carbon investment in LDCs and in sectors with more development

benefits. Under sectoral-crediting mechanisms, rather than crediting emission reductions at the project or programme level, credits would be awarded based on the performance of an entire industrial sector of a given country, such as the power generation or steel production sectors. Likewise, NAMA-crediting mechanisms would award credits to countries at the national-level based on compliance with their proposed NAMAs. These approaches would greatly reduce transaction costs for individual projects. However, there are issues with getting the incentives right for private investors, particularly if qualification for carbon credits is determined by factors outside of their control (Kraiem, 2009). Moreover, these approaches might not be appropriate for sectors that are difficult to monitor (e.g. the buildings or transport sector) or in countries with governments that do not yet have the capacity for robust monitoring (Ward, 2009).

Before COP17 there was much uncertainty about what will become of the CDM after the expiration of the first commitment period of the Kyoto Protocol in 2012. The agreement to extend the Kyoto Protocol at COP17 implies that CDM is likely to continue after 2012. According to the EU's current position, CERs will continue to be traded via the EU-ETS post-2012, but only from projects hosted in least developed countries and countries where a bilateral agreement has been reached with this aim (Castro and Michaelowa, 2011).

5. Climate Finance

Climate finance has become a key, if not the key, negotiating currency in the UNFCCC negotiations. Developing countries argue that because developed nations bear the primary responsibility for creating climate change, they owe a 'climate debt' to developing countries, and should transfer funds to cover the costs of adaptation and mitigation actions in developing countries (Grasso, 2010, UNFCCC, 2009b). Developed countries agree with the necessity of climate finance, though not with the concept of 'climate debt'. For them, the main purpose of climate finance is to incentivise private investment in low carbon activities (Forstater et al., 2009).

Despite these differences, significant progress has been made on the climate finance front. In the original 1992 UNFCCC, developed countries agreed to cover the 'full incremental costs' of mitigation measures in developing countries, and to 'assist the developing country Parties that are particularly vulnerable to the adverse effects of climate change in meeting costs of adaptation.' Subsequently in the Copenhagen Accord, developed countries agreed to provide developing countries with 'new and additional' resources approaching USD 30 billion in 'fast-start finance' (FSF) for the period 2010-2012 and to mobilise USD 100 billion per year by 2020 from a mix of public and private resources. These funds are to be split evenly between adaptation and mitigation and a 'significant proportion' will be channelled through the new GCF. As of November 2011, FSF pledges equalled USD 28.22 million (Figure 5.1).

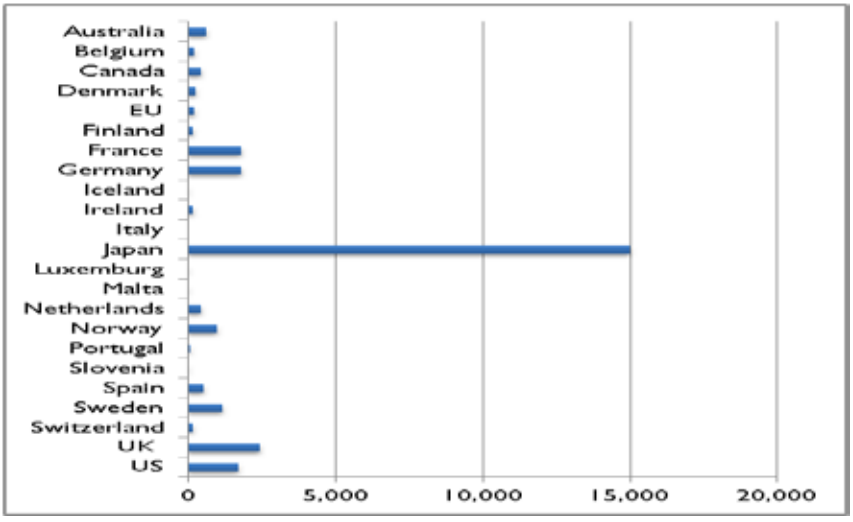


Figure 5.1 Global Fast Start Finance Pledges as of November 2011 in Millions of US Dollars (WRI, 2011b)

Although FSF pledges are ostensibly approaching the target of USD 30 billion between 2010 and 2012, there are questions concerning whether they fulfil the 'new and additional' criterion. A significant portion of these were made prior to the signing of the Copenhagen Accord and are being double-counted towards official development assistance (ODA) commitments. Climate finance is currently flowing through traditional bilateral ODA channels, and through dedicated bilateral and multilateral climate funds (Figure 5.2). Each fund has its own unique mandate, institutional design, application procedures, and MRV requirements. This complexity presents developing countries with significant challenges in accessing finance.

One of the central tasks of the GCF, which is anticipated to be several times larger than other climate funds, will be to simplify and rationalise the multilateral climate finance architecture (Nakhooda et al., 2011). Müller (2010) proposed the architecture in Figure 5.3 illustrating three different ways that climate funds could be managed. The current climate finance architecture fits primarily with Type A. Developed countries deposit funding into a plethora of dedicated multilateral funds, which then invest in adaptation and mitigation initiatives in developing countries. With the creation of the GCF, it is anticipated that the architecture will shift towards either Type B or Type C. Developed countries will deposit funding into a centralised GCF, which will then invest directly into adaptation and mitigation initiatives in developing countries (Type B), or devolve funding to developing country national implementing entities (Type C).

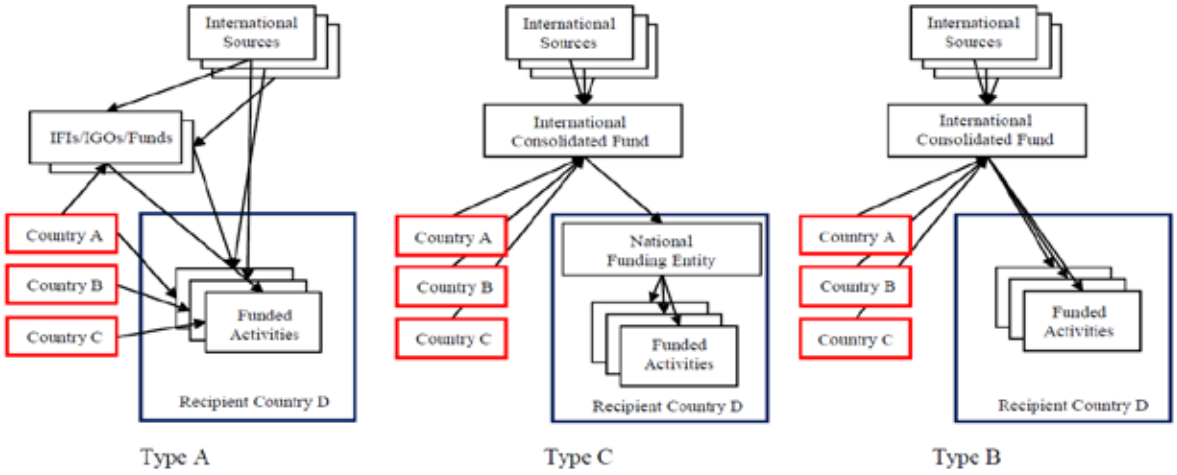


Figure 5.3 Potential Public Climate Finance Architectures (Müller et al., 2010)

Developing countries want climate finance to be managed separately from ODA through a new entity, such as the GCF, to ensure that the funds are 'new and additional', rather than redirected development funding (Müller et al., 2010). However, to ensure efficient management, developed countries argue that climate funds should be 'mainstreamed' with development funds, and remain largely managed by international financial institutions (IFIs) (Klein, 2010, Smith et al., 2011). As argued by De Nevers (2011), "Climate actions are generally not end-of-pipeline or separate actions that are disconnected from a country's broader economic and social development programmes. Mitigation and adaptation actions, and thus planning for climate investment, need to be fully integrated into development planning and not 'ghettoized'" (De Nevers, 2011).

Developing countries have responded by calling for mainstreaming to occur through a devolution of funding decisions to national level governments, either by enabling direct access to the GCF or through the establishment of national-level funding entities (Müller, 2009, Gomez-Echeverri, 2010, Horstmann, 2011). They argue that whereas projects and programmes supported by international funding entities have been fragmented and had little impact on government policy and activities, national funding entities would enable governments to coordinate incoming funds and align them with national level projects and programmes. A number of developing countries have already established, or are in the process of establishing national funding entities.

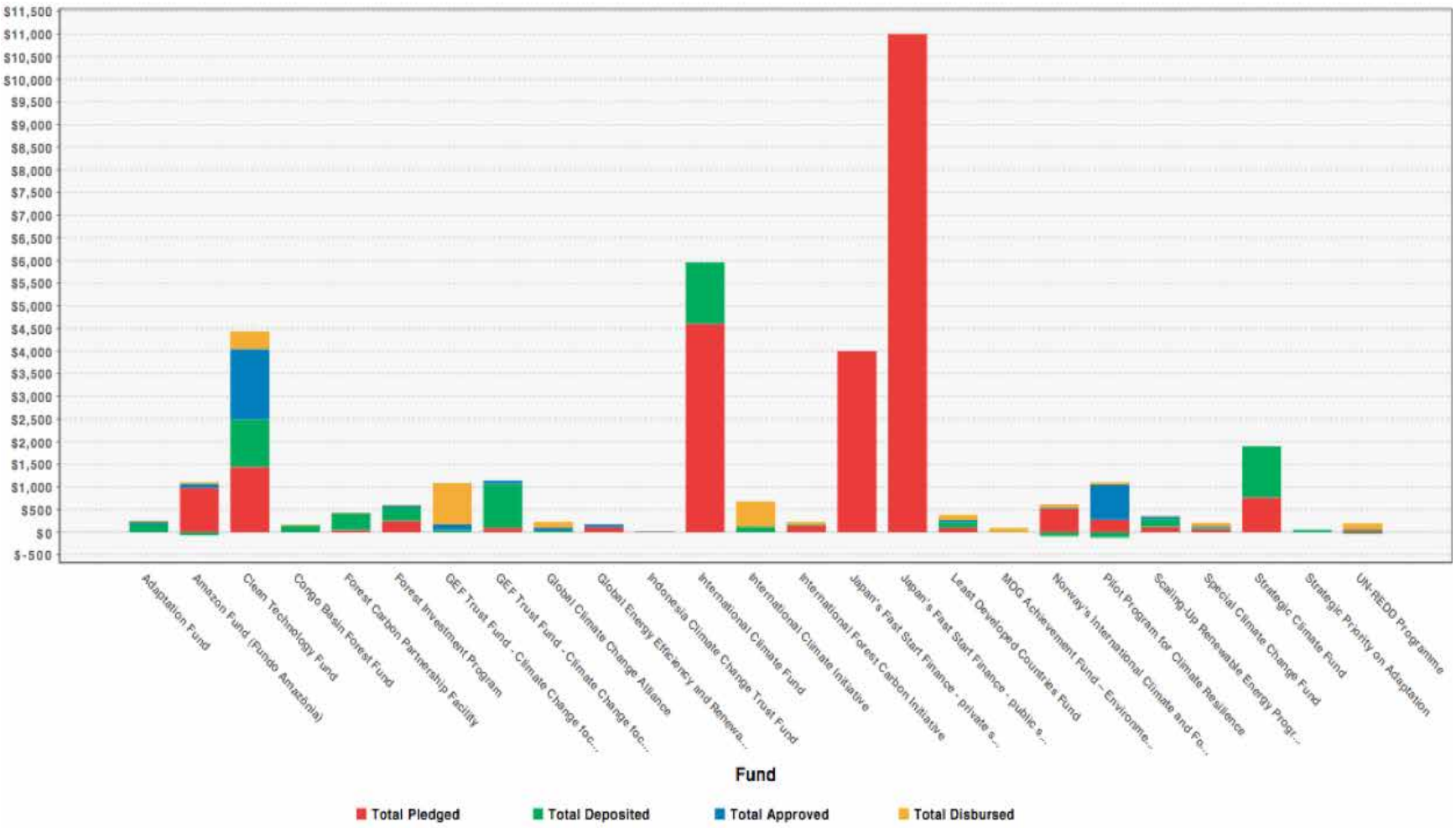


Figure 5.2 Size of Climate Funds (million USD) (ODI, 2012)

Note that a large portion of the bilateral funding through the International Climate Fund, the International Climate Initiative, and Japan's Fast Start Finance is dispersed through multilateral and national climate funds, thus there is a significant amount of double counting between these funds. The total amount of public climate finance available cannot be estimated by adding up the total size of each of the funds.

Beyond the institutional architecture of the GCF, there are disagreements over what proportion of the USD 100 billion will flow through it, and where capitalisation will come from. Developing countries want most, if not all, of the USD 100 billion per year pledge to come from public sources and be disbursed through the GCF (Oxfam, 2010). However, many analysts have argued that a large-scale public transfer of USD 100 billion is not politically feasible with the severe budgetary constraints currently faced by most developed countries, and see public sources only contributing a small portion. Liebreich (2011) calls for as little as USD 10 billion in public capital to be invested in the GCF. The extent to which private finance is deemed compliant with the USD 100 billion per year pledge, makes a drastic difference in its ambition.

In 2010, the UN Secretary General Ban Ki Moon assigned the task of determining how to mobilise USD 100 billion per year to a 'High Level Advisory Group on Climate Finance' (AGF). From its report, it appears that private finance would count towards the USD 100 billion if it is 'leveraged' by public policy or public spending, as seen in Figure 5.4. To maximise leverage, the AGF pushed for a large portion of the funds to channelled through IFIs (AGF, 2010). However, private finance does not naturally flow to industries associated with adaptation (water, agriculture, etc), and there is a risk that focusing too much on leveraging private resources might redirect public funds to regions and sectors where private finance is already flowing. As argued by Atteridge (2011), "Leveraging needs to shift private flows, rather than follow them." Though indicative, the AGF's rather liberal inclusion of leveraged private finance does not make it a *fait accompli*. The decision of which sources of capital will count will need to be a political decision made by the COP.

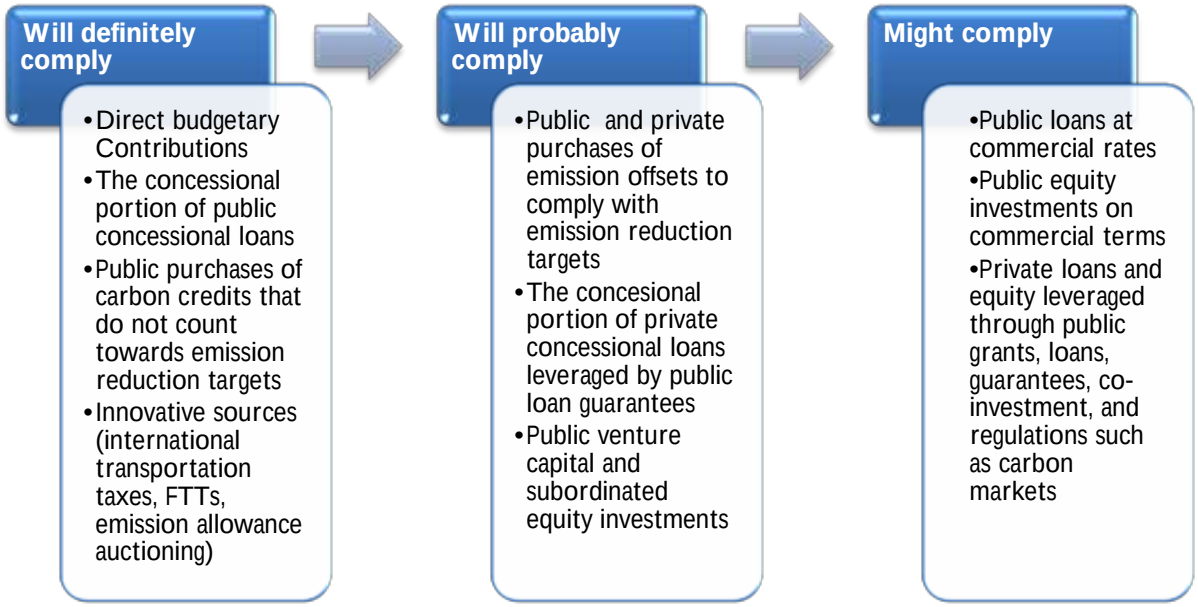


Figure 5.4 Likelihood of different flows of finance being complying with the USD 100 billion target

The AGF also identified a number of potential innovative international sources of finance, listed in Table 5.1. These sources could offer a compromise in the debates over public resource transfers, because in many cases the revenues would fall outside the scope of national jurisdictions.

Table 5.1. Potential Innovative Sources of Climate Finance

Measure	Description	Potential Revenue
Auctioning of emissions allowances	Auctioning of emission allowances in international trading schemes such as the EU-ETS.	The AGF (2010) estimated that if developed country emissions were priced at USD 20-25 per ton of CO_2e (using emission allowance auctions or a carbon tax), and 10% of total revenues were allocated to international climate action, such sources could generate USD 30 billion annually.
Revenues from offset levies	Precedence for levies on carbon credits is offered by a 2% tax on CDM transactions, the revenues from which are used to capitalise the Adaptation Fund. There are proposals to increase the levy on the CDM and extend it to JI and emission trading schemes. A fundamental issue with offset levies is that they are on 'economic goods' and are likely to reduce offset transactions and offset price in developing countries (Bowen, 2011).	Martin (2010) estimated that a 10% tax on an expanded CDM could raise USD 10 billion a year by 2020. The margin of error in this estimate is high due to uncertainties regarding the impact of such a levy on trading volumes.
Taxes on aviation and shipping or inclusion in carbon markets	An international tax on the bunker fuels of aviation and shipping could be imposed, a tax could be levied on airline tickets, or international transport could be included in future international carbon markets, as is occurring in the EU-ETS. The revenues of such measures could be earmarked for climate finance.	According to the Landau Report (2004) on innovative financing, a tax of USD 3.65 per tonne of kerosene could yield USD 74 billion, and a tax of 1% on ticket and freight fares could yield USD 74 billion. In regards to shipping, it estimated that a 10% global tax on bunker fuel would yield about USD 1 billion per annum.
Carbon border cost levelling	CBCL would raise revenue from pricing the embodied emissions of imported goods. While consumers within the countries with emission pricing systems would be hit most directly, CBCL would also impact the exporting country through a decreased market share. There is little justification for the revenues to go to the national budgets of the countries raising the levy. Grubb (2011) argues they should go to climate finance.	Grubb (2011) estimated that if the entire OECD were engaged in carbon trading, border levies could raise about USD 5 billion per annum from the cement and steel industries alone.
IMF Special Drawing Rights & Green Bonds	Developed countries could use their IMF shareholder reserves, referred to as Special Drawing Rights,[5] to provide the initial equity in the GCF. With this capital injection, the GCF would be able to provide the credible security necessary to issue green bonds to raise debt through capital markets. Green Bonds are an innovative debt instrument that have been used by the World Bank to raise capital for green investments.	The Position Note suggests that the GCF could issue green bonds totalling up to USD 40 billion a year by 2020, which would subsequently be lent to developing countries with the purpose of helping them finance climate change mitigation and adaptation projects (Bredenkamp and Patillo, 2010).
Financial Transaction Tax (FTT)	FTTs are levied on transactions of financial products, including stocks, bonds, foreign exchange and derivatives.	Revenue estimates range from USD 10 billion to USD 376 billion per year depending on the rate, the tax base, and estimated impact of the tax on trading volume (McCulloch and Pacillo, 2011). The AGF (2010) suggested if 25-50% of revenues from a global FTT were directed to climate finance, it would yield circa USD 10 billion

[5] SDRs were created in the 1960s as a notional currency to supplement the IMF member countries' official reserves. There value is tied to the value of four key international currencies: the USD , €, £, and ¥.

6. Drivers for Action

A number of different factors have driven action on climate agreements in the past, and will continue to do so in the future. Although each country has its own unique set of drivers for action on climate change, there are several that are generally applicable globally. Although countries are largely driven by domestic interests, the UNFCCC plays a role in increasing the attention that must be given to the issue of climate change. It is an important forum in which all countries (in theory) are able to express themselves on an equal footing. It also provides a space for civil society, indigenous people, and business to push their representatives for increased ambition in a way that other international forums, such as the G20, do not. This chapter will provide a brief overview of six drivers for action, or in some cases, inaction on climate change.

6.1 Impacts of Climate Change

The effects of climate change, and the fear of the effects of climate change, are major stimuli for action. The effects of climate change are already being felt through changing rainfall patterns, extreme weather events, heat waves, glacial and sea ice melt, sea level rise and storm surges, spread of vector-borne diseases and pests, ocean acidification and coral bleaching. The indirect impacts include reduced agricultural yields, food and water insecurity, loss of income and livelihoods, infrastructure damage and loss of life. These impacts are being felt around the world, and have caused many countries to begin to build in resilience to climate change. The impacts are and will be felt in different degrees around the world. The increasing awareness of AOSIS and LDCs to their high vulnerability has, over time, increased how vocal these countries are in the negotiations.

How these climate change impacts drive the climate change negotiations could go in two directions. Firstly, the threat of increased insecurity of resources and higher levels of extreme events could spur more ambitious action on climate change mitigation and adaptation. Alternatively, very negative impacts of climate change on society could distract from long-term planning, leaving governments focused on 'fire fighting' short term problems and coping with disasters at home. In the extreme, resource shortages could lead to political collapse, and ultimately failed states which threaten global security and cause large-scale migration. In this situation, the UNFCCC negotiations would find it difficult to come to any meaningful solution. Improvements in climate science that allow attribution of extreme events to climate change would potentially increase the will to act on climate change by allowing a monetary value to be put on the current impacts of climate change on the economy. A greater emphasis on the need to act would be realised when tangible effects of emitting are observed.

6.2 Resource Scarcity

The growing world population has an ever increasing demand for natural resources, but is facing growing resource scarcity. The Food and Agricultural Organisation (FAO) estimates that demand for food will increase by 50% by 2030, International Food Policy Research Institute (IFPRI) predicts an increase demand of 30% more water by 2030 and the International Energy Agency (IEA) estimates we will need 50% more energy by 2030. Meeting these demands is a challenge, and is likely to increase GHG emissions unless done in a very different way to current practice. Climate change

in turn will exacerbate resource constraints making it even harder to meet the demands. Developing countries will be impacted the most as the price of basic food stuffs rapidly increases as a result.

Conventional oil is also becoming more scarce and this is a driver for oil-importing countries to increase their energy security through diversification of their energy supply. A high dependence on imported oil can leave a country's economy vulnerable to oil price spikes, geopolitical events in oil-producing countries and oil scarcity. This energy insecurity can promote energy efficiency, investment in green substitutes and renewable energy usage which has co-benefits for climate change in the resultant emissions reductions. Unfortunately it can also push many countries to extract unconventional oil resources (heavy oil, and oil from shale and tar sands) as they become profitable. The world has vast resources of unconventional oil (IEA, 2010b), which currently provides just over 2% of total oil production, and is expected to grow to 7% by 2030 (IEA, 2010a). This has negative implications for climate change as the extraction of unconventional sources is generally riskier and more detrimental to the environment. Also, increasing fuel prices may limit the ability of governments to put a price on carbon.

6.3 Economic Opportunities

The economic opportunities of green growth are an additional driver for action on climate change. This factor has been a clear driver for change in many large developing countries, notably China, and developed countries, particularly Germany and the US. For developing countries, green technologies represent an opportunity to be world leaders in a new emerging and growing sector. Businesses and economies can benefit from the opportunity of growing a green sector as it generates investment and job creation. The renewable energy technology market is an example of one area that has grown dramatically over the past decade and is likely to experience further growth. As it does so, it will enable higher levels of action on climate mitigation and the shift in the global energy system away from fossil fuels as it becomes competitive and drives down the cost of mitigation. These opportunities have led businesses to lobby governments to commit to legally binding agreements to enable them to make long-term investment decisions. Climate agreements can therefore benefit countries through enabling private sector investment.

One of the main barriers to the economic opportunities of clean energy being realised, are fossil fuel subsidies. According to the IEA (2011) over USD 500 billion is spent every year on fossil fuel subsidies. As shown in Figure 6.1, these are dominated by oil and gas and far outweigh subsidies for renewable energy. These subsidies make them artificially cheap and encourage fossil fuel consumption. As pointed out by the Guardian (2012), while government support for renewable power is 'subject to seemingly endless media and political scrutiny, the 500% larger (fossil fuel) subsidies … rarely get much attention'. The IEA estimate that if fossil fuel subsidies were removed, 2.6 billion tCO_2 could be saved annually by 2035 – equivalent to 72% of current EU total annual emissions.

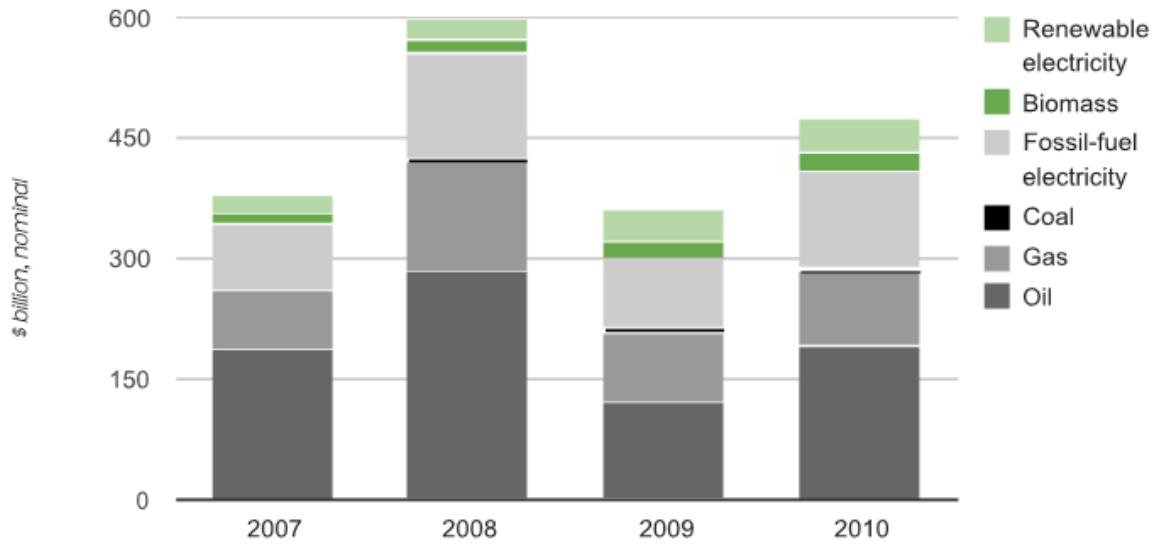


Figure 6.1 Global energy subsidies in 2007 to 2010 (Grandia, 2010)

6.4 Activism and Lobbying

Increasing public activism and engagement with the challenge of climate change would enable increased action on climate change. Civil society demand for action would give leaders the mandate to make bolder commitments in terms of both emission targets and financial transfers. As time goes by younger generations could realise that they are the ones who will experience the negative effects of climate change. At present there is a growing youth movement on climate change concerned with intergenerational equity. In addition to civil society lobbying, businesses can also play a role. The balance between the two traditional stances on climate change in businesses will dictate how much support there is for strong policies.

The biggest lobby group is the fossil fuel lobby in the US. According to Open Secrets, the combined lobbying expenditures from 1998 to 2010 of the oil and gas and electric utilities sectors was USD 2.3 billion (Grandia, 2010). In 2009, 'big oil' alone spent USD 169 million on lobbying the US government in 2009 (Burley and Hoedeman, 2011) with the big spenders being ExxonMobil, Chevron, ConocoPhillips, BP and Koch Industries. In response, the renewable energy sector has increased their expenditure on lobbying by a factor of 12 since 1998 (Grandia, 2010).

6.5 Political Leadership

Throughout history, individual leaders have influenced the national and international course of action. The emergence of political and country leadership on climate change action could increase the ambition of wider action. In the past, the EU has been one of the central drivers of the UNFCCC negotiations, pushing for timelines and ambitious pledges. It has also taken unilateral action, for example in expanding the EU ETS to include aviation emissions, which utilises its own economic strengths to prompt actions from others. Bold commitments from LDCs and AOSIS have also produced pressure on developed and larger developing countries to increase ambition. Although these countries have been key to pushing the UNFCCC negotiations, thus far there have been no notable high level displays of strong political leadership. Should this kind of leadership emerge the progress of the UNFCCC could be greatly enhanced.

7. Future Scenarios

It is very difficult to predict what the outcome of the negotiations will be in the next 10 to 20 years and the way they may unfold. Very few commentators on the UNFCCC negotiations accurately predicted, beforehand at least, the outcomes of the Durban negotiations. The actual outcome was considered very unlikely. This is a trend in the negotiations. The Copenhagen Accord was one of the most dramatic twists of the negotiations. Cancun managed to build upon the developments made at Copenhagen leaving predictions of a collapse of the negotiations unfulfilled. UNFCCC negotiators are incredibly skilled at interpreting the language of the negotiating texts in imaginative ways.

The outcomes of the Durban negotiations remain volatile while many key questions in relation to mitigation commitments and finance remain unanswered. In the end, agreement on the Durban Platform text depended upon alterations to make it sufficiently ambiguous. Although the language used in calling for a new agreement is strong in comparison to that used in the negotiations in the past, the wording allows a wide range of interpretations. An 'outcome with legal force' may turn out to not be very forceful at all. However, given the issues with enforcement outlined in chapter 2 the existence of a legally-binding agreement, rather than a political agreement, may not be overly significant. In many ways, the key aspects of an international agreement will be the enabling architecture that it creates around practical measures such as finance and technology transfers to developing countries. Action taken on climate change in an alternative forum to the UNFCCC will also be important, particularly in the period between the present and the beginning of the outcome of the Durban Platform in 2020.

In considering the future outcomes of the UNFCCC negotiating process it is useful to address the range of uncertainties surrounding the process. The following uncertainties are relevant for the negotiations:

- The effects of climate change impacts on action
- Advances in climate science
- Society's attitude towards climate change
- Business' attitude towards climate change
- Behavioural change rate
- Political situation within countries participating in the negotiations
- Wider international geopolitics
- Speed of developments in technology
- Resource scarcity
- Price of fossil fuels
- Level and type of economic growth
- Demonstration effect – increasing experience in reducing emissions

The relationships between countries in the international climate change negotiations are only one aspect of complex and evolving international politics. At a national level there are political uncertainties in some key countries. In the US, the presidential elections will be taking place at the end of this year. The outcome of these elections could affect the climate change negotiations given

the climate sceptic views among the Republican Presidential candidates. On the other hand, the Democrat government led by Obama has been unable to make progress on climate change commitments despite promises made in 2008. The effects of the elections on commitments in the international forum may therefore have little effect. A Republican-led government may have a negative impact on the state level action on climate change and could limit the scope of the Environmental Protection Agency. A more significant political event is the once-in-a-decade change in top-level Chinese leadership at the end of this year. This leadership change is not always a smooth process and the outcomes and position that the new leaders will take in the climate change negotiations are far from certain. Feeding into the factor of political uncertainty is the stance that civil society and businesses take on climate change. A desire for stronger action from these two groups will allow for more a more ambitious political space.

On top of political uncertainty is economic uncertainty. Over the past few years the economic crisis has acted to detract attention from the climate crisis. Economic concerns are often used as excuses to reduce support for 'expensive' green policies. A worsening of the global economic state may further detract from the desire to act on climate change. In addition, sufficient finance is one of the key demands that developing countries make of developed countries. An inability of developed countries to deliver on this may have dire consequences for the climate negotiations.

On the other hand, more ambitious action could be spurred. As temperature continues to rise and cause wide-ranging and increasingly significant changes in our climate, we will see greater negative economic impacts. This is likely to drive action on mitigation and adaptation. Developments in science to enable attribution of extreme events to climate change would highlight the dangers of letting climate change occur unabated. This could inject urgency into the process. Developments in technologies could enable abatement at much cheaper costs than anticipated. At present governments are reluctant to act on climate change due to the perceived trade-offs with economic growth and active campaigning from large emitting industries. If it could be demonstrated that this trade-off is not necessary then the barriers to action would be significantly reduced.

7.1 Global Context

When considering the future outcomes of the UNFCCC process it is important to be aware of the wider global context in which it will be evolving. The world today is a very different place from when the UNFCCC was first being negotiated. There has been a shift in global power. The past twenty years has seen the emergence of a new group of economic and political powers in the developing world. Figure 7.1 illustrates the rapid increase in GDP in these developing countries. Whilst the increase is strongest in China particularly, both India and Brazil have also experienced rapid growth. The figure also shows that developed nations have greatly increased their annual GDP but over a longer time period. China and India are now challenging the dominance of the US and Western Europe in crafting the regimes of governance.

The global economic crisis of 2007 and continuing EU financial crisis has highlighted weaknesses in the financial system of developed countries. Developed country government debt is now at a very high level (Figure 7.2) largely due to the overspending on credit. Public transfers of funds from developed countries in this context will be increasingly difficult for governments to justify to populations that are experiencing stringent cuts in public spending.

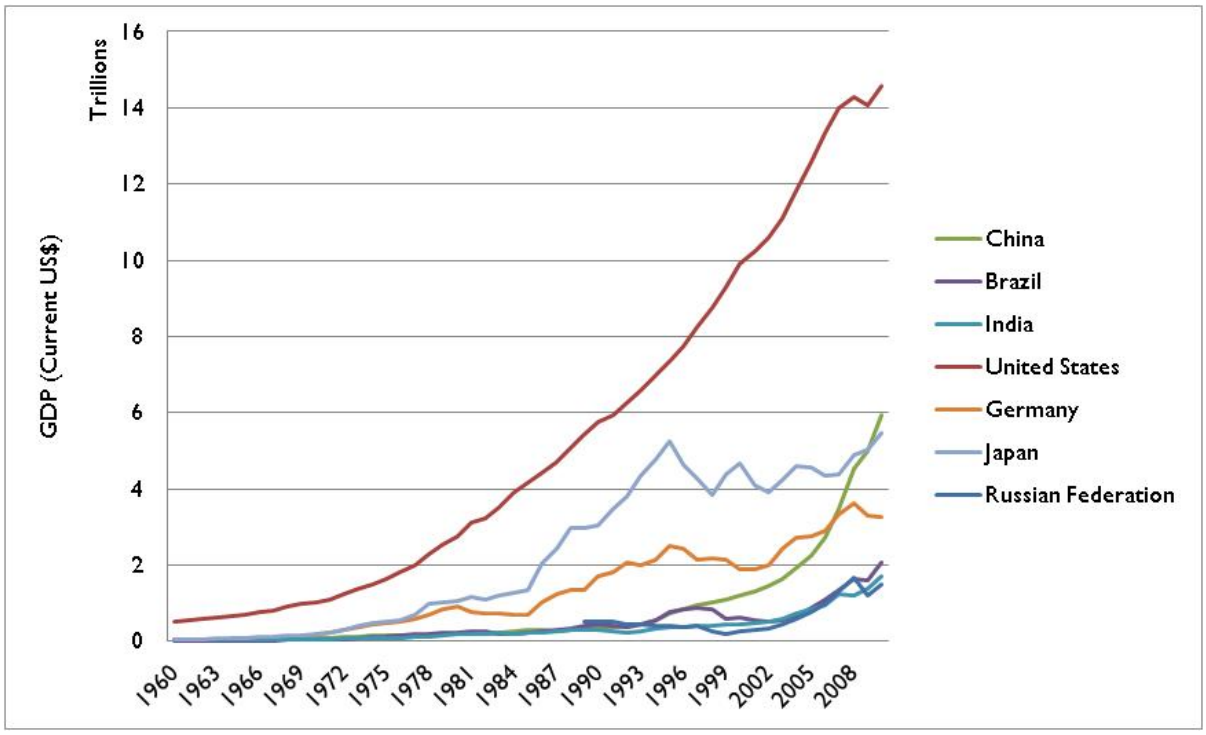


Figure 7.1. GDP (in current USD) of large economies since 1960 (WB, 2012)

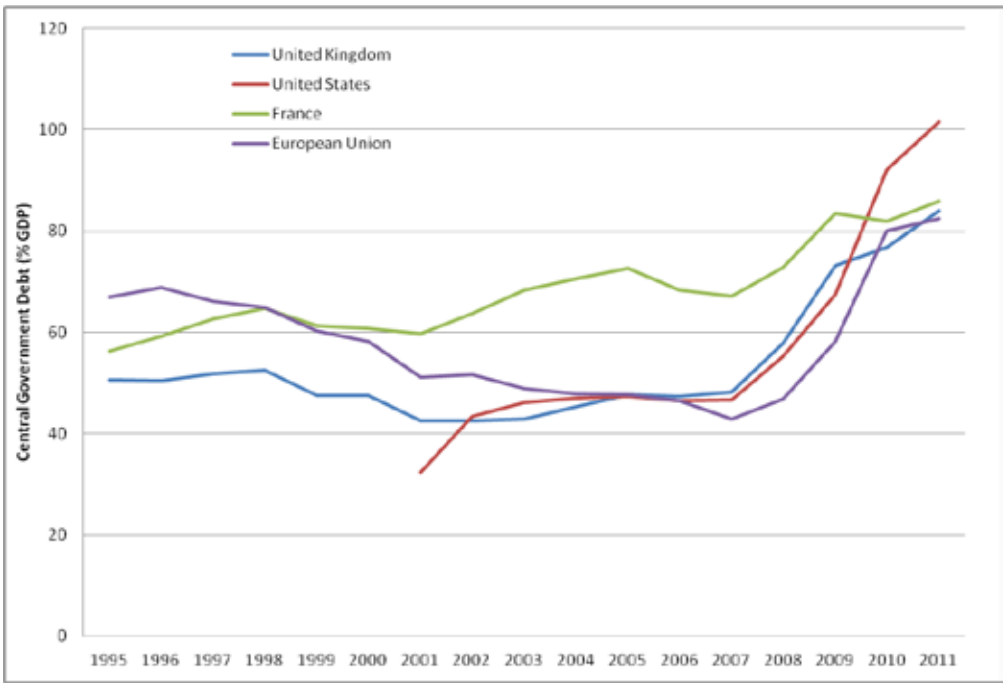


Figure 7.2. Central government debt as a percentage of GDP in the UK, US, France and EU (WB, 2012)

Since the formation of the UNFCCC, other factors have also become increasingly important; in particular the high and volatile price of oil and the scarcity of conventional oil. Since 2005, despite an increase in the demand for oil, and a rise in price of around 15% per year, supply has been unable to increase and production has remained at around 75 million barrels per day. Prior to 2005 supply had increased with demand (Murray and King, 2012). Figure 7.3 plots oil prices against oil production

from 1998 to 2011. It demonstrates that prior to 2005 oil production could increase or decrease in response to changes in price – supply was elastic. Since 2005, a ceiling in oil production appears to have been reached – oil supply is now inelastic. In oil importing countries, this has generated the need to increase energy security through diversifying energy sources. This has included developing clean sources of energy and green technologies.

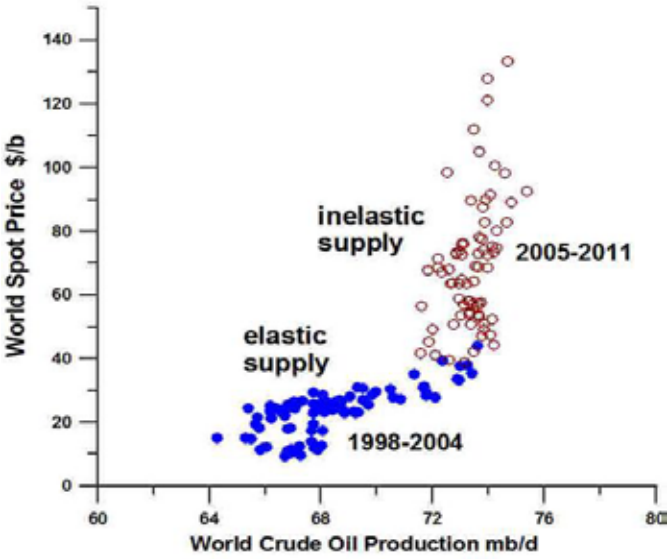


Figure 7.3. Oil spot price plotted against world crude oil production from 1998 to 2011. Blue markers represent data from 1998-2004 and red markers represent data from 2005 to 2011 (Murray and King, 2012).

7.2 Current Trends in Climate Action

The current trends in key areas also provide guidance on future scenarios.

Policy

Deutsche Bank Climate Change Advisors have, since 2008, tracked policy momentum of mandates, emission targets and supporting policies put in place by the Clean Energy Ministerial (CEM) and key US states. The CEM is a global forum ,created following the UNFCCC conference in 2009, that was designed to bring countries together to advance clean energy and the transition to a global clean energy economy (DBCCA, 2011). It is made up of 23 countries including the Major Economies Forum (MEF) countries[6]. As this group of countries represents around 80% of global GHG emissions it provides a good picture of global trends. The increase in cumulative policies implemented is shown in Figure 7.4.

[6] Australia, Brazil, Canada, China, EU, France, Germany, India, Indonesia, Italy, Japan, Korea, Mexico, Russia, South Africa, UK, US, Spain, UAE, Sweden, Norway, Denmark and Finland)

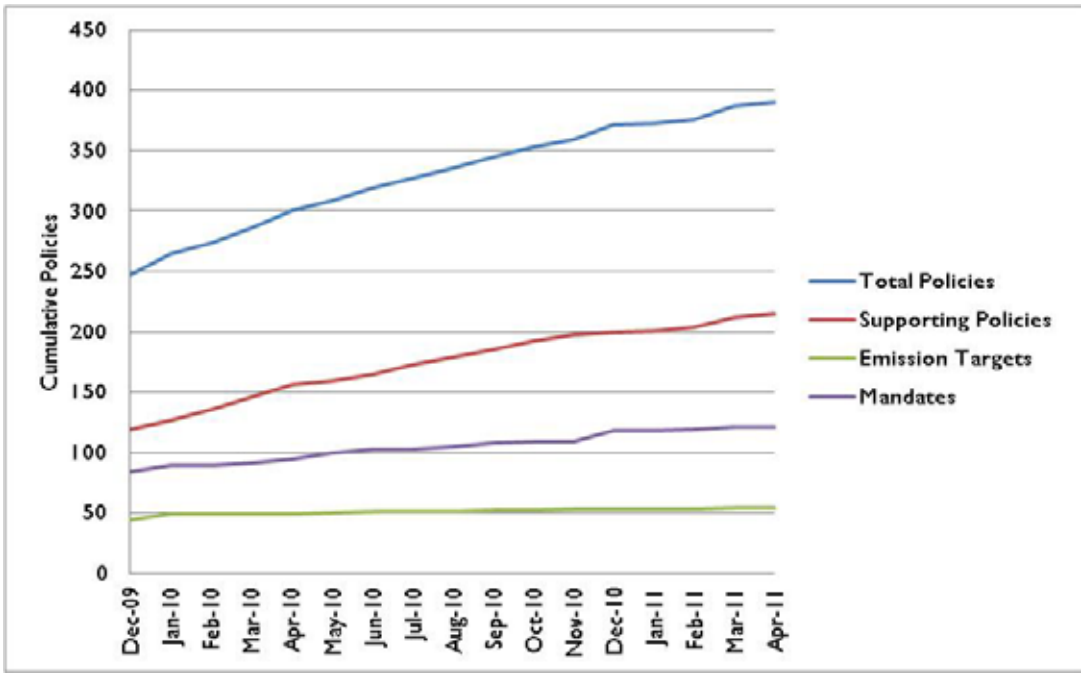


Figure 7.4 Cumulative climate policies for CEM countries, EU and US states including mandates, emission targets and supporting policies (DBCCA, 2011)

Although there has been an overall increase in the number of policies supporting action on climate change, there is considerable regional divergence. Asia and Europe demonstrate the greatest momentum on the issue whilst the US has yet to adopt emission targets and standards at a federal level (DBCCA, 2011). The EU (25%), US states (21%) and China (11%) make up the majority of the total number of policies put in place. while Brazil, Russia and India make up 9%. The three US states assessed (California, New Jersey and Texas) put in place 58 policies compared with 22 at a federal level, demonstrating that action in the US is still dominated by state level policies (DBCCA, 2011).

Over the past year there has been some slowdown in the policy momentum although it remains positive. There are two factors that could explain this trend. Firstly, many economies may have developed and implemented their domestic climate policies. Secondly, the financial crisis has caused some countries to negatively revise climate policy due to budgetary concerns. Most notably within EU countries Feed-in Tariffs have been fine-tuned (DBCCA, 2011).

The build-up of climate change policy means that it will be increasingly difficult to back-track. The development of policies supporting national pledges suggests there is both commitment and increasing ability to meet them. This suggests that, regardless of the outcome of the international climate negotiations, some nations will act to reduce emissions.

Renewable Energy

Renewable energy and clean technology will play a major role in enabling the transition to a low carbon future. Therefore progress in this area is critical to assess. Renewable energy investment is driven in a large part by policies put in place by governments (DBCCA, 2011). These policies have been addressed in the previous section. However, there are a number of other ways of analysing the developments in the renewable energy sector - global financial new investment in clean energy (Figure 7.5), comparing new investment in renewable energy with that in fossil fuel capacity (Figure 7.6) and installed renewable capacity worldwide (Figure 7.7 and 7.8).

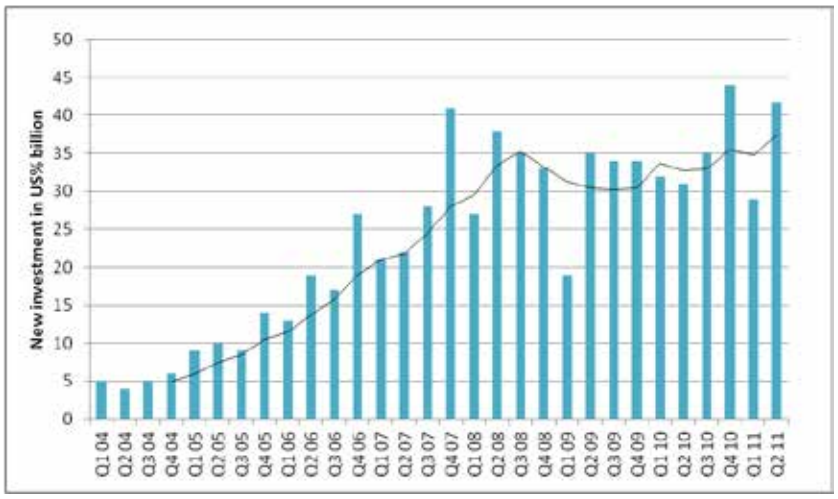


Figure 7.5 Financial new investment in clean energy by quarter in billions of USD (Bloomberg, 2011)

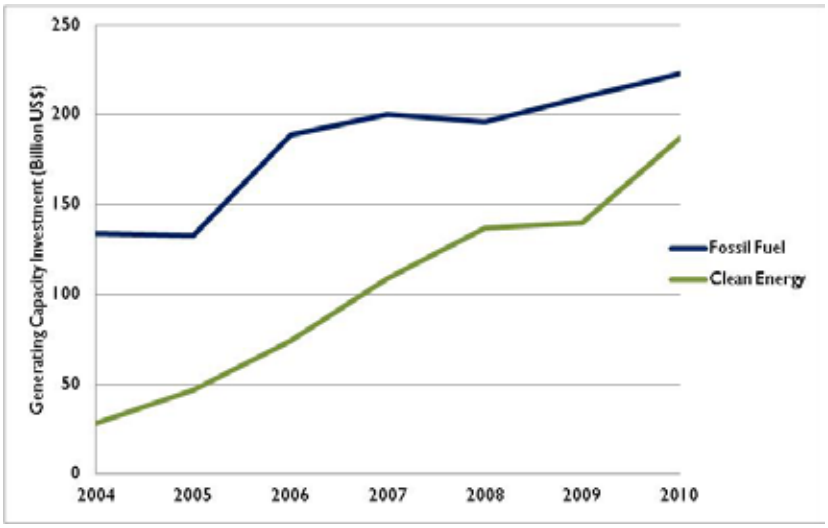


Figure 7.6. Global investment in renewable energy vs conventional energy, 2004-2010, USD billion (Bloomberg, 2011)

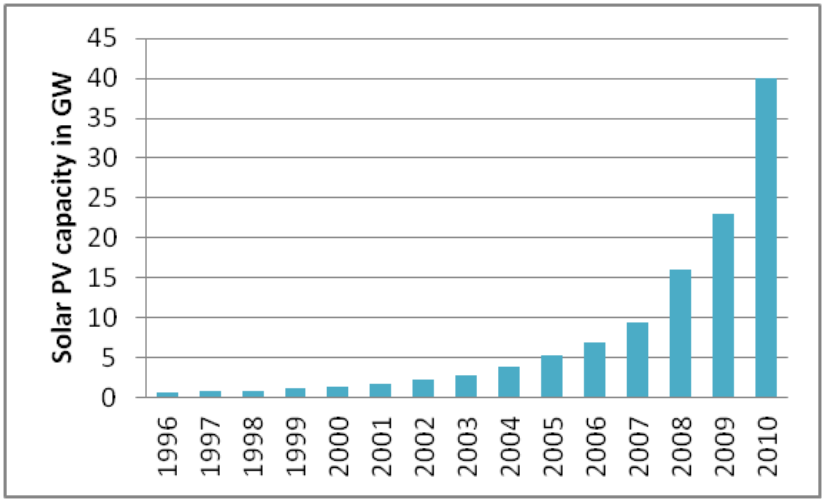


Figure 7.7. Global solar PV capacity in GW, 1995 – 2010 (REN21, 2010)

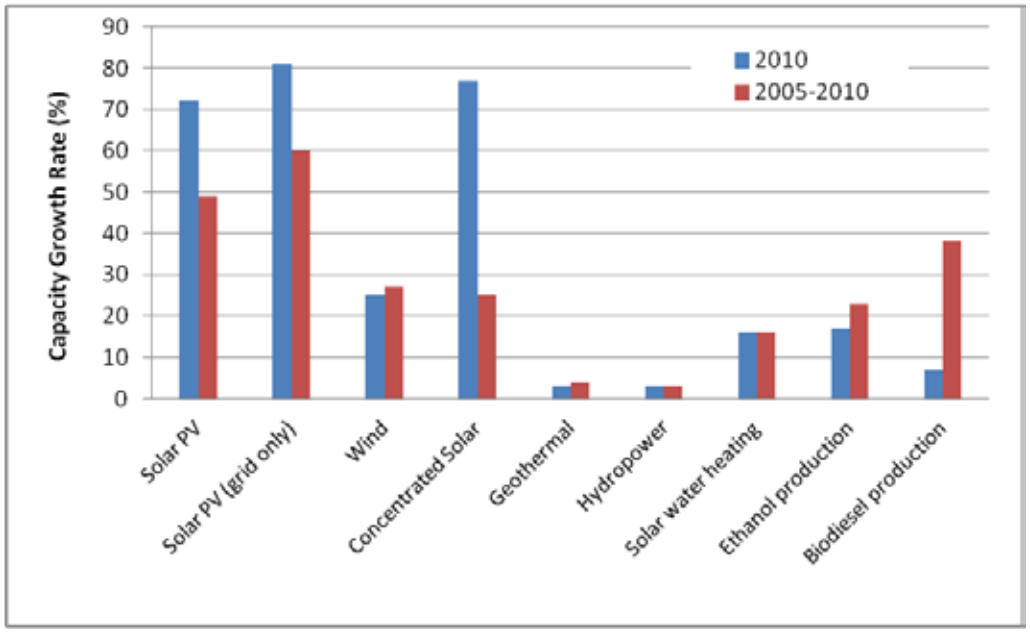


Figure 7.8. Average global annual growth rates of renewable energy capacity and biofuels production (REN21, 2010)

Carbon Markets

As outlined in chapter 4, putting a price on carbon is generally considered a logical step towards factoring in the true cost of burning fossil fuels. Momentum in this area is building. Cap and trade programmes are being developed around the world with increasing numbers of developing countries expressing an interest in implementing a price on carbon. The EU ETS now operates in 30 countries. New Zealand, Australia, Japan, China and the US have set up or are in the process of setting up emissions trading schemes at state or national level. The US state participants in emissions trading schemes represent 51% of US GHG emissions. Figure 7.9 illustrates the global cover of carbon markets. Developing countries that have formally said they either intend to or are considering launching carbon-trading programs include Brazil, Chile, Colombia, Costa Rica, India, Indonesia, Jordan, Kazakhstan, Mexico, Morocco, South Africa, Thailand, Turkey, Ukraine and Vietnam. Ten countries have implemented a carbon tax. This level of interest suggests that a price on carbon will become a permanent feature and one that will have to be taken into account by highly fossil fuel dependent countries and businesses globally.

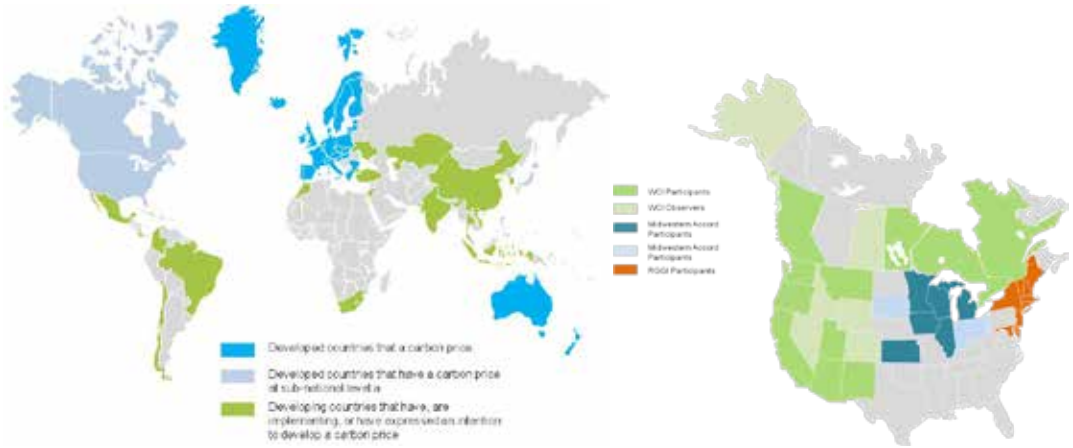


Figure 7.9. Carbon pricing introduced around the world

7.3 Framing the Scenarios

Although it is difficult to predict what may happen in climate negotiations, it is possible to propose scenarios based on past and current events and actions. Some indications were given in chapters 2 to 5 but here four scenarios are outlined and aim to provoke a consideration of the possible spaces that the future negotiations could inhabit. The drivers or preconditions that would be necessary for each scenario to be fulfilled are outlined in Table 7.1. The scenarios are summarised in the 2x2 matrix in Figure 7.10. The horizontal axis, 'International Collaboration', refers to how action on climate change is driven. The right position is a top-down approach through international institutions and agreements such as the UNFCCC and the Kyoto Protocol that set timelines and targets. The left position is a bottom-up approach where action is led by national and regional actors. The reality will be a combination of the two but the boxes represent the dominance of one or the other. The vertical axis, 'Breadth of Policy', pertains to the possible parameters for future action on climate change. The basal position represents low ambition where business as usual continues with some action to green the economy - 'greening growth'. The top position represents high ambition where the mode of economic growth changes to truly address mitigation and adaptation - 'climate resilient green growth'.

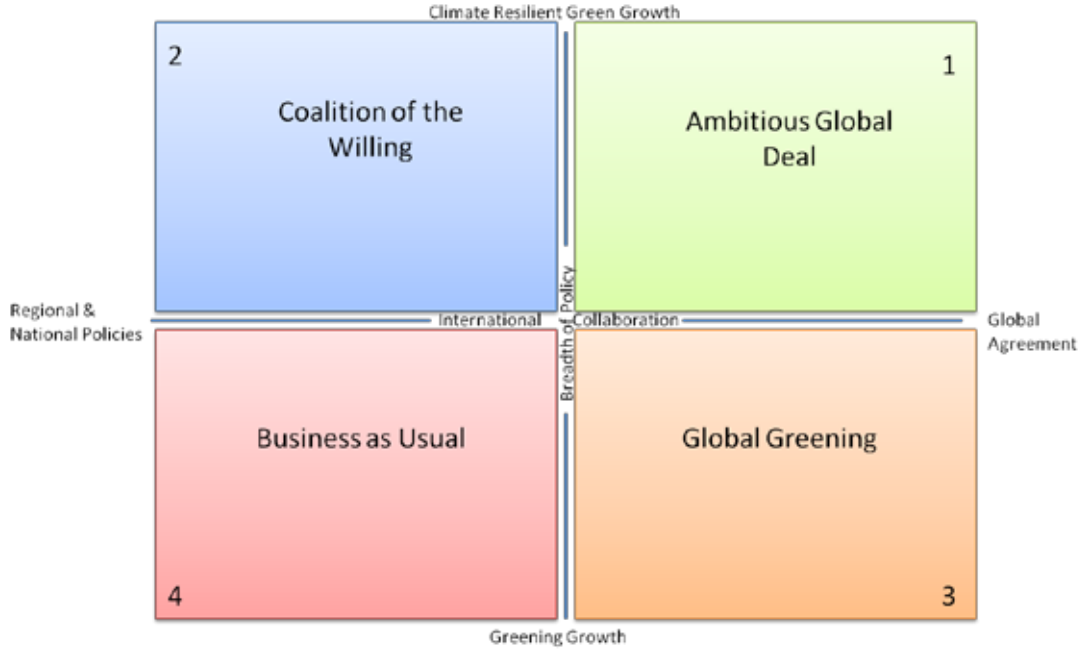


Figure 7.10 Scenarios of future climate negotiations and action

International Collaboration

Action on climate change can occur at many levels. To date the focus has been on 'Global Agreement' at the international level through the UNFCCC process. Progress can also be made through other multilateral fora, bilateral agreements and at a national and sub-national scale – 'Regional and National Policies'. Whilst countries are unlikely to abandon the UNFCCC process and the AWG-DPA mandate due to the loss of political capital that would necessitate, a new agreement will not come into force until 2020 at the earliest. This leaves almost a decade during which it is likely that other forums will be the dominant site of action on climate change. As an alternative forum, the G20 could be a source of progress on the removal of fossil fuel subsidies. Coalitions of the willing or ambitious could form in the interim period. These coalitions would work together to generate agreements among major emitters or to foster innovation. This could involve the linking of

emission trading markets, bilateral finance and technology transfers. In addition, countries, states or industries with similar interests could form alliances or sectoral agreements. The bottom-up approach requires strong leadership while the top-down approach requires a willingness to cooperate.

Neither approach is guaranteed to produce sufficient action to prevent climate change and its far-reaching consequences. The top-down approach will only be effective if monitoring, reporting and enforcement is in place and accepted by all Parties. The bottom-up approach will produce significant action in certain areas but, without a global target, the combined effect may not be enough. On their own, the individual approaches could meet the targets required by science, but based on current trends the outlook is not positive.

Breadth of Policy

To date the focus of negotiations has been on mitigation rather than adaptation. This could have dire consequences for developing countries who have limited capacity to cope with a changing climate, as well as other economic shocks. In order to properly respond to climate change, policy makers need to address all sectors and aspects of the economy. 'Greening growth' refers to scenarios in which policy is narrowly focused upon mitigation. A purely 'greening growth' strategy focuses on removing carbon from the current system through technological innovation, efficiency improvements and pricing externalities. 'Climate resilient green growth' on the other hand includes a wide range of policies that would enable adaptation and would ensure the sustainability of the economic system from the beginning. This end of the spectrum of policies represents the growing 'green growth' movement that recognises that environmental protection is a driver of global and national economic development. It refocuses society on achieving comprehensive improvements in overall well-being rather than simply increasing GDP. A central component of policies at this end of the spectrum will be ensuring climate resilience. This captures activities that build the ability to deal with climate variability, both today and in the future.

Greening growth may slow down the impacts of climate change but will not address the fundamental problem of the consumption mindset. It also leaves countries vulnerable to climate impacts, significantly setting development back in many countries. The lack of adaptation worldwide could lead to migration, health outbreaks, resource scarcity and trade wars while another financial recession is possible if the economic system remains unchanged.

GHG Emissions

A conceptual diagram depicting possible emission pathways resulting from each of the four scenarios is depicted in Figure 7.11. The trajectories for Scenarios 1, 3, and 4 are taken from the website www.climateactiontracker.org, and respectively represent the estimated emission pathways that are likely to hold warming to 2 °C, that correspond to current international pledges, and that would result in a business-as-usual (BAU) development and emissions path (climateactiontracker.org, 2012). The Scenario 2 trajectory is much more indefinite, as it is based on no defined data, but rather is dependent on how effective the 'coalition of the willing' is in incentivising others to mitigate climate change.

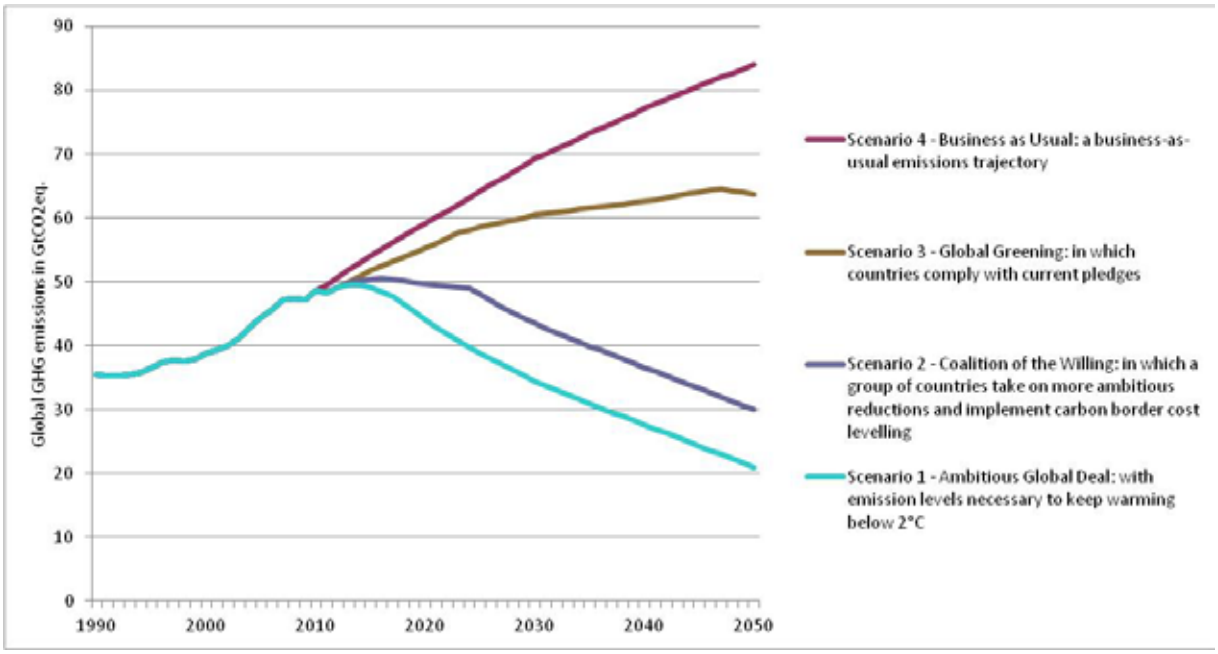


Figure 7.11 A conceptual diagram depicting possible emission pathways resulting from each of the four scenarios.

Scenario 1: Ambitious Global Deal

Globally-Led, Climate Resilient Green Growth

In this scenario, action on climate change is led through internationally defined agreements developed through the UNFCCC process. The outcome of the Durban Platform is a protocol setting out ambitious timelines for action and targets. The protocol covers a wide variety of climate policies enabling climate resilience and green growth in developing countries. International agreement on technology transfer and capacity building enable developing countries to take action and ensures that all countries benefit from a global effort. Emission reductions are achieved in line with that required to limit temperature increase to below 2 °C above pre-industrial levels (Figure 7.11).

To incentivise developing countries to take bold legally-binding action, large sources of public climate finance are secured for both mitigation and adaptation, and funding decisions are devolved to national-level funding entities. Innovative international sources, such as taxes on international transport, are earmarked for capitalisation of the GCF, ensuring that flows of climate finance are not dependent on the whims of national treasuries.

Developed countries, including the United States, and emerging markets, including Brazil, China and India, establish emission trading systems with caps based on common but differentiated responsibilities. These systems become increasingly inter-linked, leading to an eventual global price on emissions. 'Symmetry' in emission reduction commitments negates the need for CBCL. With ambitious targets, a high price on emissions is achieved, incentivising heavy private investment in low carbon industries, technological innovation, efficient use of resources, and a subsequent downward pressure on the emissions price.

Due to its co-benefits for all countries, the CDM is incorporated into each of the emission trading systems, providing a large market for carbon offsets from developing countries. Carbon markets are also linked to REDD+ and sectoral or NAMA-crediting mechanisms to incentivise and enable developing country governments to implement low carbon growth strategies.

Scenario 2: Coalition of the Willing

Nationally and Regionally Led, Climate Resilient Green Growth

In this scenario, climate action is led through national actions and regional alliances. Outcomes at the international level follow and are only of very limited significance. This scenario is characterised by regional divergence in action on climate change. Some regions, such as the EU and China, demonstrate strong leadership whilst others fail to respond (US, Russia). Others fall in the middle of the scale. Despite the divergence on action levels, policies responding to climate change cover the broad spectrum of building climate resilience and real green growth. There are significant flows of finance for adaptation and technology transfers within these coalitions. Linkages between various regions' carbon markets facilitate cooperation in investment in mitigation projects. Only those countries with strong national leadership or big economies benefit while many developing countries struggle to adapt.

A 'coalition of the willing' including the EU, Australia, New Zealand, South Korea, China and Western and North-Eastern North America form regional carbon markets. Some implement carbon border tax adjustments to place domestic industries on an even playing field. These measures lead to international trade wars and undermine the UNFCCC process, but eventually incentivise others, such as the remaining BASIC and Umbrella countries, to price their own emissions in order to capture the revenue generated on their exports. A moderate price on emissions is achieved, and combined with high costs of fossil fuels, drives private investment in low carbon industries, and technological innovation.

Developed countries fail to fulfil their pledge of mobilising USD 100 billion in climate finance per year, and disagreements over the design of the GCF cause the fund to remain insignificant. However, the 'coalition of the willing' signs bilateral agreements with developing countries. These agreements exempt those countries that pursue low carbon growth from CBCLs, provide significant climate finance for both mitigation and adaptation through bilateral channels to national implementing entities, and open up the coalition's emission trading schemes to carbon offsets through the CDM. REDD+ and sectoral- and NAMA-crediting mechanisms are also implemented through bilateral agreements incentivising developing country governments implement GHG-reducing regulations. Due to technological innovation, expensive fossil fuels, and a market for emission offsets, significant private capital flows to low carbon industries.

Emissions in this scenario are below those predicted from a BAU pathway. The level of emissions reductions will depend on how effective the 'coalition of the willing' are in incentivising others to mitigate climate change. In Figure 7.11, emission reductions for this scenario are not as large as those made in Scenario 1. This implies the assumption that, due to the divergence in actions on climate change between different countries, the emission reduction rate is not as rapid as that for Scenario 1. As can be seen in the figure, emissions decrease more rapidly from 2023 onwards, this point marks the implementation of carbon border tax adjustments. However, theoretically, the emissions trajectory for this scenario could lie anywhere between those for Scenarios 1 and 3 in Figure 7.11.

Scenario 3: Global Greening

Globally Led 'Greening' Growth

In this scenario, action on climate change is led through the UNFCCC process. The outcome of the Durban Platform focuses heavily on mitigation through technology, carbon pricing and efficiency improvements. As mitigation remains the strong focus of the international negotiations, policies to

encourage adaptation measures are limited. The focus remains upon developed countries and the major developing countries. Ambition in the mitigation pledges under the Durban Platform outcome is low the pledges are those made under the Cancun Agreements. Although emission levels are lower than BAU, the pledges result in a steady increase in global temperatures and increasing changes in the climate.

Developed countries fulfil their pledge of mobilising USD 100 billion in climate finance per year, but do so through a disproportionate reliance on private sources of capital. The GCF is established, but due to inadequate capitalisation, and a reliance on insecure donations from developed countries, it remains just another multilateral climate fund. It targets primarily private initiatives focused on mitigation in developing countries. Little climate finance is made available for adaptation.

Annex 1 countries, including the EU, South Korea, New Zealand, and Australia, continue to pursue emissions trading, but due to low emissions caps, fail to achieve emissions prices high enough to drive technological innovation, adequate private investment in low carbon industries, and low carbon growth. The CDM remains in place and emission trading schemes are linked to REDD+, but forestry credits flood the market and reduce the price on emissions even further. No effort is made to develop sectoral or NAMA-crediting mechanisms. As such, there is little incentive for developing country governments to implement bold low carbon growth strategies.

Scenario 4: Business as Usual

Nationally and Regionally Led 'Greening' Growth

In this scenario, national and regional alliances represent the highest level of action on climate change. International agreements are made up of voluntarily pledged targets based upon previously decided national actions. This scenario is characterised by variations in levels of action on climate change between countries. Action remains focused upon mitigation targets.

Developed countries fail to fulfil their pledge of mobilising USD 100 billion in climate finance per year, and disagreements over the design of the GCF cause the fund to remain insignificant. Little climate finance is made available for adaptation. As a result, climate finance fails to incentivise developing country governments to implement low carbon growth strategies.

The market for credits from CDM remain limited to the EU-ETS, and the only projects that are eligible are those based in LDCs and countries that sign bilateral agreements with the EU. Due to a low price on emissions, very little carbon finance flows through the CDM, and no effort is made to include REDD+, sectoral- or NAMA-crediting mechanisms. Countries with ambitious GHG emission reduction goals, such as the EU, may attempt to implement carbon border tax adjustments to protect domestic industries while imposing a carbon price, but the World Trade Organisation Dispute Settlement Mechanism rules that these measures are protectionist. As a result, no country pursues ambitious targets because they fear sparking a trade war, and do not want to place domestic industries at a competitive disadvantage. Without a sufficient price on emissions, there is inadequate private investment in low carbon industries to drive technological innovation, and both developed and developing countries continue along a BAU development path. Many of the previously declared emission reduction targets under the UNFCCC are not met. This scenario is closest to a business as usual emissions trajectory, where no action is taken to reduce GHG emissions. This is depicted in Figure 7.11.

The Likelihood of the Scenarios

As noted above, it is very difficult to predict how the climate change negotiations will develop due to the wide range of uncertainties surrounding the issue. However, it is possible, given the preconditions necessary for each scenario outlined in table 7.1 and the current trends in climate action discussed above, to infer which is currently most likely. Given the present context, it seems unlikely, without a marked change from current policies, that either Scenario 1 or 4 will come to fruition. Scenario 1 would require a significant increase in mitigation pledges and delivery of public funds for climate finance in a currently highly financially constrained world, Scenario 4 on the other hand would require countries to back-track on current policies, some of which are already written into domestic policy. Scenarios 2 and 3 are therefore the most likely to occur.

A large amount of political capital has been invested in the UNFCCC process. The supporting architecture of the UNFCCC is also very important in enabling technology transfer, adaptation and finance. Parties will be unwilling to let the process fail, even if it means signing up to an agreement with less than satisfactory targets. In terms of Scenario 2, it may be difficult for countries to increase the ambition of their current pledges meaning that the increased levels of mitigation in this scenario are unlikely. However, the UNEP 'Bridging the emissions gap' report, has identified a number of ways in which the gap between the current pledges and what is required by science could be reduced. In addition, advances in science and technology could allow increased ambition at lower costs. Advances and decreased costs in low carbon technology are likely to occur, and would be a continuation of current trends. Action on climate change is also, at present, led by a few regions, namely Asia and the EU. If this trend continues it may be more likely that Scenario 2 will occur. Particularly if major emitters such as the US and Canada continue along high emitting trajectories which could lead to equity issues preventing progress in the international climate change negotiations.

Table 7.1 Preconditions for each scenario

Preconditions	Scenario 1: Ambitious Global Agreement	Scenario 2: Coalition of the Willing	Scenario 3: Global Greening	Scenario 4: Business as Usual
Impacts of Climate Change	- Impacts felt globally, particularly in the US and large developing countries - Good ability of science to attribute extreme events to climate change - Climate change impacts multinational business supply chains	- Impacts result in fire-fighting - Unevenly felt impacts – less in major emitters such as US and Canada	- Impacts felt in vocal countries in the UNFCCC - Major emitters less impacted by climate change	- Science unable to attribute extreme events to climate change with certainty - Impacts felt largely in countries with limited global power
Resource Scarcity	- Large economies negatively affected by resource scarcity - Oil scarcity leads to high price and incentivises investment in green technologies	- Resource scarcity leads to mixed policy response: 'oil-grabbing' vs energy diversification and efficiency - Fossil fuel importing countries largely switch to renewable energy	- Resource scarcity leads to mixed policy response: 'oil-grabbing' vs energy diversification and efficiency	- Resource scarcity leads to mixed policy response: in some countries it leads to a disincentive to put additional price on carbon, in others to increasing efficiency and use of renewables
Economic Opportunities	- Advantages to green growth widely recognised - Alternative to GDP as growth measure widely accepted - Advantages for green businesses - Green technologies competitive with fossil fuels - High, global carbon price	- Advantages to green growth recognised in some countries - Alternative to GDP as growth measure accepted by a number of countries - Renewables increasingly competitive with fossil fuels, some countries lead in this sector	- Preoccupation with GDP growth - Economic recovery allows some transfer of technology and finance from developed to developing countries	- Preoccupation with GDP growth and health of the global economy - Limited investment in the green economy - Poor economic situation in developed countries prevents delivery of climate finance and technology transfers

Preconditions	Scenario 1: Ambitious Global Agreement	Scenario 2: Coalition of the Willing	Scenario 3: Global Greening	Scenario 4: Business as Usual
Activism and Lobbying	- Global widespread support and activism for action on climate change - Widespread behavioural change to sustainable lifestyle	- Level of civil and business activism and lobbying varies between countries but strong in some regions	- Some global engagement in the climate change issue from civil society and business - Business divide, some push for limited regulations on climate change	- Strong business lobby against international policy on climate change and against policy in some major countries
Political Leadership	- Political leaders have mandate from populations to make strong commitments - Political leaders emerge in the US and major developing countries - LDC, AOSIS, ALBA and EU alliance continues to successfully push for ambition	- Some leaders emerge, coalitions of ambitious groups join together in trade, pricing emissions, financial and technology transfers	- Strong political leadership lacking - Some countries push for international agreement but they lack political power	- Strong political leadership lacking - Limited engagement on a global level with the issue of climate change
UNFCCC Dynamics	- Trust resulting from developed country delivery of finance, mitigation and capacity building - Focus more evenly upon adaptation and other measures in addition to mitigation	- A few blockers prevent action at an international level - Political constraints prevent strongly legally-binding agreement - Focus more evenly upon adaptation and other measures in addition to mitigation	- Countries invested in the UNFCCC process - Desire to save face politically by generating an agreement - Focus remains strongly upon mitigation	- Loss of faith in the UNFCCC process - Focus remains strongly upon mitigation

8. Implications for South Africa

Politically, South Africa has stated its preference for a global deal to address climate change**.** "There is no doubt that a global response is the only effective and sustainable answer to this global challenge," stated President Zuma in the run up to COP17 in Durban last December. South Africa has developed comprehensive Long Term Mitigation Scenarios (LTMS) and has pledged ambitious, though voluntary, GHG emissions reduction targets of 34% by 2020 and 42% by 2025 from BAU. South Africa's *New Growth Path* promotes green growth, seeking the 'prioritisation of programmes and policies needed for inclusive, green growth'. The South African Risk and Vulnerability Atlas provides information on climate change vulnerability for all levels of government, and is a unique tool in building climate resilience. South Africa's government has therefore shown much support for Scenario 1: Ambitious Global Agreement.

8.1 Implications of the Impact of Climate Change

The primary reason that Scenario 1 would be beneficial for South Africa, is that it would be the most effective in reducing the impact of climate change. South Africa's climate record shows an increase in air temperature over the past 30 years, increased maximum temperatures, fewer frost days and increases in the intensity of extreme rainfall events. No strong trends in rainfall over the last 100 years have been detected, but there is weak evidence of drying in the north-west, and a wetting in the north-east since the 1950 (Midgley et al., 2007). Projected regional climate scenarios are uncertain, particularly with regard to rainfall projections, although air temperature is virtually certain to continue to increase by between ~1 °C and 3 °C across the country over the next three to five decades at least, with the greatest increases towards the interior. Regional rainfall scenarios project a general drying in most seasons in the SW parts of the western Cape, while the northern and eastern regions of the country are likely to become wetter. The projected changes in the intensity and frequency of precipitation events are uncertain (Midgley et al. 2007).

The impact of these changes in climate on key sectors in South Africa is given in Box 2 below. Initial estimates of the costs of damages due to inaction as a result of low levels of adaptive capacity through human and financial constraints; and secondly of the costs to accommodate climate impacts in the relatively few sectors in which these have been estimated are in the tens of billions of Rands – or billions of dollars. This will significantly impact on South Africa's GDP. A number of potential barriers to implementing adaptation plans in South Africa include (Midgley et al. 2007):

- Low local (site-based) human capacity to undertake adaptation planning
- Limited financial resources and competing priorities
- They require a longer time horizon than the typical political and development framework
- The absence of a legislative framework

Scenario 1 would be optimal for South Africa as it would be the most effective in reducing the impact of climate change. Moreover, financial and technological resources could potentially be made available to support South Africa's efforts to adapt to climate change, though the extent to which such resources will be provided to larger developing countries like South Africa is questionable.

Box 2. Climate Projections for Key Sectors in South Africa (Midgley et al, 2007)

Hydrology: An increase of evapotranspiration by ~ 5 – 15% throughout the region by ~2050 threatens sustainable water resources directly. Indirect implications through reduced soil moisture levels could impact runoff generating mechanisms and dryland agriculture markedly. The annual number of stormflow events is projected to decrease by ~2050 over most of the country, including some of the most crucial source regions of streamflows in southern Africa such as the Lesotho highlands. Future increases in stormflow events per year are simulated over much of the Northern Cape, as well as in the Northwest of the country. Greater rates of soil erosion are projected by ~2050 over much of the interior in median, especially in wet years. Much of South Africa is projected to have more variable streamflows despite higher predicted flows overall. However, parts of the Western Cape are projected to have much lower variability relative to the present, and lower overall predicted streamflows.

Agriculture: Projected increasing water shortages will result in greater competition with urban use of water, and lower yields and greater yield variability in both irrigated and rain-fed crops. Additional heat stress will reduce the productivity of perennial and annual crops, especially chill unit-dependent deciduous fruit, and livestock. Net water requirements for crops in the summer rainfall region are projected to increase by between 10- 30% throughout southern Africa by ~ 2050. Projections for profitability of maize production are sensitive to temperature, rainfall and CO_2 fertilization scenarios. A 2°C temperature increase alone is projected to reduce profits by around R500/ha across the highveld maize region, but CO_2 fertilization may mitigate this loss almost completely.

Forestry: With expected temperature increases by ~2050 of 2ºC and a reduction in rainfall of 10%, most forestry species show reduced viable production area of between 40% and 100%, but an increase of between 50% and 90% in planting area if rainfall increases by 10% with 2ºC warming.

Biodiversity and ecosystems: Projections of enhanced extinction risk for several tens of percent of endemic species probably represent an extreme outcome by ~2050. Several savanna woodland and grassland ecosystems may store ~20 - 600% more carbon than currently stored due to temperature, rainfall and CO_2 fertilization effects, but this is likely to depend to a large extent on future fire regimes, which are projected to show a greater frequency, and possible increase in mean size.

Human health: The pattern of increasing extreme rainfall events and rising temperature favour the geographical expansion of the borders of vector borne diseases such as malaria. Climate impacts on human health will interact with those on rural livelihoods, in particular.

Rural livelihoods: Production and income activities are likely to be significantly affected by climate change and increased climate variability by ~ 2050 at least, particularly in rural areas where changes in rainfall directly affect agriculture and natural resources that underpin many production and income activities. In South Africa, there is growing evidence of how changes in rainfall impact on livelihoods by increasing vulnerability of farming systems.

Urban environment: Increasing frequency and intensity of extreme precipitation events will result in higher risk of flooding episodes in urban settings, and drought induced water shortages and fire risk, particularly in the Western Cape. Whilst more gradual, the potential of sea level rise impacts, especially when accompanied by high tidal and storm events, are relevant for key coastal areas that are identified as vulnerable due to high population densities and settlements and infrastructure of all types.

Extreme events such as heat waves are expected to increase in frequency and severity with increased risk of mortality amongst the elderly and sick, and attendant risk of fire in informal settlements.

8.2 Economic Implications

South Africa is in a rather different negotiating position than the other BASIC countries. Unlike India, China and Brazil, there is little pressure from developed countries (particularly the United States) for South Africa to assume a legally-binding emission reduction target. But with one of most GHG emission-intensive economies in the world (Figure 8.1), one would expect that South Africa would be in the subsequent tranche of countries under pressure to take on a binding target under Scenario 1.

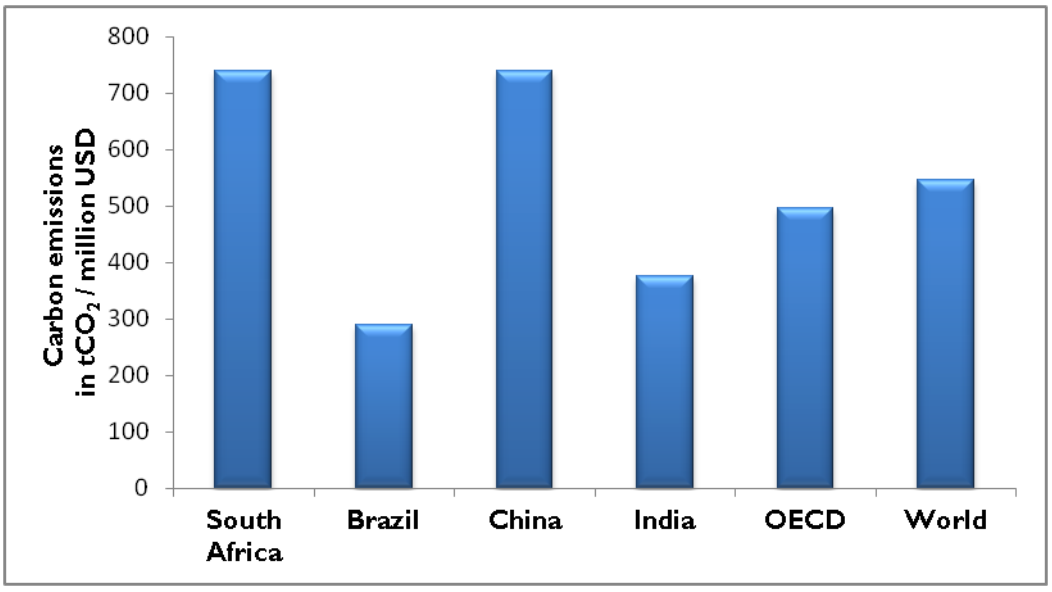


Figure 8.1 Emission intensity of BASIC, OECD and World economies (Winkler, 2010)

In 2008, South Africa experienced severe power shortages that led to frequent blackouts. In response, the National Energy Regulator of South Africa allowed Eskom, the state-owned utility, to raise electricity prices by 27.5% on the year, which led to a peak in energy demand at approximately 212,200 MWh (CIA, 2012). In 2009, a multi-year price determination policy was introduced to increase the electricity tariff over a five-year to fully cover the financial cost of coal fire generation. Taking these price hikes into account, Inglesi and Pouris (2010) projected the demand for electricity to 2025 based on 4% and 6% economic growth scenarios. The results are illustrated in Figure 8.2.

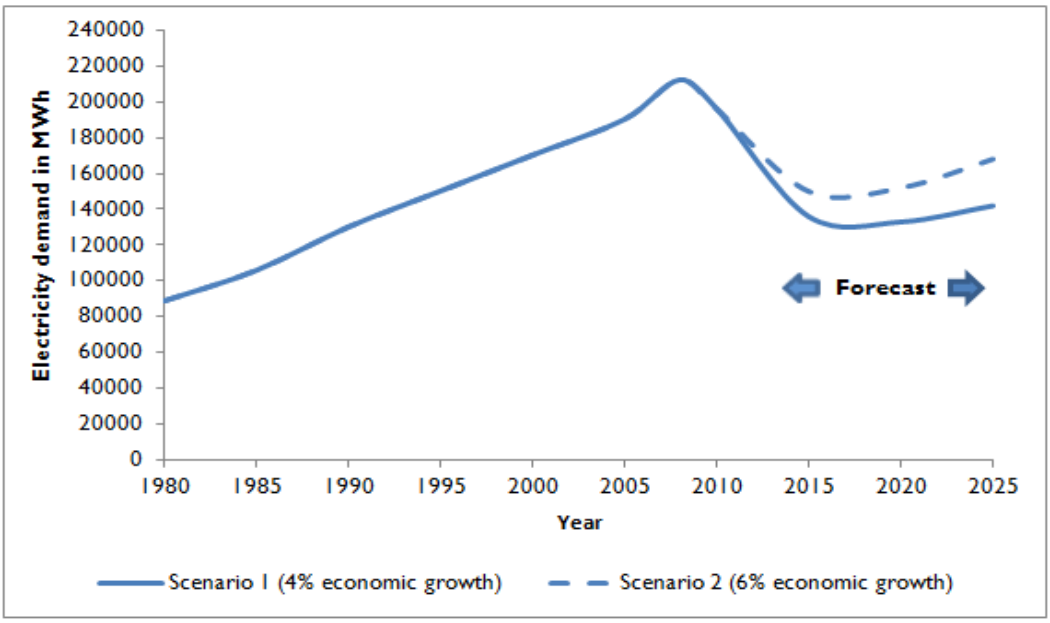


Figure 8.2 Electricity Demand in South Africa (Forecast 2008-2025) (Inglesi and Pouris, 2010)

One of the central goals of the South African government is to extend electricity services to the unserved portion of its population, estimated to be 3.4 million people. There is concern that an ambitious effort to reduce GHG emissions, as would occur in Scenarios 1 and 2, might conflict with the goal of achieving universal electricity access. Evidence from Tait and Winkler (2012) suggest that a conflict between the two goals would not arise, despite South Africa's emission-intensive energy sector. The bulk of South Africa's electricity is consumed by industry and transport. In 2000, only 2% of South Africa's energy-related emissions from fuel combustion came from the residential sector. Tait and Winkler (2012) estimate that if South Africa were to achieve universal electricity access by 2020, newly added houses would produce 13 $MtCO_2e$ per year. Even if the country were to achieve its rather ambitious, but voluntary target of reducing emissions by 34% below BAU by 2020, emissions from newly electrified households would amount to only 0.09% of the total (Tait and Winkler, 2012).

There is greater cause for concern regarding the potential economic impact of emission pricing due to an ambitious emissions reduction scenario. The South African treasury has already indicated its intention to implement a carbon tax in fiscal year 2013-14. The proposed rate of the carbon levy is R120 (USD15.35) per tCO_2e above a tax-free threshold of 60%. The rate would increase by 10% per year until FY 2019-20 (Blaine, 2012). The more ambitious the scenario, the higher the likely eventual tax rate will be.

Emissions pricing is most effective when competition between emitters prevents them from passing the costs on to consumers. However, South Africa has a monopolistic energy sector and an oligopolistic liquid fuels sector (Cloete and Tyler, 2012). Eskom generates about 95% (50.2 GW) of the country's electricity, 85% of which is produced by coal fired plants. Combined with Sasol, which uses low-grade coal to produce synthetic fuels at the Sasol synfuels plant in Secunda, the world's only commercial coal-to-liquids plant in operation (Zadek, 2011), two companies account for just under 60% of South Africa's emissions (Cloete and Tyler, 2012). Under the monopolistic conditions of the electricity sector, combined with inflexible demand for electricity, a carbon tax provides little incentive for Eskom to invest in low-carbon alternatives, and it can be expected that the costs of a carbon tax will be passed on to consumers in the form of rising electricity prices. The impact on the

road transport sector would be comparatively weak. Cloete and Tyler (2012) estimate that an emission price of R100 (USD 12.80) per tCO_2e would lead to an increase of less than 5% in the average retail price of diesel and petrol. An increase in energy prices tariffs would likely hit low-income households disproportionately hard, because they spend a relatively larger share of their income on energy than high income groups (Vorster et al., 2011).

South Africa's exports are also vulnerable to emissions pricing as they are dominated by energy- and emissions-intensive commodities: metals (platinum, gold, chromium, copper etc), automobiles and machinery, textiles, iron and steel, chemicals, fertilizer, foodstuffs, etc. Exporting industries use about 40% of generated electricity (Zadek, 2011). Energy-intensive sectors that are exposed to international trade, as listed in Table 8.1, would be the most vulnerable to industry flight (Vorster et al., 2011). However, the threat of industry flight is mitigated in Scenario 1 by countries implementing GHG emission reduction measures in unison. The threat of industry flight is greatest in Scenario 2, were South Africa to become part of a coalition of willing countries that implements emission reduction measures ahead of lagging countries.

Table 8.1, South African sectors that are vulnerable to industry flight due to emissions pricing: Energy-Intensive; Trade-Intensive; and Energy-Intensive and Trade-Intensive sectors (Vorster et al., 2011)

Energy-intensive sectors	Trade-intensive sectors	EITI sectors
Iron and steel	Basic iron and steel	Iron and steel
Non-ferrous metals	Basic non-ferrous metals	Non-ferrous metals
Non-metallic minerals		
Chemicals and petrochemical products		
Mining and quarrying	Gold and uranium ore mining	Gold and uranium ore mining
	Coal mining	Coal mining
	Other mining	Other mining
	Machinery and equipment	

Considering the potential negative economic implications of emissions pricing, a number of policies will have greater importance in Scenarios 1 and 2, than under less ambitious scenarios, in which emissions pricing is implemented at a lower rate. In particular, policies that support a broader economic transition to a low-carbon economy gain in importance. These policies include subsidies and regulatory incentives to promote green jobs and private investment in renewable energy and energy-efficient alternatives, R&D in new energy-efficient technologies, and behavioural change towards low-carbon consumption patterns (Vorster et al., 2011). The importance of such policies is compounded due to the monopolistic nature of South Africa's energy sector. Considering the potential socially regressive impacts of a high price on emissions prevalent in Scenarios 1 and 2, it will be important to impose a tight regulatory environment that prevents costs from being passed on to the consumers. Currently a 3.5c/kWh levy on electricity generated from fossil fuels is being passed through. Recycling the revenues from the carbon tax in a progressive manner through targeted tax relief or government investment could further mitigate the impact on low-income households and vulnerable sectors (Vorster et al., 2011). Finally, the potential for ambitious green growth Scenarios 1 and 2 to materialise, increases the importance of introducing emissions pricing at a low rate sooner, rather than later, in order to allow the economy to adjust (Cloete and Tyler, 2012). In fact, using a dynamic economic model, Kearney (2010) found that the economic impact of a carbon tax that increases gradually was "mildly positive if combined with either tax relief or reinvestment," with an increase in GDP of 0.7%. Under the modelled scenario, all households were better off due to increases in economic productivity resulting from higher investments (Kearney, 2008).

The climate finance and technology transfer that we argue are a prerequisite for Scenario 1 to materialise would open up significant economic opportunities for South Africa in regards to mitigation. Investment in many of these opportunities has been deterred in the past due to the low prices in South Africa of energy and coal, which were around 60% below the US average over from the 1970s through to the 2000s (Winkler and Marquard, 2009). With the multi-year price determination policy announced in 2009, electricity tariffs will increase significantly, and low-carbon investments will become more viable. The global high price of emissions under Scenario 1 will further incentivise investment in these opportunities, as well as innovation in technology that could be particularly beneficial in the South African context: concentrated solar power, biomass, liquid biofuels, carbon capture and storage and nuclear.

Energy efficiency improvements offer substantial economic opportunities. Winkler and Marquard (2009) estimate that energy efficient options in industry could save around 770 MtCO2 emissions between 2000 and 2025 and save R18 billion (USD 2.3 billion). They also estimate that commercial energy efficiency measures could save around R13 billion (USD 1.66 billion) and reduce 12 $MtCO_2$ in 2025; and efficiency measures in residential buildings could save R1 billion (USD 128 million) and reduce CO_2 emissions by 4 $MtCO_2$ emissions in the same year (Winkler and Marquard, 2009).

Low GHG energy production options also offer economic opportunities. Winkler and Marquard (2009) considered a scenario in which South Africa developed 4,500 MW of baseload nuclear capacity. They predicted the scenario would cost an increase of R4.6 billion (USD 589 million) above the BAU scenario, but mitigate 246 $MtCO_2$ emissions by 2025. They also considered a scenario in which biofuels provided 8% of the country's liquid fuels by 2025, which they estimated would cost an estimated R2 billion (USD 256 million) more than the BAU scenario, but would avoid 31$MtCO_2$ emissions over the period. South Africa's current Integrated Resources Plan 2010 aims to implement almost 19 GW of renewable energy capacity, just under 15% of its current total generating capacity, by 2030. Sources will include primarily on-shore wind and solar. Zadek (2011) estimated that the programme could mitigate 1.2 billion tCO_2, and move South Africa about a third of way to achieving its voluntary emission reduction commitment.

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Investment in alternative energy sources to coal could have substantial knock-on benefits for the economy. Investment in renewable energy could create 35-50,000 jobs, and increase regional export potential improving balance of trade (Zadek 2011). The planned 5GW solar power plant could create 12,300 jobs alone. South Africa has the second largest oil refinery in Africa, and as seen in Figure 8.3, it imports a significant amount of oil, largely from politically unstable members of OPEC

(Iran, Saudi Arabia, Nigeria, and Angola) making it vulnerable to oil price spikes. By diversifying its energy portfolio to include renewable sources, South Africa would improve its energy security.

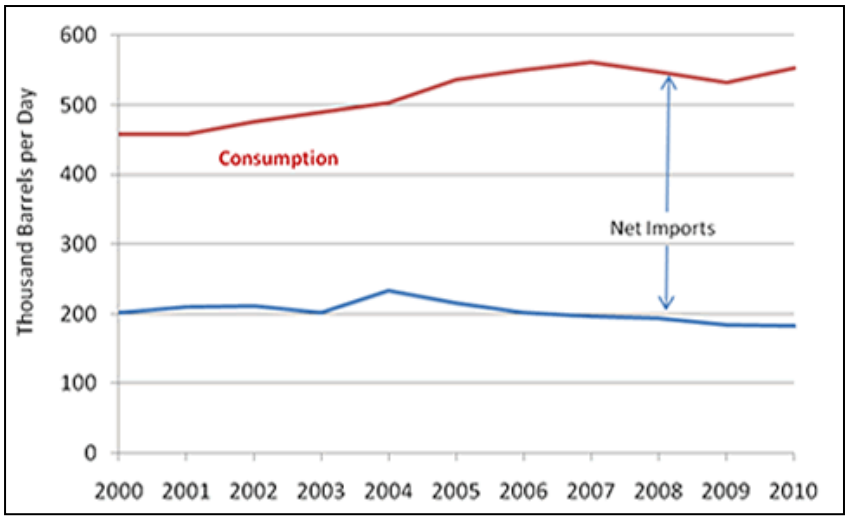

Figure 8.3 South Africa oil production and consumption 2000-2010 (USEIA, 2011)

However, investing in renewable energy and other alternatives to coal would have substantial costs. For example, building 20GW of renewable will cost South Africa an estimated USD 55-60 billion, ~USD 9 billion more over the period to 2025 than it would to generate the same power from coal-fired stations (Zadek, 2011). Accessing finance to fill this gap opportunity will be vital in enabling South Africa to pursue this route. Climate finance offers one source of finance to fill this gap, however, as argued by Zadek (2011) it will likely be a minor component. In 2011, the government established the South African Renewables Initiative (SARI) to mobilise and channel international financial support into renewable energy investments through low-cost loans, feed-in tariffs, etc. (DOE, 2011)

An ambitious green growth scenario may require South Africa to import lower emission electricity from abroad. It could import natural gas for use in electricity production from Mozambique, Namibia, or in the form of liquid natural gas. Winkler and Marquard (2009) estimate that this would cost R95 million (USD 12.2 million) more than BAU, but abate 200 million tCO_2 emissions by 2025. Alternatively, South Africa could import hydroelectricity. Winkler and Marquard (2009) considered two options: a new Mozambique plant at Mepanda Uncua that could produce around 1300 MW; and a plant at Inga Falls in the DRC which could provide 40,000 – 100,000 MW. The Mozambique option would save South Africa an estimated R11 billion against BAU, and abate 167 $MtCO_2$ emissions by 2025 (Winkler and Marquard, 2009).

In the end, the greatest economic opportunities to South Africa in an ambitious green growth scenario will likely lie in shifting its industrial development strategy, policies and investment to less energy and emission-intensive tertiary sectors (Winkler and Marquard, 2009).

8.3 Climate Finance and the Clean Development Mechanism

Climate finance is a bargaining chip in the UNFCCC negotiations. Therefore, the magnitude of climate finance available, and the amount of control developing countries have over its management, is predicted to be positively correlated with the level of ambition developing countries pledges to reduce GHG emissions. Therefore, Scenario 1 would see the largest transfer of public funds and the greatest control by developing countries. With the EU and the US facing severe fiscal

constraints, it is difficult to foresee a large-scale public transfer in the order of USD 100 billion per year without establishing innovative sources outside the reach of national treasuries. If public funds are not secured from innovative sources, it is likely that a greater portion of the climate finance provided to South Africa as part of the USD 100 billion pledge will be leveraged from private sources, as is the case in Scenarios 3 and 4. Were this the case, then securing funds for adaptation may be problematic.

South Africa has a large untapped potential to implement emission offset projects through the CDM. Only 20 CDM projects that will produce an estimated 16.7 million CERs by 2013 have been registered in South Africa thus far (CD4CDM, 2012). However, a recent World Bank study on the GHG emission abatement potential of the energy sector in Sub Saharan African countries found that South Africa has the potential to implement CDM projects abating 188.9 $MtCO_2e$ per year (the lifespan of each project would vary). These projects are outlined in Table 8.2. The value of these CERs would vary greatly depending on the emissions price at which they are sold. At USD 5 per tCO_2e these 188.9 million CERs would be worth USD 944.71 million; at USD 20 per tonne they would be worth USD 3.8 billion. The emission price will depend primarily on the ambition of emission reduction targets. Electricity-related CDM projects are particularly attractive in South Africa due to its high grid emission factor of 980 tCO_2/GWh. To illustrate, for each GWh of renewable electricity fed onto the grid, a CDM project will receive 980 CERs. Were the CDM to expand to include new types of projects, particularly those relating to agriculture, the potential for South Africa to sell CERs would increase.

However, the future of the CDM is very uncertain, as is the eligibility of projects in South Africa. In Scenario 4, the market for CDM CERs remains limited to the EU-ETS, and the only eligible projects are those from LDCs and countries that have a bilateral agreement with the EU. In this case, South Africa could seek a bilateral agreement by committing to ambitious mitigation actions or targets. Were a global or regional cap-and-trade systems to be established, as in Scenarios 1 and 2, each would need to determine whether emission offsets through the CDM would eligible, from which sectors, and from which countries. However, due to the co-benefits for developed and developing nations, one could predict that eligibility of emission offsets through the CDM would be a political prerequisite to such ambitious green growth scenarios occurring.

Trade Implications

Scenario 2, involving nationally and regionally-led climate resilient green growth, would present South Africa with a number of challenges. In the absence of a global legally-binding agreement on climate change, it is likely that regions taking the lead in mitigation will implement CBCL to keep domestic industries on an even playing field. The most likely region to implement CBCL is the EU. South Africa, with 30.75% of its exports between the years of 2007 and 2009 going to the EU, is one of the most vulnerable countries to EU CBCL along with Venezuela, Egypt and India. Moreover, because South Africa and the EU share a Free Trade Agreement (FTA) that reduces EU trade barriers for South African products, the cost imposed by CBCL will be relatively higher for South African products than for products from countries without similar FTA preferences (ICTSD, 2011).

A study conducted by the International Centre for Trade and Sustainable Development (ICTSD, 2011) found that 28.1% of South Africa's exports to the EU between the years of 2007 and 2009 was sensitive to CBCL. The average annual value of these sensitive trade flows was USD 7.67 billion. Figure 8.4 provides a breakdown.

Table 8.2 Potential CDM Projects in South Africa (Gouvello et al., 2008)

Type of Project type	No. of potential projects	Project emission reductions		Reductions over projects' 10-yr life span (millions tCO_2)	Value of projects' emissions (millions US$)		Electricity generation		Added power of projects		Total investment cost
		millions tCO_2e /yr	% country total		US$5/$tCO_2$	US$10/$tCO_2$	GWh/yr	% country total	MW	% of total installed	
Second-cycle Addition to Open-cycle Gas Turbine	10	6.1	3.37	60.6	303.2	606.4	7,962	3.5	996.8*	2.5	1,196.1
Combined heat and power for industry	195	58.6	13.81	585.5	297.3	584.7	119,119.2	52.5	13,607*	33.6	13,607.2
Combined heat and power in sugar mills	16	0.90	0.21	9.0	44.9	89.7	1,281.8	0.56	242.8*	0.6	364.1
Energy from agricultural residue	137	35.5					53,895		6,836	16.9	9,570
Energy from Roundwood Production residue	86	4.34					6,820	3	860	2	1,210
Energy from Residue from Wood-processing Facilities	165	5.9					9,283	4	1,180	3	1,650
Jatropha Biofuel for Power Generation	51	2.85					3,960.49		502	1	14.72
Grid-loss reduction	1	12.94	3.05	129.41	647.06	1,294.12	5,890	7	2,015.47	4.98	
Improved Use of Non-lighting Electricity for Industry	9	1.1	0.26	10.95	54.76	109.52	4,075	1.8	516.87	1.28	
Switch to Compact Fluorescent Lamps	10	10.01	2.36	100.14	500.7	1,001.39	10,212.62	4.5	9,326.59	23.04	2,915
Improved Energy Efficiency of Household Appliances	11	6.6	1.56	66	329.99	659.97	8,103.58	3.57	1,027.85	2.54	
Flared Gas Recovery	1	0.101							49	0.1	
Coal Mine Methane Capture and Use for Power Generation	5	1.525							67	0.17	80.39
Waste-gas Recovery for On-site Power Generation in Sub-Saharan Africa	4	1.12	0.26	11.2	56	112	1,830.6	0.81	208.97	0.52	292.6
Improved Steam-system Efficiency in Industries	74	29.7	7.02	297.4	1,486.6	2,973.5					
Shift from Ordinary Portland Cement to Blended-Cement Production	4	0.939									41.08
Production of B20 Blended Bio-diesel from Jatropha	39	3.666									2,089
Bus Rapid Transit	9	5.079									
Efficient Charcoal Production	155	1.927									19.55

*90% load factor

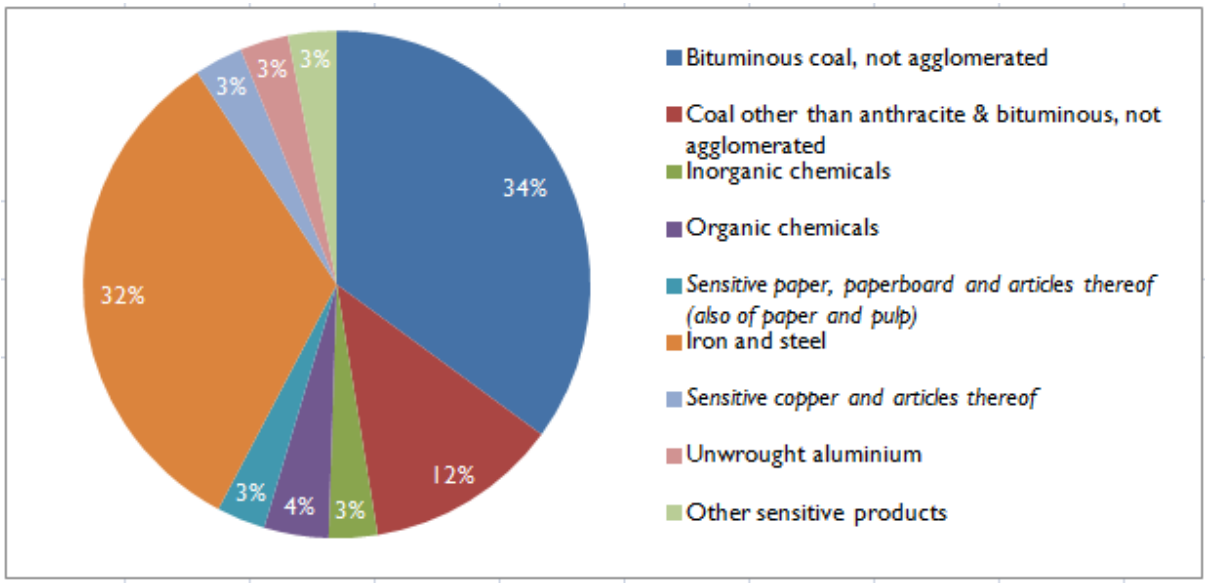

Figure 8.4 Breakdown of South African CBCL sensitive exports to the EU, 2007-09 (ICTSD, 2011). *Sectors in italics are those from which not all goods are identified as sensitive.*

South Africa's vulnerable exports to EU CBCL are its coal products (both 'bituminous coal' and 'coal other than anthracite and bituminous'), iron and steel, organic and inorganic chemicals, paper and paperboard, copper and unwrought aluminium. Moreover, the EU seems to be an even more important export market when it comes to these specific sensitive products. As seen in Table 8.3, the EU was a particularly important market for these South African products, increasing these sectors vulnerability (ICTSD, 2011).

Table 8.3 South African CBCL sensitive exports to the EU, 2007-09 (ICTSD, 2011). *Sectors in italics are those from which not all goods are identified as sensitive.*

Sectors with largest trade flows of sensitive products to the EU	Exports of sensitive products to the EU as % of total exports to the EU	Average annual trade value of exports of sensitive products to the EU (in million USD)	Exports to the EU as % of total / sector exports
All sensitive products	**28.1%**	**$7,672**	**30.75% (of total exports)**
Bituminous coal, not agglomerated	9.51%	$2,596	54.18%
Coal other than anthracite & bituminous, not agglomerated	3.41%	$931	
Inorganic chemicals	0.79%	$216	24.05%
Organic chemicals	1.12%	$305	28.21%
Sensitive paper, paperboard and articles thereof (also of paper and pulp)	0.72%	$196	
Iron and steel	9%	$2,456	29.66%
Sensitive copper and articles thereof	0.55%	$150	
Unwrought aluminium	0.7%	$192	14.34%

One strategy for South Africa to reduce its vulnerability to EU CBCL would be to diversify its markets. The more regions that implement CBCL, the more difficult it would be to diversify.

Another option would be for South Africa to levy a price on its own exports to regions with CBCL in order to capture the revenue for domestic purposes. A final possibility would be for South Africa to seek bilateral agreements with countries/regions that implement CBCL, in which it would agree to implement mitigation actions or comply with a GHG emission reduction target in return for concessional carbon border tariffs rates. Of course, the optimal solution would be for all countries to adopt a global agreement on climate change negating the need for CBCL, as in Scenario 1.

On the flip side, were the EU to increase its price on domestic emissions without implementing CBCL, the same South African sectors that are vulnerable to CBCL would be well placed to increase their EU market share due to the competitive advantage gained from lower environmental standards. This situation would be most likely to occur in Scenario 3: Global Greening and Scenario 4: Business as Usual. Presumably, the gains would be small, because the EU would be unlikely to pursue ambitious environmental regulation that would place its domestic industries at a competitive disadvantage.

CBCL is generally only discussed in the context of energy intensive raw materials, and not consumer goods such as food products, textiles, motor vehicles and other manufactured products. However, there have been growing calls for developed countries to promote a shift to low GHG consumption patterns. Erickson, Owen and Dawkin (2012) modelled the impact that a low-GHG consumption scenario developed by the UK Waste & Resources Action Programme (WRAP) would have on the economies of developing countries. The behavioural changes outlined in the WRAP scenario are outlined in Table 8.4. Such a shift in consumption patterns could be promoted through fiscal and regulatory policy, as well as consumer awareness campaigns through ecolabelling, etc., and would be most likely in Scenarios 1 and 2.

Table 8.4 Behaviour Changes included in WRAP scenario (Erickson et al., 2012)

Category	Measure
Food	· All edible food waste is eliminated, reducing the need for food purchases
Goods	· Goods that are still working are no longer discarded; 90% of goods used to their full 'technological lifespan' · Durability of goods increases, reducing need for new goods by 40% · Several goods are shared (rented) rather than owned personally: clothing, glassware and tableware, tools and equipment, vehicles, and recreational and audio-visual equipment (with rental rates varying by good) · The GHG intensity of government procurement declines 90%
Services	· Shift from goods to services (i.e., shared goods), per above
Construction	· 90% of homes slated for demolition are brought back into use, reducing the need for new builds

The paper finds that the exported consumer goods that would be hardest hit by a shift to low GHG consumption patterns in developed countries are red meat and dairy products, textiles, motor vehicles and electronic equipment. Demand for raw materials used to produce these products would also be reduced. Table 8.5 outlines the estimated economic impact, as a percent change in GDP, were the UK, EU-27 or High-Income countries to adopt the WRAP scenario. South African exports of consumer products that would be hit include automobiles, machinery and textiles.

Table 8.5 Impact on GDP if UK, EU-27 and High-Income Countries adopted the WRAP scenario (Erickson et al., 2012)

Region Affected	Change in GDP due to Switch to Low-GHG Consumption (WRAP scenario) in:		
	UK	EU-27	High-Income
U.K	4.6%	3.3%	2.8%
High Income	-0.2%	0.2%	1%
Lower Income	-0.3%	-1.5%	-4.5%
LDCs	-0.7%	-3.4%	-5.7%

As a gateway to the region, South Africa could also be impacted negatively by a reduction in trade due to an international levy on marine bunker fuels, which would most likely be implemented in Scenario 1, and on a regional basis in Scenario 2. The tax would be felt most heavily by the port cities of Cape Town, Durban, Port Elizabeth, Richards Bay, and Saldanha Bay. Because shipping is the cheapest option for transporting large loads, a marine bunker fuels tax would likely not cause a severe reduction in volumes carried. The UN Report (2010) estimated such a levy could result in a cost impost on global world trade in the order of 0.25%.

One South African industry that may benefit from global agreements on climate change is platinum. It is used in auto-catalysts which help to reduce carbon monoxide emissions. As pressure to reduce emissions increases, demand for platinum is likely to increase. South Africa produces 80% of the world's platinum and is in a strong position to take advantage of this opportunity. The main rival will be recycled platinum, which is gaining in market share.

9. Conclusion

The international climate change negotiations have been underway for three decades. Arguably, very little has been achieved in producing what is required by science to prevent catastrophic climate change. The negotiations have developed over time; from an initially mitigation and developed country focus to a more inclusive process involving developing and developed countries. Over time, a much greater understanding of the scale of the challenge has developed. There is now increased urgency for adaptation and for developed countries to support developing countries with finance, technology transfer and capacity building. Making progress remains challenging as core issues surrounding equity, emissions allocations, pricing emissions and climate finance remain. These challenges highlight the complexity and difficulty in achieving a global agreement.

Despite these difficulties, at the last COP the Durban Platform was agreed to by all Parties to the UNFCCC. This Platform created the mandate for 'a protocol, another legal instrument or an agreed outcome with legal force' that would be applicable to all Parties. Although still far from adequate, this represents an unexpectedly positive step forward. The Platform calls for the new agreement to come into effect no later than 2020. Action on climate change will need to occur prior to this point. In addition, it is uncertain how successful the negotiation process will be in producing an outcome that will effectively tackle climate change. The next two decades will be crucial in the international climate negotiations and for the climate.

Here we outline four scenarios for future action on climate change. The aim of these scenarios is to prompt thought and discussion on the possible spaces that the future negotiations could inhabit. There are a number of factors that create uncertainty around future action on climate change. In developing the scenarios, a number of key drivers for action were identified, namely climate change impacts, resource scarcity, economic opportunities, activism and lobbying, and political leadership. In addition, current trends related to these drivers were briefly reviewed. Four scenarios were then proposed for future climate negotiations and action. They are:

Scenario 1: Ambitious Global Agreement
Scenario 2: Coalition of the Willing
Scenario 3: Global Greening
Scenario 4: Business as Usual

The implications of these scenarios were then outlined for South Africa. Depending upon the level of action and the manner in which it takes place the implications for South Africa will be quite diverse. The most important factors to consider are the success at climate change mitigation, the price on carbon and the level of financial, technical and adaptation support available. In Scenarios 1 and 2 the price on emissions and the level of developed country support for developing countries is likely to be higher than in Scenarios 3 and 4. In Scenarios 3 and 4 the negative impacts of climate change are more likely to be felt.

As a member of the BASIC negotiating group, South Africa faces pressure to mitigate. As a vulnerable country and a member of the Africa group, it has an imperative to drive adaptation.

Despite having an energy intensive economy, there are realistic opportunities for a lower carbon pathway which will have financial, trade and employment benefits.

South Africa has shown political support for a global agreement to tackle climate change; Scenario 1 is most representative of this outcome. Scenario 1 will be in South Africa's best interests as in every other scenario the negative economic and social consequences of climate change are likely to be considerable. In addition, Scenario 1 represents the greatest opportunity for climate finance, technology transfer and adaptation support. The high level of climate finance and technology transfer available in Scenario 1 is likely to open up significant economic opportunities for South Africa. In addition, a high price on emissions will incentivise investment and innovation in low carbon technologies that could be beneficial to South Africa. A high price on emissions may necessitate some careful regulatory measures on the part of the South African government to ensure that costs aren't passed onto the consumers. Revenues generated by a high emissions price could be used in a progressive manner to mitigate the impact on low-income households and vulnerable sectors.

We postulate that Scenarios 2 or 3 are most likely to occur, given the current political environment, climate policy trends and low carbon technology development. The implication of this for South Africa should be considered. Scenario 3 would present significant challenges as it would be necessary to adapt to high levels of climate change with little support in the form of finance and technology transfer from developed countries. In Scenario 2 South Africa's exports are vulnerable to CBCLs implemented by the 'coalition of the willing'. The EU is most likely to resort to such measures to prevent carbon leakage and generate an even playing field for its domestic industries. South Africa is vulnerable to EU CBCL as the EU is an important export market for some of South Africa's most carbon intensive products. In the case of CBCL, there are several strategies that South Africa could utilise to minimise negative impacts; export market diversification, implementation of an emissions levy on its own exports or development of bilateral agreements with CBCL countries. Should South Africa join the 'coalition of the willing' and price its own emissions there is a risk of industry flight to countries that lag behind in emission reduction measures. On the other hand, research suggests that there are economic gains for countries that introduce a low emissions price in the near term and allow it to gradually increase over time. This seems to be a sensible action for South Africa to take given the range of scenarios for which this would be beneficial.

The timeline for the future international negotiations are uncertain, however, and other scenarios may in fact be obtainable. It seems likely that action on climate change will become unavoidable. By 2020 a legally binding global agreement could be in place and bilateral and regional agreements may be operational. By 2030 we may have reached tipping points, resulting in irreversible changes in the Earth system. The economic arguments are likely to have changed by then and inaction may no longer be an option. What is clear from this report is that, whatever the outcome, there will be large implications for South Africa. Climate change and the UNFCCC process should not be dismissed; South Africa should continue to push for a comprehensive global agreement.

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