Overview of financial mechanisms and funding options for a carbon capture and storage test injection in South Africa

South Africa-EU Cooperation on Carbon Capture and Storage (SAfECCS)

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Overview of financial mechanisms and funding options for a carbon capture and storage test injection in South Africa

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Foreword

This report is part of the SAfECCS project that was initiated in 2011. It is a two-year project that informs the South African Centre for Carbon Capture and Storage (SACCCS) strategy for Carbon Capture and Storage (CCS) in South Africa which proposes an onshore Test Injection Project initiated by 2017, followed by a larger scale demonstration. The SAfECCS project is funded by the Sixth Framework Programme of the European Union (FP6, 70%) and the South African Centre for CCS (SACCCS, 30%).

‘Work package 4 – Financing’ of the SAfECCS project is implemented by Climatekos with support from EcoMetrix South Africa with the aim of defining the gap in the business case for CCS in South Africa and exploring international and national opportunities to fill that financial gap for the test injection. The following activities are conducted during the implementation of the work package:

- overview of national and international financial mechanisms and funding options that can be used to finance CCS in South Africa;
- assessment of the financial requirements for establishing CCS in South Africa to determine the financial gap that prevents the private sector from engaging in this field;
- analysis and high-level risk assessment of carbon trading, other mitigation finance mechanisms and related national policies to close the financing gap, and
- feeding results into the final SAFECCS stakeholder workshop.

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Summary

This report deals with the potential financial mechanisms and funding options for a Test Injection Project in South Africa, looking at what options are available to Carbon Capture and Storage (CCS) in South Africa in general with a focus on the test injection – narrowing down the options to what is or can become relevant to the Test Injection Project. This project, the Test Injection Project, is a project under development by the South African Center for Carbon Capture and Storage (SACCCS) with the main purpose of demonstrating the safe storage of carbon dioxide under South African conditions. This project, concerning a test with an envisaged volume of 10,000’s of tonnes of CO₂ does not stand on its own. The Test Injection Project is part of an overall strategy aimed at scaling up to volumes that could provide a meaningful carbon dioxide emission mitigation potential for South Africa.

The analysis of the overall landscape of potentially available finance mechanisms provides insights into which mechanism, types of finance and sources are relevant to CCS in the South African context and, more specifically, to the Test Injection Project. Public funding sources, private finance and climate finance are analysed, including grants and tax incentives, climate finance mechanisms, equity and debt finance, alongside climate finance risk reduction and finance enhancement mechanisms.

Funding sources and intermediary organisations are divided into the following groups: multilateral funds and programs, bilateral sources and programs, donor governments, national funding options and sources, and private sector sources. The advantages and disadvantages of using certain finance mechanisms and related sources for the Test Injection Project, or rather their relevance to the Test Injection Project, are discussed. The basic funding options based on the current project design scenario, prerequisites and options to improve the funding base are investigated, followed by a brief excurse in the options for a financial model for the Test Injection Project.

The following requirements need to be met to best position the Test Injection Project for the basic grant funding options potentially available:

- Development of mitigation component
- Support from and engagement of South African government for funding from multi- and bilateral sources
- Project concept with planned, phased funding approach

There are currently limited national financial mechanisms and grant funding options for the Test Injection Project are currently limited. However, several financial mechanisms like the carbon tax, carbon budget and investment allowances are under development and will strengthen the business case for CCS in the longer term when potentially large volumes will be stored underground, thereby incentivising local stakeholders to start preparatory investments. Certain finance instruments and mechanisms are excluded from the financial structure when applying the currently foreseen project design, i.e. the pure test injection, such as loans, bonds, finance enhancement mechanisms or guarantees.

The three main prerequisites to increase the funding base for the Test Injection Project are:

1. The development of forward-looking project concept, linking the Test Injection Project with the demonstration plant at least or even phase 3 of the CCS road map without compromising the potential need for a gap between the test injection and phase 2 or even the complete stop of all further activities related to the further rollout of the CCS road map in South Africa.
2. Involvement and proactive engagement of the South African government, in particular those departments that lead on the development of relevant regulatory frameworks at the national and international level and in charge of fiscal policies or rather lead
discussions with donor governments. Furthermore, the involvement of the government will be required when approaching donor country governments.

3. Early involvement and creation of incentives for private sector participation.

A Trust Fund, an Investment Promotion Vehicle or potentially a Special Purpose Company (SPC) are suggested As appropriate or interesting financing models for the Test Injection Project. In cases such as the Test Injection Project when relying mostly on grant funding partners close to the donors are an advantage when applying for bilateral grant funding.

The following next steps at the national level are suggested:

- Understanding and exploring possibilities to include CCS in local financial mechanisms
- Understanding and exploring contributions from potential local grant providers
- Exploring potential contributions from selected Industrial Parties not partnering in SACCCS

In regard to the funding of the Test Injection Project in itself, it is likely that a combination of national and international grant and private funding should be envisaged. The currently envisaged budget requirements of the Test Injection Project are in the order of ZAR 300 to 450 million. International funding practice shows that for this size of budgets generally a public/private partnership is required where direct stakeholders/beneficiaries provide co-funding to complement the budget provided by grant funding programmes.

In summary, the basic project design needs to be clarified, agreed upon and elaborated, including the technical details, costs, timelines and potential phases (see below). The mitigation component should be elaborated first, followed by approaching multilaterals and donor countries together with the South African government, as well as initiating discussions with selected private sector players. Once public or governmental funds are committed and first down payments have been made, further commitments from the private sector can be sought, although initial private sector participation or expressions of interest will be required from the beginning to be able to make a convincing case to (host and donor) governments. Start with facilities and grants available for CCS then building a commercial case with government support – bridging the financial gap and building the case, economically and environmentally.
1 Introduction

This introduction provides background information about the role and importance of CCS in the context of mitigating climate change and climate policy. After an introduction to the SAfECCS project, the objectives of work package 4 on finance are laid out. Finally, the structure of the report is presented.

1.1 BACKGROUND AND OBJECTIVES

The reduction of greenhouse gas (GHG) emissions necessary to achieve the 2 degrees target scenario identified by the Intergovernmental Panel on Climate Change (IPCC) and agreed upon by the Conference of the Parties (CoP) to the United Nations Conference on Climate Change (UNFCCC), will require, amongst other, the large-scale deployment of clean technologies and other means to reduce and avoid the further release of GHGs into the atmosphere. The continued reliance on fossil fuel based energy production as part of the energy mix has given hope to the prospect of CCS technologies being part of the suite of clean technologies applicable to fossil fuel reliant energy production (IPCC 2005, IEA 2008 and Stern 2007).

The capture and storage of carbon has to be seen in the context of reducing emissions at relevant sources, or rather the capture and storage of those emissions which cannot be avoided. The Dutch Energy Research Centre (ECN) sees the following sources as relevant in the context of feeding (into) CCS projects (de Coninck 2011):

- Coal, gas, or biomass-fired power generation
- Biomass conversion
- Cement, iron/steel
- Refineries
- Natural gas production
- Ammonia production
- Ethylene production

The power generation sector contributes significantly to global GHG emissions and seems to offer the largest potential for CCS applications, often seen in the context of Clean Coal Technologies (CCT). The Coal Industry Advisory Board (CIAB) believes carbon dioxide (CO₂) transportation and storage must be developed as the fifth group of CCTs needed to reduce GHG emissions, next to coal upgrading, efficiency improvements at existing power plants, advanced technologies and near-zero emission technologies as identified by the IEA (2008). The electricity generation sector, including and in particular in developing countries and economies in transition or the BASIC countries¹, will be key to deep cuts in emissions and large scale emission reductions. The IEA estimated in its 2009 CCS Roadmap that two-thirds of the 3,400 CCS projects by 2050 worldwide will need to be implemented in developing countries. However, without an economic perspective the power sector will be rather reluctant to engage in large emission reduction efforts and progress will be much slower than required. The widespread deployment of CCS will therefore be linked to energy efficiency and savings or generation measures based on CCTs and similar technologies.

Funding announcements and related allocations clearly support the abovementioned link between CCS and CCTs or rather energy efficiency and generation measures. The European Union (EU) and the North American government have committed the largest contributions to the

¹ Brazil, South Africa, India and China.
US$25 billion that have been announced since 2005, with 47\(^2\) and 37 percent respectively. Ninety percent of this funding announcement targets large-scale demonstration projects. Of this 90 percent, 77 percent is allocated to power generation projects, with the remainder mainly supporting oil and fertiliser (14 percent) and oil gasification (5 percent). Almost half of the funds allocated to large-scale demonstration projects (46 percent) support Pre-Combustion Capture Technologies, whilst Post-Combustion Capture Technologies receive 33 percent and oxyfuel development 18 percent (GCCSI 2010 and 2011).

In particular, in developing countries the development of (large-scale) demonstration projects has been rather slow to date, with one of the main barriers being their significant associated costs. Despite the significant investment requirements for developing and implementing CCS projects at the required scale and achieving the abovementioned number of projects, CCS projects are generally exposed to the following key risks:

- Policy uncertainty
- Risks ‘concatenating’ across the capture, transport and storage elements of CCS systems
- Risks with new elements of CCS technologies
- Competing low-emissions technologies
- Size of the required investment
- Public acceptance

Next to technological improvements, reliable regulatory frameworks, institutional change and last but not least significant investment will be needed to accelerate CCS development and deployment. The availability and combination of public R&D funding, mandatory regulations, investment support via special CCS finance mechanisms, subsidies, or funding from Emissions Trading Schemes (i.e. revenues from selling or auctioning allowances) or other climate finance mechanisms and the related income streams are to be factored in for further development.

The above numbers demonstrate – with these developments already taking place in industrialised countries – that energy or rather commercial components, even if still in an early or rather applied research stage, are looked at and promoted right from the beginning of the process. Governments will however need to play a crucial role to fill the funding gap for R&D initiatives and demonstration projects, including the promotion of Public-Private Partnerships (PPP). The structural differences between developed and developing countries such as South Africa need to be taken into account when developing effective financing strategies for the development of a CCS project in South Africa.

In particular, but not only in the developing countries’ context, the mitigation effect of CCS plays a crucial role. Therefore the development of the emission reduction component of a CCS project with regards to tapping into innovative finance can sow the seed for further investment and attract the private sector. Apart from any potential specific finance mechanism for CCS, the best and most immediate option for innovative CCS finance (in developing countries) will come from climate change related financial mechanisms such as the Clean Development Mechanism (CDM), Nationally Appropriate Mitigation Actions (NAMAs), or a Sectoral or Bilateral Crediting Mechanism. Further climate-specific or related funding such as from the emerging Green Climate Fund or other multi- and bilateral programs will be crucial to promote CCS, in particular at this early stage and in the context of emerging economies or developing countries such as South Africa.

Climate finance cuts across a broad variety of types and sources of financial flows. These flows include both new instruments to address climate change, shifts in core development aid and private investment finance towards mitigation and adaptation in developing countries. To get a

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\(^2\) This number includes additional funding commitments by the United Kingdom and Norway.
better idea of what constitutes climate finance, it is helpful to divide it into two subsets (Corfee-Morlot, Guay, & Larsen, 2009):

- **Climate-specific finance** – this is defined as capital flows to activities that have as key outcomes and/or objectives GHG mitigation and climate adaptation. This includes investment in renewable energy, energy efficiency and sustainable forestry or agriculture or other activities; and

- **Climate-relevant finance** – this encompasses a much broader set of capital flows that will influence emissions and/or vulnerability to climate change. It includes flows going to support development and economic growth in key emitting sectors (e.g. power production and other energy supply, industry, agriculture and forestry, transport, water) or to sectors affecting vulnerability to climate change (e.g. water, health, energy, forestry and agriculture). Climate-relevant finance will influence climate change outcomes but it may also do so in a negative manner, unless the capital is supporting low-emission or climate resilient investment.

The SAFECSS project will promote cooperation in the field of CCS between South African and European partners. The project is being led by the British Geological Survey (BGS) and the South African partners are coordinated by the SACCCS with funding from the European Commission (EC) in the form of a EuropeAid grant (70%) and the SACCCS (30%). The analytical results from the SAFECSS project will feed into the SACCCS 5-year work plan, which in turn feeds into an overall South Africa CCS road map.

As part of the SACCCS work plan, a CO₂ test injection is planned and the SAFECSS project will provide the following essential support and results:

- capacity building through knowledge and experience shared between European and South African partners;
- geological assessment of potential ‘test injection’ site(s);
- regulatory requirements to undertake such a ‘test injection’, and
- assessment of financial opportunities for CCS in South Africa, with a specific focus on supporting the test injection.

The aim of this test injection, i.e. the Test Injection Project, is to prove the feasibility and concept of CCS in South Africa. The planned test injection site will be onshore. However, for larger storage sites, offshore sites will be of great interest. The test injection has to be seen in the context of a long term plan over the next 13 years and beyond to establish CCS as a viable mitigation option and technology in South Africa, with three distinct phases:

- **Test Injection Project (planned – 2016, phase 1):** a test of the safe injection of CO₂ into South African reservoirs is essential to the understanding of the suitability of the local geology as a storage medium. It is also necessary to ascertain the dispersion and transformation reactions of the CO₂ in the storage medium and surroundings. The work of the SAFECSS project will prepare for this planned experiment, but the test injection itself will not be conducted under this project.

- **Demonstration plant (planned – 2020, phase 2):** a demonstration plant will test an integrated operating system under local conditions. This phase forms an essential link between feasibility trials and a full scale commercial plant. This phase aims to demonstrate the safe injection of CO₂ into South African geological formations. The magnitude of the demonstration plant is in the order of hundreds of thousands of tonnes of CO₂ stored per year.
• **Commercial operation (planned – 2025, phase 3):** if the outcome of the demonstration plant is positive, a full scale commercial plant is envisaged. The magnitude of the commercial scale operation is in the order of millions of tonnes of CO$_2$ per year.

The energy and minerals sector of South Africa is a major contributor to both the country’s economy and GHG emissions, as the high carbon fossil fuels and valuable mineral deposits are sought after internationally. Environmental policies are being strategically designed and implemented in order to mitigate climate change as well as facilitate the country’s economic growth. Key components in this matter are the Integrated Resource Plan (IRP) dealing with ensuring security of electricity supply while introducing more renewables to the energy mix, market based policy measures like carbon taxes/incentives and the Renewable Energy IPP Procurement Programme.

The IRP for Electricity 2010-2030 (DoE 2011) mentions CCS as an option that “would allow coal generation to continue to have a large presence even in a carbon-constrained world.” And that “this is still a priority for future research.” As such, CCS could become part of a mitigation solution incorporating a myriad of clean energy options. However, one of the challenges associated with CCS, particularly for a developing country such as South Africa, is the required investments facilitating local CCS developments both financially and in terms of skill development.

This report deals with the potential financial mechanisms and funding options for a Test Injection Project in South Africa, looking at what options are available to CCS in South Africa with a focus on the test injection – narrowing down the options to what is or can become relevant to the Test Injection Project. The Test Injection Project is a project under development by SACCCS with the main purpose of demonstrating the safe storage of carbon dioxide under South African conditions. This project, concerning a test with an envisaged volume of 10,000’s of tonnes CO$_2$ does not stand on its own. The Test Injection Project is part of an overall strategy aimed at scaling up to volumes that could provide a meaningful carbon dioxide emission mitigation potential for South Africa.

SACCCS is planning for up-scaling of CCS in South Africa to the level of demonstration (100,000’s of tonnes of CO$_2$) by 2020 and commercialisation (1,000,000’s of tonnes of CO$_2$) by 2025 (see above). Taking these volumes into account, a carbon mitigation potential comes into perspective and local mitigation incentives like carbon tax, investment tax allowances and local carbon financing/trading as well as further international mechanisms and sources come into play.

The Test Injection Project is envisaged to include several exploratory activities like such as shooting seismic and drilling of exploratory wells to investigate the suitability of the subsurface for CO$_2$ storage. Once a suitable site is found, the actual injection of a certain amount carbon dioxide would take place, to test the suitability of the targeted reservoir for underground storage, to show that this can be done in a safe way and to build local capacity and understanding of carbon dioxide storage. As an offshore test would increase the cost substantially, thus SACCCS is looking for an onshore site for the Test Injection Project phase. The total cost involved is estimated to be in the order of 300 to 450 Million ZAR.

1.1 **REPORT STRUCTURE**

This report provides an overview of national and international financial mechanisms and funding options for the development of CCS in South Africa. The focus will be on the financial means for the Test Injection Project - identifying and differentiating which finance mechanism and funding source would be applicable for which phase(s), as well as advising on the best potential structure for the first phase, i.e. the Test Injection Project.
Following the introduction in chapter 1, chapter 2 will analyse the overall landscape of potentially available finance mechanisms for CCS relevant in the South African context and their relevance to the Test Injection Project. Public funding sources, private finance and climate finance are analysed, including grants and tax incentives, climate finance mechanisms, equity and debt finance, alongside climate finance risk reduction and finance enhancement mechanisms.

Chapter 3 looks at concrete funding sources and intermediary organisations, divided into the following groups: multilateral funds and programs, bilateral sources and programs, donor governments, national funding options and sources, and private sector sources. Whilst the advantages and disadvantages of using certain finance mechanisms and related sources for the Test Injection Project, or rather their relevance to the Test Injection Project, are discussed in chapter 3, chapter 4 discusses the basic funding options based on the current project scenario and prerequisites and options to improve the funding base. After a brief excurse in the options for a financial model for the Test Injection Project conclusions and recommendations are provided in chapter 5.

2 Funding sources and mechanisms

This chapter will categorise the existing funding sources, define the categories and describe subgroups and options within each category. There are three basic categories which are relevant to financing mitigation activities and technologies such as CCS (see also fig. 1):

1. public funding sources,
2. climate finance, and
3. private finance.

The section on the general sources of finance is followed by an overview of the finance mechanisms that may be applicable to CCS. Each mechanism is further analysed with a view to its different forms, the relevance to CCS and the South African context, and whether it can support phase 1 of the South Africa CCS road map, i.e. the Test Injection Project, or rather how the Test Injection Project would need to be designed to make use of the respective mechanism.

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3 Multilateral programs and sources are implemented and managed by international organisations where the funding is provided by various countries. Bilateral programs and sources concern activities between two countries, usually a donor country providing funding to a recipient country.
2.1 PUBLIC FUNDING

The main source for public funding is tax revenues – differentiating between conventional and new taxes – which are then allocated to budget items relevant to climate change activities. Next to specifically climate change related activities, these are mainly Official Development Assistance (ODA) and innovative or R&D finance. Two new types of tax have been considered during the discussions on financing action on climate change over the last decade:

- *carbon taxes* – these can be directly related to carbon or emission intensive activities; or
- *other, new taxes* – such as on international transport, financial or carbon market transactions with no direct link to GHG emissions.

Public climate change funding and ODA are being spent through various bilateral and multilateral channels, including the national development ministries and agencies, as well as development banks and funds. There is however something of a grey zone when it comes to distinguishing between ‘new and additional’ climate finance and ODA, which is related to the international negotiations under the UNFCCC, and financial commitments and pledges by developed countries.

This distinction – that is, ODA or ‘new and additional climate finance’ - may, however, be less important for projects on the ground in developing countries, but is important in the context of climate negotiations and will be necessary to support implementation of a future global climate finance architecture. This is furthermore of some relevance to CCS, as the majority of large-scale projects for demonstration and later commercial purposes will rely on seed funding from public sources, and it remains to be seen how much could come from traditional ODA funding – competing with the traditional ODA stakeholders - and how much would need to be ‘new and additional climate finance’.
According to a survey by the Climate Group (2010), public sector financial support from European sources will need to focus on fewer CCS demonstration projects. This is with a view to addressing and hopefully overcoming the challenges, instead of spreading funding thin and supporting too many or rather numerous CCS technologies without really addressing the challenges. Private sector debt financiers will come in once their concerns are addressed – viz. performance guarantees, CCS sponsors to be major players in the CCS chain, and a route to achieving grid parity with other electricity generation sources identified - with the need for public funding sharply declining thereafter.

Addressing performance risks appropriately, looking into energy efficiency and generation options, and bringing major players on board will probably also apply in order to receive the rather limited public (R&D) funding for early action pilot projects in the CCS sector internationally. Limited public spending in the aftermath of the economic crisis also impacts on funding available to CCS.

2.2 CLIMATE FINANCE

Carbon markets and offsetting lie in-between pure public funding and private finance because a) they are markets and mechanisms artificially created by regulatory commitments and b) the investments related to carbon or mitigation finance are both public and private. Carbon finance includes all investments, sales and purchases related to carbon credit generation and sales, whereas climate finance may include carbon credits and any other financial flows as set against targets or commitments.

Regulatory or ‘compliance’ markets emerge in response to a regulatory commitment for emission reductions that a government or other regulatory body imposes on the emitters. Market players are primarily entities that are legally obliged to reduce emissions, although brokers, exchanges, speculators and a variety of supporting service providers also play important roles. They include markets directly linked to the Kyoto Protocol, such as the EU ETS and trading of Certified Emission Reductions (CERs, under the CDM) and Emission Reduction Units (ERUs, under JI) from the Protocol’s ‘Flexibility Mechanisms’, the CDM and Joint Implementation (JI).

Another indirect source of revenues for the public sector linked to emissions trading are revenues from auctioning allowances and surplus emissions from countries whose emissions have fallen compared to initial estimations such as trading of Assigned Amount Units (AAUs). For example, some EU member states have used such revenues to establish programmes to promote mitigation and adaptation activities, including in developing countries.

Voluntary carbon markets emerged as a result of parties and entities voluntarily deciding to offset their own emissions. Voluntary over-the-counter (OTC) markets transacted 51 MtCO2e in 2009 whereas voluntary exchange-based markets, primarily the Chicago Climate Exchange (CCX) which transacted 41 MtCO2e in 2009. However, the supply and demand structures in the voluntary market do not cater for (large-scale) industrial projects, unless CCS projects with explicit community or other development or co-benefits would be developed at a small(er) scale. (Hamilton, Sjardin, Peters-Stanley, & Marcello, 2010)

The main source of revenue support for mitigation activities in developing countries to date has been the CDM. 211 MtCO2e were transacted as primary credits under the CDM in 2009, with a total monetary value close to USD 2.7 billion (Kossoy & Ambrosi, 2010). Although public financing has played a key role in building capacity and sometimes also in sponsoring carbon projects, the CDM is increasingly directing large amounts of private capital into the developing world (Corfee-Morlot, Guay, & Larsen, 2009). Furthermore, primary transactions under the CDM can be considered as a direct injection of capital from the private sector in Annex I countries (the developed world) to non-Annex I countries (the developing world). In the voluntary carbon market, 94 MtCO2e were transacted in 2009, equivalent to a total market value of USD 387 million. (Hamilton, Sjardin, Peters-Stanley, & Marcello, 2010)
As part of the post-2012 negotiations on a new, broad climate policy regime and a related financial architecture, new multi- and bilateral approaches to support and finance mitigation activities and technologies have emerged. Under the UNFCCC NAMAs and sectoral approaches, i.e. sectoral crediting and trading, emerged next to the Green Climate Fund (GCF) and the Technology Mechanism, that have were agreed upon in Cancun at the end of 2010. In addition, the Japanese Government and the EU have started to introduce bilateral mechanisms or agreements to support climate change action (see section 2.4).

2.3 PRIVATE AND DEBT FINANCE

Thus far, private sector finance sources used for emission reduction activities and technologies in developing countries can broadly be divided into:

1. Revenue support, mainly including the CDM, but also voluntary carbon market flows (see above under 2.2);
2. Foreign Direct Investment (FDI);
3. Equity, at this stage primarily defined as investment in sustainable energy and energy efficiency, and
4. Debt.

Foreign Direct Investment (FDI) represents the largest source of private financial flows into climate change mitigation from developed to developing countries. While in most cases FDI will not target mitigation specific activities, it often finances endeavours that are highly relevant to mitigation (Corfee-Morlot, Guay, & Larsen, 2009). UNCTAD estimates global FDI inflows to have reached USD 1.122 trillion in 2010, of which about 50% are inflows to developing countries (UNCTAD, 2011). It is not possible to single-out investment into mitigation specific or relevant activities. About 45% of FDI is estimated to be mitigation relevant (about USD 118 billion on average per year), of which the largest share goes to the industry sector (32%), followed by mining and quarrying (6%) followed by transport and storage (4%)\(^4\).

For the purposes of this report, equity is defined as investment in sustainable energy and energy efficiency. In 2009, total new investment in sustainable energy worldwide totalled USD 162 billion (UNEP, SEFI, & Bloomberg New Energy Finance, 2010).

International debt is frequently used to finance investments – the UNFCCC estimates that it accounts for close to 20% of global private and public investments annually (UNFCCC, 2007). It is currently not possible to break down the recipients of international debt, nor the activities that it will sponsor. Hence it is at present not possible to determine which fractions of debt financing are mitigation-relevant (Corfee-Morlot, Guay, & Larsen, 2009).

Most of the first CCS demonstration projects will be implemented as public-private-partnerships (PPP) with government sources providing part of the funding topped up by the private sector. The Climate Group (2010) estimates that the private sector may be able to support just two CCS demonstration projects in Europe, which contradicts European ambitions to see eight or even twelve demonstration projects. Raising significant funding support for CCS initiatives outside the EU, the US and other industrialised countries will probably also rely on a) PPPs or rather joint public and private sector contributions, and b) competing for limited resources with the best propositions – environmentally and economically.

2.4 FINANCE MECHANISMS

The following section defines the different finance mechanisms, distinguishes different forms that may occur and, last but not least, assesses their relevance to CCS in South Africa, i.e. the

\(^4\) It should be noted that data provided in this figure refers to 2003 – 2005 estimates.
Test Injection Project or later, more advanced, development stages of CCS in South Africa (see also Figure 3). Chapter 5 will further analyse the barriers to applying certain finance mechanisms in light of the related advantages and disadvantages of the Test Injection Project design. The following finance mechanisms are analysed and assessed in detail: grants, equity, debt, climate and carbon finance, risk reduction and finance enhancement mechanisms such as guarantees and insurances.

Fig. 3: Overview of finance mechanisms and their applicability in relation to technology development stages (Source: UNEP 2008)

2.4.1 Grants, subsidies and tax incentives

A grant is a contribution or subsidy (in cash or kind) handed out by a, mostly public organisation, for specific purposes to an eligible recipient. Tax incentives are reductions, deductions, exclusions, or exemptions from a tax liability to encourage or discourage specified activities.

There are also grants given by not-for-profit organisations established by individuals or companies. Grants are typically bound to certain conditions as to their use, the application of certain standards, or co-funding by the grantee or other funding sources. Activities funded by grants usually do not generate direct returns, therefore private capital only comes in at a later stage, e.g. after a grant supported feasibility study.

Grants are usually used for capacity building purposes to stimulate (early) action and activities in certain sectors, and can help with project preparation activities, particularly with small-scale activities and small developers who lack seed or development finance. Technology developments, i.e. early stages of or preparation of deployment, with an associated risk of losing the investment, are also supported by grants. Using grants for this purpose with the amount of finance required still relatively small is quite common while the larger investments at later stages become too large for pure grant funding.

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5 Here traditional clean energy project related grants and grant types are referred to whereas climate change mitigation specific grant funding opportunities are described in section 2.4.4 on climate finance.
Tax benefits support or discourage specific courses of actions. Governments can offer investment allowances promoting investments into energy efficiency projects or encourage private sector investment into scientific and technological research activities, for example. See box 1 below on investment allowances in South Africa.

**Types**

- **Technical assistance** – these grants usually aim to mobilise commercial financing for clean energy projects or capacity building of relevant players. Such grants remove barriers related to project development and preparation, project bundling to achieve a critical mass from a financial point of view, educating energy users to empower them to buy energy-efficiency/renewable energy and services by energy services companies (ESCO), and with transaction preparation and structuring. Technical assistance grants are well suited to attract more private or commercial financing in the medium and long-term (UNEP 2008).

- **Project development** – such grants can play a role in assisting project developers achieve financial closure by covering some of the costs of the more expensive and time intensive project development activities related to permits, power purchase agreements or grid interconnection and transmission contracting. Sub-forms are contingent grants and soft loans. Contingent grants can be paid back in part or full – then becoming a loan - once a project is successful, operational and generates revenues. In the event of the project not reaching implementation and financial closing, the funding becomes a grant without the need to be paid back. Incentivising enterprises to aim for success is sometimes achieved by the need to repay a loan on the grant, the grant in fact becoming a loan, if the project fails. The grant component is however kept by the grantee in the event that the project proceeds to implementation. According to UNEP (2008) grants for project development increase investor confidence and leverage more risk capital, covering early and high risk development stages, therefore providing a medium to high leverage potential.

- **Loan softening programmes** – these programmes are similar to soft loans (see below in section 2.4.3) but they do not provide financing itself, rather only incentives in the form of interest subsidies or the provision of a partial guarantee, or a combination. Therefore these programmes are provided alongside other financial instruments through commercial financial institutions (CFI), with the benefits mostly passed on to customers via lower interest rates, lower front end deposits and extended loan repayment periods. Many renewable energy technologies, programmes and projects have been promoted with this mechanism such as by the German Development Bank Kreditanstalt fuer Wiederaufbau (KfW).

- **Inducement prize contests** - a competition that awards a cash prize for the accomplishment of a feat, usually of engineering. Such contests are typically designed to extend the limits of human ability. They have been extremely effective in pushing technological advancements, although have been tested more in other sectors than those relevant to climate. The Earth Fund by the International Finance Corporation (IFC) and the Global Environment Facility (GEF) started to target climate relevant sectors with the launch of its biofuels prize in 2008.

- **Earmarked funds** – earmarked funds can be part of some kind of legislation and/or policy that entails a certain budget in support of the legislation and/or policy involved. In case of hard earmarks, the channeling of the available funding to certain policy areas is quite certain. In case of soft earmarking, the potential beneficiaries need to lobby in order to receive any funds and the actual receipt of funds is uncertain and not
guaranteed. Interestingly, the South African Budget Review 2012 (National Treasury 2/2-2012) indicates that revenues generated by the envisaged carbon tax will be soft earmarked to address environmental concerns and thus may be used to support specific environmental programmes.

**Box 1: Investment Allowances for Energy Efficiency and R&D Activities in South Africa**

*Potential extension of an energy efficiency investment allowance*

Current tax incentives under development are focussed on energy efficiency and consist of an investment allowance regarding investments into energy efficiency projects (Brownfield and Greenfield). The investment allowance concerns a maximum of 35% or 55% of the investment (depending on scoring certain points on project characteristics) that can be deducted from a company’s taxable income. The energy efficiency tax allowance requires that the project be manufacturing related, it must have a relative pre-determined base year and must result in a minimum of 10% energy reduction in the year of investment that must be sustained for a period of 4 years thereafter. (Bredenkamp 2012)

There are two investment types identified, Greenfield investments which would be an investment in a new project as well as brownfield investments which would be either an expansion or upgrade. In order to qualify for the investment allowance, a rating system is used and the scoring depends on the nature of the project. Depending on the score, a percentage of the investment is deducted from profit tax and the remaining amount is taxable.

*Investment allowance for R&D activities*

The R&D tax incentive is an initiative by South African government to encourage private sector investment into scientific and technological research activities. The incentive is co-ordinated by the Department of Science and Technology (DST), with an approvals committee made up of members from DST, South African Receiver of Revenue (SARS) and the National Treasury.

The incentive is governed by the Income Tax Act, 1962 (Act No.58 of 1962) Section 11 D which allows for a standard deduction of 100% of operational expenditure incurred during an approved R&D activity from normal profit before tax, a further 50% (the incentive) is also deductible if the activity meets the requirements of section 11 D. In order to gain the further incentive an application detailing the research and development activity needs to be submitted to DST for approval before commencement of the R&D activity. The Tax Act has been recently amended and thus only operational expenditure is dealt with under the Tax incentive, whereas previously a sub section was included on accelerated depreciation of capital expenditure (R&D assets). This accelerated depreciation can still be claimed under section 12C (gA), however this would now be over a four year period at the rate of 40/20/20/20 as opposed to the previous three year accelerated depreciation under the former R&D Tax incentive. The amendments to the Income Tax Act would be applicable as of October 2012.

**Relevance to the Test Injection Project**

In general, grant finance will be most relevant to the planned CCS test injection in South Africa (see also section 2.4.4 on *climate-specific* grant funding). Although technical assistance may not offer a large amount of funding and will not be suitable to cover costs for equipment, for example, it may be interesting in the context of further developing the concept and attracting further funding.

Project development grants and loan softening programmes will need both a special purpose vehicle (SPV) and a more commercial orientation or component. Loan softening is least likely
though, and only in combination with and alongside other finance. Project development grants and additional loan softening will be more suitable for later development stages, i.e. demonstration stage/plant, or rather if a more long term view and approach with two until three phases would be developed – integrating the abovementioned phase 2 and potentially phase 3.

The governmental soft earmarked funds generated by the envisaged South African carbon tax could be well applicable to CCS Test Injection project. The soft earmarking has been specified as earmarking to environmental programmes. With CCS being labelled as a flagship programme and the CCS roadmap being endorsed by the South African cabinet it can be a very interesting funding option.

The potential extension of tax allowances from energy efficiency to CCS or rather to a pilot phase such as the Test Injection Project is unlikely. The investment allowance for R&D activities should be further investigated with regards to making investments in the Test Injection Project more attractive and encouraging private sector participation.

2.4.2 Equity

Investment capital via equity stakes may come not only from private sources but also from public partners who take a subordinated equity stake in a company or project – acting as a door opener for potential private equity partners. Start-ups or companies with growth ambitions most likely need equity to meet debt-to-equity requirements by lenders. Banks, for example, normally ask for equity capital or investments when considering a loan.

Public investors often provide a network, knowledge and connections that will benefit the supported activities. Therefore such a venture becomes more attractive for private equity investors. Very few international private or public climate funds or investors buy equity in mitigation projects in developing countries. Firstly, equity investors are the last to be paid back if a project goes into default. Secondly, assessing risks and implementing control measures is difficult for foreign investors. In many cases local (semi-)private investors are shareholders with equity in emission reduction projects in developing countries. Equity investments bear the risk of losing the investment completely.

Types

- **Direct equity investments** – generally refers to the acquisition of ownership (equity) in a (unlisted) private company or start-up. It is called venture capital when the investment is made in infant companies where the risk is higher than an investment in a listed going-concern context. Equity investment also refers to the buying of shares of stocks on the stock market by individuals and firms in anticipation of income from dividends and capital gains, as the value of the stock rises. In-kind contributions, e.g. from the private sector, are seen as a kind of equity investment in the context of this study.

- **Private equity funds** – invest in projects or companies such as energy utilities, power producers, equipment providers, project developers and energy service companies (ESCO), and project specific SPVs. Equity is usually invested in private companies, i.e. private equity. Equity funds assume higher risks compared to loan facilities because they assume an ownership stake and take a subordinated position in profit distribution – preferred shareholders and creditors coming first. Some of these funds are specialised in one sector or technology whereas others cover a broad range of investment opportunities. Geographically they differ with regards to a regional vs. country specific focus. The funds can provide various financial products, ranging from venture capital
for new technology developments, and early stage equity for project development activities, to late stage equity for projects ready for construction. Investments by equity funds offer a medium to high leverage potential due to their ability to attract further finance (UNEP 2008).

- **Venture capital funds** – public or private venture capital is usually being tapped into when taking the development of a technology from the end of the R&D phase to demonstration phase. Opening deal flow bottlenecks can be removed effectively by public venture capital injection. Furthermore these funds can support companies that are not attractive to private investments but provide global benefits, or companies where the timeline is much longer than usual to generate returns.

### Relevance to the Test Injection Project

In particular, (public) venture capital or rather public equity, especially from funds, could be of interest to the Test Injection Project, but would most likely require a SPV and potentially also a commercial component or an more concrete ‘outlook’ or link to phase 2, at least. Private venture capitalists spread their investments rather ‘thin’ across a variety of technological solutions to have big enough portfolios with a view to the successful projects generating returns of 30% or higher. Similarly, private equity requires high returns across a spread of projects, therefore is rather attracted to commercial undertakings and would see CCS demonstration projects, and even more so a test injection, like technology funding. Specialist equity – private equity or infrastructure funds – do not invest in R&D or demonstration projects and large scale private equity and infrastructure funds usually only offer debt funding to low risk projects (Climate Group 2010).

R&D programmes of larger corporations should however be interested in, and supportive of CCS projects, even at an early development stage such as the test injection in South Africa, in particular if CCS is relevant to their sector, such as oil and gas or power production, for example – investing at a limited level directly and/or in the form on in-kind contributions. This is with a view to ascertaining if CCS has an impact on their sector with regards to emission reduction requirements and energy efficiency and management efforts, (and) whilst CCS and related technologies are being promoted by governments. Next to receiving co-finance to explore the scope to make CCS viable, it allows governments to further their climate policy agendas at the same time. According to a survey and interpretations by the Climate Group (2010), equity or bondholders do not seem to object to (major) corporates using, to a limited extent, their capital budgets for CCS demonstration projects – spending 1-2% of a company’s asset base. It remains to be seen whether or how this view could encompass the earlier stage, notably such as a test injection.

#### 2.4.3 Debt

**Debt** refers to the issuance of bonds, debentures, or other debt securities to raise (operating) capital by borrowing.

The creditors will be repaid on the principal and interest and have their loan paid back at the end of a certain period. Debt financing can be short- or long-term, i.e. to cover day-to-day requirements such as payroll and/or inventory, or buying facilities and major assets respectively.

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6 Debt instruments or loans are also used and referred to in section 2.4.4 on climate finance as they are offered by dedicated climate change multi- and bilateral funds and programs. A further distinction or clear separation cannot be made in the context of this study.
Types

- **Concessional loans** – or ‘soft loans’ with lower interest rates and/or lenient servicing conditions. In sectors where investments generate stable cash-flows, concessional loans are a useful mechanism. Due to the need for the amount of the loan to eventually be paid back (i.e. principal and interest), efficient and business oriented operations are encouraged. These loans are particularly useful to bridge the financial gap between demonstration and commercial phase, when private investment can be obtained.

- **Project loan facilities** – loan facilities are created by governments or bi- and multilateral development institutions as special vehicles with a view to providing project finance in the form of debt financing. They are usually applied where a large number of (viable) projects do not reach financial closure because of local Commercial Financial Institutions (CFI) not being able to provide the required financing. Clean energy and technology projects can benefit greatly from such capital injections because they improve access to other forms of financing. Loan facilities provide a medium leverage potential (UNEP 2008).

- **Soft loan programmes** – covering the financing gap during actual project preparation and pre-commercialization. Project development from pre-feasibility to financial structuring, like early-stage technology innovation, requires seed capital because normally a project will not generate positive cash-flow to service debt – accessing such finance in the form of loans from CFIs is therefore rather difficult. Debt finance from soft loan programmes, often provided by semi-public agencies, is provided at concessional interest rates. Although collateral funds are not usually required, matching funds, however, are often needed. Repayment can be deferred until revenues are generated and, in many cases, debt is written off if the project fails. Soft loans can help to introduce innovative technologies and project developers through the sharing of some of their costs – leveraging more commercial finance by proving the viability of technologies and projects to CFIs.

- **Credit lines to CFIs for senior and subordinated debt** – this mechanism addresses liquidity issues with regards to medium and long-term financing requirements of projects, such as clean energy activities. Such credit lines can stimulate borrowing and direct credit to target sectors and projects through concessional rates (UNEP 2008). In the event of high credit risks related to certain projects, limited or non-recourse credit lines may be applied so that the risk of the Financial Institution (FI) loans is shared by the Development Financial Institution, often involved in such cases. Usually small-scale renewable energy projects are supported through such arrangements. According to UNEP (2008), such debt facilities offer a moderate level of mobilising further finance, supporting and leveraging senior debt. Subordinated debt can also be structured through convertible debt or preferred.

- **ERPA loan** – in some cases, advanced payments on the future emission reductions and their sale in form of CERs are made through ERPA (Emission Reductions Purchase Agreement) loans. The loan is paid back once the project is implemented and delivers CERs. However, traditional loans are applied more often where the loan and interest is paid back in cash.

- **‘Conventional’ loan programs by commercial banks** – Nowadays properly structured renewable energy projects, for example, could be serviced under normal loan programs of (local) commercial banks or special energy efficiency loan programs.

- **Bonds** – another form of debt finance, more recently increasingly being looked at, is green, low-carbon, clean energy or climate bonds. The bond market lends itself well to projects with a long lifetime and high related costs, such as infrastructure projects.
However, a convincing economic case for investment, or rather complying with risk and return requirements of investors, are crucial factors. Many see the need to stimulate growth in green bonds by government support in the form of (green) bonds, supported by policy initiatives such as credit enhancement or issuance from (green) development banks (see also section 2.4.5.). The market for low-carbon bonds is still a nascent one, but may be or become an interesting opportunity for financing CCS projects with a commercial perspective (Trading Carbon, Sept 2011).

Relevance to the Test Injection Project

Debt finance is principally excluded from the finance options for the Test Injection Project or rather what is known about the project design at this stage. According to a survey by the Climate Group (2010), CCS debt providers require three issues to be addressed:

- path towards competitiveness with other forms of electricity generation;
- major sponsors with relevant track record involved, and
- well-known equipment supplier or contractor should provide a performance indicator across the whole capture and generation chain.

This clearly points towards the need for adding a commercial component to the project, such as through capturing gas and generating energy, if debt finance is to be considered at all. And even then only soft loan programmes may be applicable, depending on the size of such a component. In the event that carbon credits or rather CERs can be generated an ERPA loan may also be looked into.

2.4.4 Climate finance mechanisms and instruments

In this context climate finance – including carbon finance - is understood as financing of GHG emission reduction projects or activities via specific finance mechanisms which allow for the generation and trading of carbon credits or other units, or specifically support mitigation efforts.

Such funding can be used to meet project development or implementation costs, or increase project revenues. The financial impact of carbon finance is related to the scale of the project, whereas this may not necessarily be the case for other climate finance. It is too early to assess the leverage potential for most of the below described mechanisms as they are still either conceptually developed or still in their infancy, apart from the CDM and offsetting mechanisms.

The climate finance analysis also considers carbon tax revenues and the Technology Transfer Mechanism currently discussed under the UNFCCC, although both rather indirectly support climate change projects or programs. Tax revenues need to be channelled back to promote mitigation efforts whilst the direct financial impact of the Technology Mechanism remains uncertain yet.

Types

- CDM and voluntary offsetting mechanisms – The Kyoto Protocol under the UNFCCC established three “flexible mechanisms” – Emissions Trading, JI and the CDM - that allow the trade of emission allowances and credits generated by emission reduction projects. CDM was designed to regulate the crediting of GHG emission reductions from projects implemented in Non-Annex I countries – monetising future cash flows from advanced CER sales by mitigation activities. Depending on the scale of the project, the impact of revenues from CER sales can be significant, i.e. for small-scale projects and programmes, or cover a share of the investment costs at least in the case of large-scale grid connected projects. Advanced sales of CERs may provide early stage seed capital for small-scale projects or programmes.
In principle, the same applies to verified emission reductions (VER) – VERs are offsets traded in the voluntary market (see above) - as for CERs, although VERs are usually traded at lower prices, unless they are topped up with a high premium for development co-benefits, and are exposed to a less strict project development process than compliance CDM projects. The leverage potential of carbon finance has not yet been fully explored, and must be further exploited to help mobilize both climate and development finance on a larger scale (World Bank 2010). A clearly established and elaborated carbon component, however, can help raise further finance, as carbon credits have become better established and a (regularly) traded commodity. Current low price levels in the market are however not conducive with regards to raising more capital (solely) based on carbon credits.

- **Carbon tax** – a tax on energy sources which emit carbon dioxide, a form of carbon pricing and a pollution tax. Carbon taxes address a negative externality and a number of countries have introduced carbon or energy taxes related to the carbon content of fuels. By placing a cost on these negative externalities, the underlying purpose of a carbon tax is to reduce emissions of carbon dioxide. It can be implemented by taxing the burning of fossil fuels — coal, petroleum products such as petrol and aviation fuel, and natural gas — in proportion to their carbon content. The revenues generated by carbon taxes can in turn be used by governments to support low-carbon development strategies and activities. See also box 2 on the proposed local carbon tax in South Africa.

Also in case of the possibility of carbon tax offsetting within a national context may work similar to the aforementioned mechanisms with the carbon tax rate being an indication of the maximum price one would be willing to pay for a carbon tax offset.

**Box 2: Local Carbon Tax, South Africa**

As per the 2012 Budget Review (National Treasury-1/2, 2012), the proposed design for the local carbon tax will apply to carbon dioxide equivalent (CO\textsubscript{2}e) emissions, at an amount of 120 ZAR per tonne CO\textsubscript{2}e to be implemented in 2013/14 increasing at a rate of 10% annually until 2019/20. This first implementation phase, 2013 to 2019, would include a so called basic tax free threshold of 60% of the total greenhouse gas emissions. This means that the carbon tax will only be applied to 40% of the total volume of greenhouse gas emissions.

In addition to this basic threshold, it has been proposed to add a trade exposure allowance as well as a process emissions allowance where applicable. The trade allowance would mean a further reduction of the taxable volume of greenhouse gas emissions for those sectors involved in international trade and the process emissions allowance would mean a further reduction in taxes for those industries where production of carbon dioxide is unavoidable. The latter concerns production processes where, inherent to the chemical reaction that takes place, carbon dioxide is produced e.g. the manufacture of clinker for cement, gas/coal to liquid and the iron & steel industry also using coal as a reductant.

- **NAMAs** – one of the more advanced mechanisms, emerging from the international climate negotiations under the UNFCCC, which will be overseen and recognised by the UN through a registry. A NAMA describes voluntary activities for emissions mitigation in countries that are not subject to reduction commitments. The objective behind this mechanism is two-fold; developed countries promise technical and financial support for related programmes, whereas developing countries are requested to develop and implement mitigation actions, usually for a whole sector. ‘Supported’ or
‘credited NAMAs’ may allow for funding support or investment by developed countries or private entities, whereas ‘unilateral NAMAs’ would be independently funded and carried out (exclusively) by developing countries.

- **Sectoral trading or crediting** - Under sectoral approaches, developing countries may propose, on a voluntary basis, emissions thresholds for broad segments of the economy, set significantly below business-as-usual emissions. Units may be issued to developing countries in the event of emissions being reduced below the pre-established level, within a Sectoral Crediting Mechanism (SCM) scenario. Whereas sectoral emissions trading would allow for credits to be issued by the host country and traded in the international market, backed by a UNFCCC approved target. Box 3 describes the proposed carbon budget for heavy emitters in South Africa.

**Box 3: Carbon Budget, South Africa**

The carbon budgets division will look at the sectors that will be included in the carbon budget process and a baseline will be drawn up for each sector. In particular, carbon budgets will be considered for the major energy supply (electricity and liquid fuels) and use (mining, industry and transport) sectors. (SA Government, 2011)

The carbon budgets and the process thereof will not be a standalone process, other governmental policies and plans will also be aligned e.g. GHG inventory, development of monitoring and verification systems. The aim of the technical working group is to allocate carbon budgets by the end of October 2013 and also to provide details on the financial mechanisms that will aid those impacted by the policy as support in meeting the carbon budgets. (SA Government, 2011)

It is stated in the “National climate change response - white paper” (SA Government, 2011) that one of the key elements in the overall approach to mitigation is “using the market” which includes (but is not limited to) “…the possible use of emissions offset or emission reduction trading mechanisms for those relevant sectors, sub-sectors, companies or entities where a carbon budget approach has been selected.”

- **Bilateral mechanisms** – emerging new, bilateral mitigation mechanisms outside the UN system should be mentioned in this context. Most prominently, the Japanese government is developing a Bilateral Credit Offsetting Mechanism (BCOM) to allow for cost-effective mitigation options abroad, trying to avoid the complexities and technicalities of the CDM. Also, international offsets are being discussed as part of a potential federal US cap-and-trade scheme. Most recently, the EU and its member states announced the possibility of bilateral agreements for activities or projects not covered by, or carbon credits excluded from, the EU ETS.

- **Multilateral and bilateral funds and programs** - major multilateral funds and programs by the World Bank or the Global Environment Facility (GEF) amongst other provide funding to mitigation activities, mainly in the form of grants and (concessional) loans. The governments of Germany, the United Kingdom, France and Japan, for example, have also established major initiatives supporting mitigation activities worldwide.

- **Green Climate Fund** – at the 16th Conference of the Parties (COP) in Cancun in 2010, it was decided to establish a Green Climate Fund (GCF) with a view to its becoming the operational entity of the financial mechanism of the Convention. The GCF will

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7 The Green Climate Fund is described separately (see below) as it is the financial mechanism of the UNFCCC which is foreseen to become the main funding channel for climate change mitigation and adaptation activities significantly contributing to the US$ 100 billion annually by 2020, trying to leverage large amounts of private finance.
support projects, programmes, policies and other activities in developing country Parties using thematic funding windows. The aim is to simplify the increasingly complicated landscape of funding mechanisms and bilateral agreements that provide climate finance. However, the GCF will only help to disburse the $100 billion a year by 2020 funds, but it is not designed to raise them. The funding is supposed to come from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources.

- **Technology Mechanism** – a new Technology Mechanism was established at the CoP in Cancun which is expected to facilitate technology development and transfer to support climate change mitigation and adaptation action. The mechanism consists of two key components: a Technology Executive Committee (TEC) and a Climate Technology Centre and Network (CTCN). The actual financial relevance of the Technology Mechanism to finance projects is however uncertain as well as whether it will be linked to the actual finance mechanism, i.e. the Green Climate Fund.

### Relevance to the Test Injection Project

Financial support due to the mitigation impact of CCS is the most immediate opportunity with regards to starting to establish a financial structure for CCS projects that lack any other investment due to scale issues (i.e. not being an industrial demonstration project) and/or being in very early development stages. Once the technicalities for CCS projects under the CDM are clarified and therefore allow for the development of related methodologies and the actual registration of projects with the CDM Executive Board, this mechanism would be the most advanced or developed among the carbon finance or climate finance mechanisms thus far. CCS projects are unlikely to cater for the voluntary market due to their rather industrial nature, the scale of most projects and the related credit volumes generated. It is questionable though whether the size or rather amount of injected carbon will justify the development (costs) of a CDM project, if only considering the test injection.

A demonstration plant (Phase 2) and/or further emission reduction components through energy efficiency or generation measures may allow for the generation of larger credit volumes and related revenues, therefore potentially justifying the development of a CDM project. To what extent sectoral crediting and trading, (credited) NAMAs or bilateral mechanisms or rather related funding is dependent upon the amount of emission reductions generated needs to be further assessed⁸. Less dependent upon the amount of credits, or rather of emission reductions generated, will be (grant) funding provided by multi- and bilateral sources and the GCF or revenues from a carbon tax provided by the South African government. In addition, unilateral or conditional NAMAs, as opposed to credited NAMAs, next to a bilateral mechanism or agreement such as by Japan or the EU, are most relevant when considering climate finance or rather a fundraising framework for the Test Injection Project.

In case of offsetting a national carbon tax, the costs of establishing the offset will probably not be a show-stopper. The volume envisaged to be injected (10,000’s of tonnes of CO2 may contribute to 1,200,000’s of ZAR, taking the envisaged initial tax rate of 120 ZAR per tonne.

A carbon tax and related concessions may encourage (local) companies and industries to invest in a CCS R&D project, with direct support from the South African government via revenues from the carbon tax. Although according to the International Energy Agency (IEA) (2008) successful tax incentives have mainly been associated with developed economies, where the tax structures are in place for the application and monitoring of such complex and comprehensive programmes. Nevertheless, a carbon tax is envisaged to take effect in South Africa during 2013/2014 as per the Budget Review 2012 (National Treasury 2/2-2012).

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⁸ This assessment has been conducted as part of the further work under work package 4.
2.4.5 **Risk reduction and finance enhancement mechanisms - guarantees and insurance**

Guarantees and insurance are risk sharing mechanisms.

In the case of a defaulted loan the guarantee obliges the defaulting party to compensate the lender. Low fee guarantees can be offered by development banks or governments. If activities with a certain public value and a long-term perspective do face barriers due to elevated risk perceptions, guarantees are appropriate instruments. Risks for private investors are reduced by publicly supported guarantees whilst investment levels increase, delivering co-benefits for the public at the same time.

Private investors and project developers are keen to insure their investments against risks, i.e. managing or rather minimizing the risks of (financial) losses. Scaling up mitigation activities in developing countries and/or certain sectors may require public funding to compensate for the lack of insurance products offered by private insurers and help to remove this barrier. In addition to supporting the movement of private investors into these markets or sectors, it may also pave the way for private insurance products being offered in the future.

When a technology is expected to generate cash flow, private sector lenders are principally interested in offering loans. Market introduction is usually the moment when private lending comes in, but public guarantees are often required with a view to the remaining risks. In addition to reducing the risks of private investors, public guarantees can also address regulatory risks. A public guarantor getting involved in a project and its success often has direct access to and can influence governments with regards to making sure that the regulatory framework is or remains conducive to the relevant project(s).

Guarantees are generally only appropriate in financial markets where borrowing costs are at reasonable levels, and where a good number of CFIs are interested in the targeted market segment. Typically guarantees are partial, that is they cover a portion of the outstanding loan principal, with 50-80 percent being common. This ensures that the CFIs remain at risk for a certain portion of their portfolio to ensure prudent lending. Responsibility for taking remedial action in the event of a default remains with the CFIs. (UNEP 2008)

Carbon delivery guarantees, for example, address the risk of non-delivery of CERs to buyers from industrialised countries. Forward ERPAs or rather the underlying risks can therefore be addressed through this form of carbon finance. Lending organisations do interpret CER sales in a positive way and enhance the overall security in the context of loan requests.

Guarantees are usually applied in the context of dealing with credit risks of large-scale grid connected renewable energy and small-scale to medium energy efficiency and renewable projects, as well as in energy access markets. Leverage potential varies widely and is related to how guarantees are structured and the target market segment involved. (UNEP 2008)

**Relevance to the Test Injection Project**

Risk reduction or finance enhancement mechanisms are not applicable to situations like the test injection, as they only apply in commercial settings and not pure R&D undertakings. Loan guarantees and similar instruments are more likely to play a role and support or rather encourage investment decisions of companies when taking pilot technologies to commercial scale, i.e. demonstration to commercialisation. The IEA (2008) points out that their application is normally associated with the existence of financial structures for applying and monitoring such complex and comprehensive programmes, i.e. mainly found or applied in developed economies.
3 Funding channels and intermediaries relevant to a carbon capture and storage test injection in South Africa

After the overview of funding sources and finance mechanisms potentially relevant to CCS in general, and in particular with regards to the Test Injection Project in South Africa, the following chapter looks into concrete funding sources and channels that use or provide the above identified finance mechanisms. In a few cases, CCS is directly mentioned as an area eligible for funding; in most cases such a direct reference is not made but rather broader categories are provided for.

First, the selection criteria and methodology are explained followed by an overview of funding sources or channels and intermediaries. Public and private organisations are distinguished as well as funds and governmental organisations. The financial instruments or mechanisms, thematic and/or geographical coverage, and key funding criteria and/or size are described to the extent possible, and where such information is available. Although the below lists are by no means exhaustive, they provide an indication of the types of funding in existence and their specific characteristics, including whether or not they provide any support for CCS projects.

Section 3.2 provides an overview of the multilateral funds and programs, section 3.3 looks at bilateral funding channels, and a list of private sector companies involved in CCS project development is presented in section 3.4. Figure 4 presents and summarises the sources from which funding for climate change projects – climate-specific or related - originates, including CCS projects.

Fig. 3: Funding sources and intermediaries for finance available to climate change mitigation and adaptation initiatives (Source: Atteridge et al. 2009)

3.1 KEY SELECTION CRITERIA AND RESEARCH METHODOLOGY
At the current and early planning and design stage of the test injection, a high-level overview is aimed at, with a view to gaining first insights into where funding could come from. A two-level analysis has been applied:
Level 1

- Identification of countries, intermediaries and corporates already involved in and supportive of CCS
- Analysis and selection of those funding opportunities where thematic and/or geographical coverage includes CCS and/or South Africa or rather does not exclude either of them
- National grants/funds potentially relevant for the funding of the Test Injection Project were extracted from the draft Test Injection Scoping Study report

Level 2

- Focus on the pre-identified finance instruments in chapter 2 (i.e. grants, climate finance mechanisms, and limited private sector contributions)
- Local or international companies with operations or other business relationships with South Africa that may be interested in being early movers by addressing (future) regulatory pressure and technology providers

Certain opportunities are not included in the analysis because they do not apply to the current or rather known project design, i.e. the Test Injection Project, according to the above analysis in chapter 2, or they would require much more preparatory work and analysis as compared to approaching and using the identified sources and mechanisms. For example, the possibility of a sovereign loan to the South African government with regards to further development and implementation of CCS related activities, or research funding from overseas.

Research funding provided by donor governments – excluding EU funding here as this already covered and used for the implementation of the SAfECCS project - usually require partner organisations in the relevant country to be able to apply for funding (see also chapter 5). However, the likelihood of funding and applying for CCS earmarked funding is certainly higher in those countries which already invest and participate in CCS projects (see below).

The countries or governments that have been analysed with regards to their bilateral funds and programs or relevant ministries and agencies are: Australia; Canada; France; Germany; Japan; Norway; United Arab Emirates; United States and United Kingdom. These countries have all pledged or committed significant funding for climate initiatives via different multi- and bilateral channels, partly covering or specifically targeting CCS. They also currently have bilateral relations with South Africa. The companies analysed are outspoken supporters of CCS for various reasons – mostly because CCS is relevant to their businesses as an emission reduction option, or they provide relevant technologies – and are members of the leading international CCS associations and lobby groups, and/or have otherwise made their support publicly known, and/or are involved in pilot projects – having the financial means to support or rather invest in CCS projects.

Local companies that could be potential funders for the Test Injection Project were identified from the private sector. The criteria for selection were based on:

- Johannesburg Stock Exchange (JSE) listed companies participating in the Carbon Disclosure Project in 2011, thereby indicating a commitment towards climate change mitigation. The companies selected are the largest emitters of Scope 1 emissions with annual emissions above 0.5 Million tonnes of CO₂. Scope 1 emissions are direct onsite emissions and exclude indirect emissions related to, for example, the use of electricity from the grid.
- Membership of and sponsorship to SACC CCS, the South African Centre for CCS.
- Publicly stated interest and/or (potential) involvement in CCS in South Africa and/or beyond, e.g. as end-user, equipment vendor or supplier of consumables.
### 3.2 MULTILATERAL FUNDS AND PROGRAMS

<table>
<thead>
<tr>
<th>Fund and website</th>
<th>Management</th>
<th>Instruments/ Mechanisms</th>
<th>CCS projects/ South Africa included</th>
<th>Criteria / support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clean Technology Fund <a href="http://www.climateinvestmentfunds.org/cif/node/2">http://www.climateinvestmentfunds.org/cif/node/2</a></td>
<td>International Bank for Reconstruction and Development (IBRD)</td>
<td>Concessional finance - grants, concessional loans, risk mitigation instruments, such as guarantees and equity</td>
<td>- CCS mentioned but not prioritised South Africa included</td>
<td>- Potential CCS support in the context of scaling up energy efficiency investments (pure test injection rather unlikely) - Investment plan has been designed for South Africa - African Development Bank (AfDB) needs to be involved - $500 million co-financing up to 2015</td>
</tr>
<tr>
<td>Carbon Partnership Facility, CPF (i.e. Carbon Asset Development Fund, CADF, and Carbon Fund, CF) <a href="http://cpf.wbcarbonfinance.org/cpf/">http://cpf.wbcarbonfinance.org/cpf/</a></td>
<td>World Bank Carbon Finance Unit</td>
<td>Grants and ERPAs</td>
<td>- Global coverage - CCS included</td>
<td>- Government involvement required but other entities not per se excluded - CADF provides grant funding for project/program development and implementation - CF purchases emission reductions - €140 million committed to CPF with an additional €11 million to CADF</td>
</tr>
<tr>
<td>CCS Trust Fund</td>
<td>World Bank Carbon Finance Unit</td>
<td>Grants</td>
<td>- Dedicated to CCS - South Africa included</td>
<td>- In-country consultations and dialogue with counterparts determine funding for activities - Capacity building and knowledge sharing assistance plus carbon asset creation services - Capitalization of €11 million</td>
</tr>
</tbody>
</table>

9 If known the lifetime of the initiative is mentioned.
<table>
<thead>
<tr>
<th>Fund and website</th>
<th>Management</th>
<th>Instruments/ Mechanisms</th>
<th>CCS projects/ South Africa included</th>
<th>Criteria provided / size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Partnership for Market Readiness (PMR)</td>
<td>World Bank Carbon Finance Unit</td>
<td>Grants</td>
<td>- New or untapped mitigation efforts and (new) market mechanisms - South Africa observer and prepares EoI</td>
<td>- EoI by government, grant agreements with a delivery partner to prepare and implement market readiness elements - Funding and technical assistance for piloting of market-based instruments - PMR preparation phase provides funds for studies and analytical work, consultations, ToR preparation, organising management arrangements for PMR operation, training and workshops - $100 million target fund size with $50 Mio pledged to date</td>
</tr>
<tr>
<td>Post-2012 Carbon Fund</td>
<td>Conning Asset Management Limited and First Climate</td>
<td>ERPAs</td>
<td>- Global coverage - CCS included</td>
<td>- Detailed criteria not known but should be similar to existing carbon funds - Purchase of Kyoto-compliant carbon credits generated after 2012, potentially up to 2020 - Forward agreements with project owners for purchasing CERs - Capitalised with €125 million</td>
</tr>
<tr>
<td>Climate Change Technical Assistance Facility (CCTAF)</td>
<td>EIB</td>
<td>Conditional grants or loans</td>
<td>- Global coverage - CCS included</td>
<td>- Submission of detailed description of capital investment together with prospective financing arrangements - Adherence to EIB lending objectives and well-developed business plan - Advance funding for activities associated with the development of CDM projects - Total funding of €5 million</td>
</tr>
<tr>
<td>Fund and website</td>
<td>Management</td>
<td>Instruments/ Mechanisms</td>
<td>CCS projects/ South Africa included</td>
<td>Criteria provided / size support</td>
</tr>
<tr>
<td>------------------------------------------</td>
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<td>-------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Special Climate Change Fund (SCCF)</td>
<td>GEF/World Bank</td>
<td>Grants</td>
<td>- Global coverage</td>
<td>Requires project concept and assistance from GEF implementing agency</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Technology transfer (for mitigation projects)</td>
<td>National GEF Focal Point needs to endorse project</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Full-sized projects (FSP) – over $1 million vs. medium-sized projects (MSP) - $1 million or below</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SSCF resources: $200 million with a funding window of $50 million for Strategic Program on Technology Transfer</td>
</tr>
<tr>
<td>NEFCO Carbon Fund (NeCF)</td>
<td>Nordic Environment Finance Corporation</td>
<td>ERPAs</td>
<td>- Africa included</td>
<td>Detailed criteria not known but should be similar to existing carbon funds</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Carbon finance for renewable energy, energy efficiency, fuel switching and other investments</td>
<td>Purchase of Kyoto-compliant carbon credits generated after 2012 up to maximum of first crediting period of a project (7 or 10 years)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>NeCF provides coverage of carbon related project preparation costs</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Capitalisation of €165 million</td>
</tr>
<tr>
<td>Green Climate Fund (GCF)</td>
<td>UNFCCC body (to be established)/World Bank (interim trustee)</td>
<td>Grants and non-grant instruments such as concessional loans and guarantees</td>
<td>- Global coverage</td>
<td>Details not known currently being developed but should be similar to other existing funds relevant to climate change</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Limitation and reductions in GHG emissions</td>
<td>Streamlined and fast-track access envisaged</td>
</tr>
<tr>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fund and website</td>
<td>Management</td>
<td>Instruments/ Mechanisms</td>
<td>CCS projects/ South Africa included</td>
<td>Criteria / provided / size / support</td>
</tr>
<tr>
<td>-----------------</td>
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<td>-------------------------------------</td>
</tr>
</tbody>
</table>
| COMESA Climate Initiative/Carbon Fund<sup>10</sup>  
http://programmes.comesa.int/index.php?option=com_content&view=article&id=31&Itemid=40  
[COMESA](http://programmes.comesa.int/index.php?option=com_content&view=article&id=31&Itemid=40) | Common Market for Easter and Southern Africa (COMESA) | ERPAs, debt, equity, co-financing | SADC region Energy efficiency, renewables, general GHG abatement | Detailed criteria not known at this stage  
Up to 50% of projected CER issued determined on a project-by-project basis  
Target size $500 Mio |
| African Carbon Support Program (ACSP)  
CDM project development and implementatio n support | Assistance with the development, implementation and commercialisation of CDM projects  
Supported by a $1 Mio grant from the Fund for African Private Sector Assistance (FAPA) and integrated with the Enhanced Private Sector Assistance Initiative (EPSA), a US$1 billion joint initiative of Japan and the AfDB to promote private sector development |

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<sup>10</sup> COMESA has not been able to fully operationalize its Climate Initiative but has and is benefiting from donor funding such as from Norway. Climatekos has been involved in the early stages of the development of the initiative and is engaging with COMESA again together with multilateral organisations to revive COMESA’s program. Certain changes and amendments to the initiative may allow for projects like the Test Injection Project to benefit from related funding.
<table>
<thead>
<tr>
<th>Fund and website</th>
<th>Management</th>
<th>Instruments/ Mechanisms</th>
<th>CCS projects/South Africa included</th>
<th>Criteria provided / support</th>
</tr>
</thead>
<tbody>
<tr>
<td>Public-Private Infrastructure Advisory Facility (PPIAF)</td>
<td>World Bank</td>
<td>Grants and technical assistance</td>
<td>South Africa included</td>
<td>- Supports governments and public entities by creating enabling environment for PPP projects, early stage project conceptualization, and pre-feasibility project development</td>
</tr>
<tr>
<td><a href="http://www.ppiaf.org">http://www.ppiaf.org</a></td>
<td></td>
<td></td>
<td>- Mitigation projects in the context of energy generation, amongst others</td>
<td>- Assistance with planning and prioritizing climate-friendly projects, designing legal and regulatory environments</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>-</td>
<td>- Assistance finding and justifying subsidy funding to pay for costs or mitigate risks that make private participation non-viable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Sub-National Technical Assistance (SNTA) in cases where PPP are impractical or inappropriate to support access to financing from banks or bond markets without relying on sovereign guarantees, obtain a credit rating or improved rating from a recognized credit rating agency, taking measures to enhance their creditworthiness, assisting sub-national entities access market-based financing</td>
<td></td>
</tr>
<tr>
<td>Fund and website</td>
<td>Management</td>
<td>Instruments/ Mechanisms</td>
<td>CCS projects/South Africa included</td>
<td>Criteria / support provided / size</td>
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<td>----------------------------------</td>
</tr>
</tbody>
</table>
| Global Environment Facility (GEF) | GEF/World Bank | Grants and concessional finance | - Global coverage  
- GEF 5 supports projects in reducing or avoiding GHG emissions in renewable energy and efficiency, technology transfer and enabling activities | - Promotes the demonstration, deployment, and transfer of innovative, low-carbon technologies, as well as investments in renewable energy technologies  
- Relies heavily on government involvement and support  
- GEF provides grants to various types of projects ranging from several thousand dollars to several million dollars; these are Full-Sized projects, Medium-Sized Projects, Programmatic Approaches and Enabling Activities  
- Total pledged amount under GEF 5 (2010-2014): USD 3.54 billion with about USD 1.14 billion for climate change |

11 CCS is not directly mentioned in the relevant GEF documents, the GEF however discussed potential support to CCS projects in 2007. In fact, the GEF already supported a CCS project in a developing country (i.e. Brazil) under GEF 4 (2006-2010). The project was cancelled at some point though. An energy component may need to be added and the rather limited funding per project may only allow for further preparatory work, enabling activities or may be seen as co-finance as part of a larger finance package. To what extent GEF 5 and the SCCF can be distinguished from each other is unclear.
### 3.3 BILATERAL SOURCES AND PROGRAMS

<table>
<thead>
<tr>
<th>Organisation/program and website</th>
<th>Administering organisation</th>
<th>Instruments / mechanisms</th>
<th>CCS projects / South Africa included</th>
<th>Criteria /support provided / size</th>
</tr>
</thead>
</table>
| International Climate Initiative (ICI)  
- Energy efficiency and renewable energy/sustainable energy systems  
- South Africa is focus country | - Supports investment projects and activities in the fields of technology transfer, policy advice, research cooperation, capacity development and training and elaboration of studies and strategies  
- No real restrictions on project organizations and partners known  
- Projects should demonstrate mitigation effect, be anchored in partner countries’ national strategies, be innovative and have an impact beyond the individual project itself, as well as be transferable, build on the strengths of German climate policy and have synergies with the conservation of other global environmental goods.  
- Total funding volume: €1.2 billion; €120 million per year |
| French Global Environment Facility (FGEF)  
http://www.ffem.fr/site/ffem/ | FGEF | Grants | - Supply-side management, e.g. energy efficiency in production and transport, and demand-side management of fossil fuels with regards to habitat, industry or transport  
- South Africa included | - Co-funding required  
- French government needs to be involved in the preparation and monitoring of projects  
- Innovative nature of projects important  
- No real restrictions on project organizations and partners  
- AFD often involved in managing implementation  
- Supplies of equipment and services, capacity building, training and measurements of results and impacts are financed  
- Budget 2011-2014: €95 million |
<table>
<thead>
<tr>
<th>Organisation/program and website</th>
<th>Administering organisation</th>
<th>Instruments / mechanisms</th>
<th>CCS projects / South Africa included</th>
<th>Criteria /support provided / size</th>
</tr>
</thead>
<tbody>
<tr>
<td>International Climate Fund (ICF)</td>
<td>Department for International Development (DFID), the Department for Environment and Climate Change (DECC) and the UK Economics and Finance Ministry</td>
<td>Grants and concessional loans</td>
<td>- Low carbon future that reduces poverty, focusing on low carbon growth, low carbon energy, energy efficiency, clean technology innovation and finance - Ensuring private finance contributions - South Africa included</td>
<td>- Details not known as the ICF is not yet fully operational but likely that conventional bilateral funding procedures of the UK will apply - Involving the South African government when approaching the UK government probably preferable - Pledges: £2.9 billion from 2011-2015</td>
</tr>
<tr>
<td>Hatoyama Initiative</td>
<td>Japanese Ministry of Finance (MoF)</td>
<td>Grants, loans and equity finance</td>
<td>- Mitigation efforts in the form of energy savings, increased energy efficiency technologies, and new, clean energy - South Africa included</td>
<td>- Financial and technical assistance, based on the needs of the requesting countries, will be given on a concessional basis – mostly through loans and equity financing - Country involvement will occur via bilateral channels - Involving the South African government required - Pledges: $15 billion over 5 years (2008-12)</td>
</tr>
</tbody>
</table>


### 3.4 GOVERNMENTS

<table>
<thead>
<tr>
<th>Country</th>
<th>Government departments and agencies</th>
</tr>
</thead>
<tbody>
<tr>
<td>United Kingdom</td>
<td>Department of Energy and Climate Change (DECC), Department for International Development (DFID)</td>
</tr>
<tr>
<td>France</td>
<td>Ministry of the Environment, Sustainable Development, Transport and Housing; Ministry of Foreign and European Affairs, Ministry of Economy, Finance and Industry, Ministry for Higher Education and Research; AFD, French Environment Agency (ADEME)</td>
</tr>
<tr>
<td>Germany</td>
<td>BMU, BMZ, KfW, German International Cooperation (GIZ), German Investment and Development Company (DEG)</td>
</tr>
<tr>
<td>Japan</td>
<td>Ministry of Economy, Trade and Industry (METI), Ministry of the Environment (MoE), New Energy and Industrial Development Organisation (NEDO), Ministry of Education, Culture, Sports, Science and Technology (MEXT), Cabinet Office of the Prime Minister, Japan Bank for International Cooperation (JBIC), Japan International Cooperation Agency (JICA)</td>
</tr>
<tr>
<td>Norway</td>
<td>Ministry of the Environment and International Development, Ministry of Petroleum and Energy, Norwegian Agency for Development Cooperation (NORAD)</td>
</tr>
<tr>
<td>Australia</td>
<td>Department of Climate Change and Energy Efficiency; Department of Resources, Energy and Tourism; Department of Innovation, Industry, Science and Research; Australian Government’s Overseas Aid Program (AusAID),</td>
</tr>
<tr>
<td>United States</td>
<td>Department of State, Department of Energy, Department of the Treasury, Department of Agriculture, United States Agency for International Development (USAID), Environmental Protection Agency (EPA)</td>
</tr>
<tr>
<td>United Arab Emirates</td>
<td>Ministry of Foreign Affairs, UAE Office for the Coordination of Foreign Aid, Abu Dhabi Development Fund</td>
</tr>
<tr>
<td>Canada</td>
<td>Natural Resources Canada, Canadian International Development Agency (CIDA)</td>
</tr>
</tbody>
</table>
### 3.5 NATIONAL GRANTS/FUNDS

<table>
<thead>
<tr>
<th>Fund/Programme and website</th>
<th>Management</th>
<th>Instruments and Mechanisms</th>
<th>Criteria / Support provided</th>
</tr>
</thead>
<tbody>
<tr>
<td>The Grow-E Fund <a href="http://www.idc.co.za">www.idc.co.za</a></td>
<td>International Development Corporation</td>
<td>Loans to start-up businesses with a strong focus on economic growth and industrial development.</td>
<td>Clear business case with concrete strategy to scale-up CCS activities providing substantial job creation.</td>
</tr>
<tr>
<td>The Industry Matching Fund <a href="http://www.tia.org.za">www.tia.org.za</a></td>
<td>Technology Innovation Agency</td>
<td>Co-funding</td>
<td>- Investment in technology innovation at the end of development phase and start of commercialisation phase. - Should be approached by companies interested in providing commercial services and products to CCS projects following the Test Injection Project.</td>
</tr>
<tr>
<td>The Technology Development Fund <a href="http://www.tia.org.za">www.tia.org.za</a></td>
<td>Technology Innovation Agency</td>
<td>Co-funding</td>
<td>Higher Education institutes and Scientific councils participating in the test injection project may request funding if innovation with commercial relevance is part of the scope of the CCS project.</td>
</tr>
<tr>
<td>Technology and Human Resources for Industry Programme <a href="http://www.nrf.ac.za">www.nrf.ac.za</a></td>
<td>National Research Foundation</td>
<td>Joint investment in research projects</td>
<td>Could be used to fund research in support of the Test Injection Project however Higher Education Institutes and Scientific councils need be involved.</td>
</tr>
<tr>
<td>Support Programme for Industrial Innovation <a href="http://www.idc.co.za">www.idc.co.za</a></td>
<td>International Development Corporation</td>
<td>Grant co-funding</td>
<td>South African companies could obtain funds to develop local technologies that can be delivered to CCS projects e.g. drilling companies</td>
</tr>
</tbody>
</table>
### 3.6 PRIVATE SECTOR

#### 3.6.1 International corporations

<table>
<thead>
<tr>
<th>Company</th>
<th>CCS engagement</th>
<th>Connection to South Africa / international outreach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masdar Carbon/Capital</td>
<td>Develops CCS projects with the aim of mitigating CO₂, including the potential use of mechanisms like the CDM</td>
<td>South Africa one of the focus countries in Africa</td>
</tr>
<tr>
<td>E.ON Masdar Integrated Carbon (EMIC) – joint venture between E.ON and Masdar</td>
<td>Develops CCS projects with the aim of mitigating CO₂, including the potential use of mechanisms like the CDM</td>
<td>See above</td>
</tr>
<tr>
<td>Japan CCS Co.Ltd. (JCCS)¹²</td>
<td>Dedicated to integrated CCS technology solutions by fine-tuning, optimizing, and improving the efficiency of CCS constituent technologies and integrated CCS systems</td>
<td>- Cooperates with foreign organisations for CCS deployment overseas &lt;br/&gt; - Collects and exchanges the latest information on CCS with overseas research organizations</td>
</tr>
<tr>
<td>Mitsubishi Heavy Industries (MHI)</td>
<td>Technology provider already involved in CCS pilot projects</td>
<td>- Operates globally, including (planned) CCT exports in the future &lt;br/&gt; - Office in South Africa</td>
</tr>
<tr>
<td>Korean Electric Power Corporation (KEPCO)</td>
<td>CCS one of the key technologies pursued with regards to low-carbon development</td>
<td>- Intends to expand and go overseas financing and exporting technology and operating and maintaining projects &lt;br/&gt; - South Africa one of the target countries for technology export</td>
</tr>
<tr>
<td>J-Power</td>
<td>- Japan's largest coal consumer promotes CCS technology with a view to decarbonising coal stations &lt;br/&gt; - CCS key technology in the context of CO₂-free power sources, also combined with integrated gasification combined cycle (IGCC)</td>
<td>- Engaged in overseas power generation business, incl. capital injection and provision of technology, implementation design and construction supervision &lt;br/&gt; - Plans to boost purchases of coal supplies from South Africa via a new annual contract</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Company</th>
<th>CCS engagement</th>
<th>Connection to South Africa / international outreach</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitsui</td>
<td>General trading company where CCS plays a role as mitigation strategy, in the context of trading carbon as well as with a view to reducing emissions from supplying coal</td>
<td>Business relations with and an office in South Africa</td>
</tr>
<tr>
<td>Marubeni</td>
<td>- Globally operating company with activities in various sectors and fields, incl. power projects and infrastructure and finance, - Conducts business investment, development and management on a global level - Already involved in CCS mitigation project overseas as part of Japan’s bilateral offset credit mechanism initiative</td>
<td>Represented in South Africa</td>
</tr>
<tr>
<td>Toshiba</td>
<td>- Technology provider with specialised unit to prepare practical application and commercialisation of its technology - Aims towards business able to meet emerging needs for commercial scale CCS systems - Engaged in CCS development projects overseas</td>
<td>Office in South Africa</td>
</tr>
<tr>
<td>BP</td>
<td>- International oil and gas company which looks at reducing emissions from hydrocarbons by undertaking large-scale CCS projects - Develops new technology and builds capacity in the emerging industry</td>
<td>Present in South Africa</td>
</tr>
<tr>
<td>Statoil</td>
<td>- International company in the oil &amp; gas energy generation, power and emissions trading business - Develops CCS technology applications for CO₂ reductions</td>
<td>- Ambition to develop, own and operate profitable CCS projects worldwide, focusing on being a storage provider - Involved in a shale gas exploration study with SASOL in the Karoo Basin in South Africa</td>
</tr>
<tr>
<td>Company</td>
<td>CCS engagement</td>
<td>Connection to South Africa / international outreach</td>
</tr>
<tr>
<td>-------------------------</td>
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</tr>
</tbody>
</table>
| Vattenfall Carbon Fund  | - Energy provider with an energy mix including oil, gas, coal and biomass amongst other  
- CCS being one of the six R&D focus areas for reducing Vattenfall’s carbon dioxide emissions                                                                                                   | Global purchase of CDM/JI credits                                                                                                           |
| E.ON                    | - Power and gas company that seeks to reduce emissions whilst pursuing technological advances in power generation  
- Involved in CCS and CCT projects, including R&D                                                                                       | E.ON Climate & Renewables originates, buys and sells carbon credits globally                                                                   |
| GDF Suez                | - Pursues a number of CCS initiatives with a view to controlling CO₂ emissions from industrial facilities, and particularly power stations  
- Seeks to underwrite its investments in new capacity powered by fossil fuels and build thermal power stations equipped with CCS systems and provide solutions for the transportation and storage of these emissions  
- Develops a portfolio of research and pilot projects                                                                                      | Interested in pursuing opportunities in the power generation business in South Africa                                                         |
| RWE                    | - Electricity and gas company that aims to reduce CO₂ emissions  
- Avoidance of CO₂ by further technological development of fossil-based power stations  
- Promotes the developments required to implement the climate-friendly coal-fired power plant, incl. CCS and CCTs                                                                 | RWE Supply&Trading sources carbon credits worldwide                                                                                         |
| Aker Clean Carbon       | - Carbon capture technology developer and provider  
- Aker, the parent company, is an industrial investment company whose main interests lie in energy, amongst other areas                                                                                     | - Aware of SACCCS and the CCS activities in South Africa  
- Believes there is funding potential and a market for CO₂ capture in South Africa                                                             |
| Rio Tinto               | - International mining group that recognises its responsibility to reduce emissions  
- Invests in developing and commercialising CCS technology                                                                                       | Office in South Africa                                                                                                                      |
<table>
<thead>
<tr>
<th>Company</th>
<th>CCS engagement</th>
<th>Connection to South Africa / international outreach</th>
</tr>
</thead>
</table>
| Fluor                                       | - Technology and engineering, procurement and construction services provider that works in the energy and chemicals, mining and metals, oil, gas, and power sectors  
- Provides services related technologies in the field of CO₂ capture | Manages operations for Sasol in South Africa                                                                 |
| POSCO/POSCO Research Institute              | Global steel producer that works on low-carbon or green steel production processes and can be combined with CCS as part of its low-carbon and green growth strategy | Owns operations in South Africa with ferrochrome producer Poschrome wholly owned by POSCO |
| Sargas                                      | CCS technology provider                                                       | Looks for commercial carbon capture opportunities, including in the Middle East and Africa, in partnership with Daewoo Shipbuilding & Marine Engineering Co., Ltd. and SNC-Lavalin Constructors Inc. |
| SNC Lavalin Inc.                            | Engineering, procurement, construction and related technical services organisation | - Engaged in CCS projects in North America, North Africa and Asia  
- Office in South Africa                      |                                                                                                               |
| Taiwan Power Company                        | - Major corporate providing power development, power supply, investment in power-related businesses, energy technology services, amongst other things  
- Engaged in CCS pilots being Taiwan’s largest GHG emitter and as part of its contributions to reduce the country’s emissions | Long-term cooperation with South African power generator Eskom, including exchanging views and experiences related to CCS |
| Hitachi                                     | Global technology provider and CCS technology developer that is involved in several trails worldwide | - Office in South Africa  
- Hopes to expand the range of products in the South African market with a view to more efficient use of energy |
| General Electrics Energy / Oil and Gas      | - Supplier of power generation and energy delivery technologies  
- CCS technology provider                   | - Presence in South Africa  
- Invested in major infrastructure projects and focuses nowadays on growth in the energy industries, amongst others |
<table>
<thead>
<tr>
<th>Company</th>
<th>CCS engagement</th>
<th>Connection to South Africa / international outreach</th>
</tr>
</thead>
</table>
| Air Products     | - Serves customers across a wide range of industries, including energy and transportation  
|                  | - Supplies atmospheric gases, process and specialty gases, performance materials, equipment and services  
|                  | - Developer of technologies for capturing CO\(_2\) from fossil fuel conversion  
|                  | - Currently working on several CCS projects around the world                    | South African branch supplies and distributes a wide variety of industrial and specialty gas products and chemicals to the Southern African region |
| Siemens          | - Leading energy technology provider  
|                  | - Provides products along the entire process chain from power generation to flue-gas cleaning and CO\(_2\) capture and finally CO\(_2\) compression for CO\(_2\) transportation and storage, and integrated solutions for power production | Presence in South Africa |
| Tata Steel       | Global steel company that is involved in ultra-low steel CO\(_2\) steelmaking pilot activities which could be combined with CCS to further reduce emissions as part of its emission reduction efforts | Tata Steel has a subsidiary in South Africa |
## 3.6.2 National companies

<table>
<thead>
<tr>
<th>No.</th>
<th>Organisation</th>
<th>Sub-sector</th>
<th>SACC CS</th>
<th>Scope 1 emissions tonne/a CO(_2)e(^\text{14})</th>
<th>Publicly stated interest and/or (potential) involvement in CCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>African Oxygen</td>
<td>Industrial Gases</td>
<td></td>
<td>583,000(^{[1]})</td>
<td>Potential CO(_2) supplier</td>
</tr>
<tr>
<td>2</td>
<td>African Rainbow Minerals</td>
<td>Metals &amp; Mining</td>
<td></td>
<td>896,529(^{[1]})</td>
<td>Not identified</td>
</tr>
<tr>
<td>3</td>
<td>Alstom Power</td>
<td>Construction Materials</td>
<td>X</td>
<td>9,809,076(^{[1]})</td>
<td>Involved in international CCS projects (Anglo American, 2012)</td>
</tr>
<tr>
<td>4</td>
<td>Anglo American</td>
<td>Metals &amp; Mining</td>
<td>X</td>
<td>457,336(^{[1]})</td>
<td>Not identified</td>
</tr>
<tr>
<td>5</td>
<td>Anglo American Platinum</td>
<td>Precious Metals &amp; Minerals</td>
<td></td>
<td>1,215,000(^{[1]})</td>
<td>Involvement in international CCS projects (ZERO, 2012)</td>
</tr>
<tr>
<td>6</td>
<td>AngloGold Ashanti</td>
<td>Gold</td>
<td></td>
<td>230,000,000(^{[2]})</td>
<td>Eskom prepared to invest in CCS if business case is strong (Naidoo, B., Engineering News, 2011)</td>
</tr>
<tr>
<td>7</td>
<td>Arcelor Mittal SA</td>
<td>Steel</td>
<td></td>
<td>19,591,969(^{[1]})</td>
<td>Partner in CO2CRC. Involved in technology development areas as coal gasification, oxy-fuel, and CCS (CO2CRC, 2011)</td>
</tr>
<tr>
<td>8</td>
<td>BHP Billiton</td>
<td>Metals &amp; Mining</td>
<td></td>
<td>19,591,969(^{[1]})</td>
<td>Energy &amp; Climate Change, active role in establishing SACCS (Exxaro, 2010)</td>
</tr>
<tr>
<td>9</td>
<td>Eskom</td>
<td>Energy</td>
<td>X</td>
<td>2,799,579(^{[1]})</td>
<td>Not identified</td>
</tr>
<tr>
<td>10</td>
<td>Evraz Highveld Steel &amp; Vanadium</td>
<td>Steel</td>
<td></td>
<td>1,377,194(^{[1]})</td>
<td>Not identified</td>
</tr>
<tr>
<td>11</td>
<td>Exxaro</td>
<td>Metals &amp; Mining</td>
<td>X</td>
<td>2,103,211(^{[1]})</td>
<td>Not identified</td>
</tr>
</tbody>
</table>

---

\(^{13}\) Except for SAB Miller which falls under the sector ‘Consumer Staples’, all companies listed in Table 2 above belong to the sector ‘Energy & Materials’ as defined by the Carbon Disclosure Project (CDP). Therefore, only the subsectors are indicated. CDP Scope 1 emissions are direct emissions from onsite activities and thus this figure would give a good indication of those that would be affected by carbon taxes. The Scope 1 emissions are separate from CO\(_2\) inclusive of methane and other GHG’s. Therefore, not all companies listed and related emissions have a direct importance to CCS as part of it may relate to other GHG’s. An example of the latter is methane emissions from mining operations like in case of Gold Fields. Nevertheless, the list of Scope 1 emissions is a good starting point for further investigations into any interest shown in CCS as it concerns parties that will be in need of mitigation options whether by direct involvement or by potentially offsetting emissions.

\(^{14}\) The list of companies compiled on the basis of largest Scope 1 CDP2011 emitters and private SACCCS members/sponsors were researched for public statements on the internet in the form of, amongst others, environmental policies, annual reports, news articles and press releases. The results are presented in the column “Publicly stated interest and/or (potential) involvement in CCS”, Added to the list were Air Liquide and African Oxygen (Afrox) as they could be involved in a Test Injection Project as suppliers of carbon dioxide.
<table>
<thead>
<tr>
<th>No.</th>
<th>Organisation</th>
<th>Sub-sector</th>
<th>SACCS</th>
<th>Scope 1 emissions tonne/a CO₂e</th>
<th>Publicly stated interest and/or (potential) involvement in CCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>Mondi Group</td>
<td>Paper Products</td>
<td></td>
<td>4,450,294 [1]</td>
<td>Not identified</td>
</tr>
<tr>
<td>16</td>
<td>PetroSA</td>
<td>Energy</td>
<td>X</td>
<td></td>
<td>Directs/supports R&amp;D in areas of specific interest, including CCS (Marokane, D., 2009)</td>
</tr>
<tr>
<td>18</td>
<td>SABMiller</td>
<td>Brewers</td>
<td></td>
<td>1,144,901 [1]</td>
<td>Will monitor developments in clean coal and CCS carefully to understand whether they offer any benefits to operations. (SABMiller, 2009)</td>
</tr>
<tr>
<td>19</td>
<td>Sappi</td>
<td>Paper Products</td>
<td></td>
<td>4,648,669 [1]</td>
<td>Not identified</td>
</tr>
<tr>
<td>20</td>
<td>SASOL</td>
<td>Energy</td>
<td>X</td>
<td>64,166,000 [1]</td>
<td>CCS essential part of mitigation solutions portfolio; partner of TCM [3] (Sasol, 2009)</td>
</tr>
<tr>
<td>21</td>
<td>Total Coal SA</td>
<td>Mining</td>
<td>X</td>
<td></td>
<td>Not identified</td>
</tr>
<tr>
<td>22</td>
<td>Xstrata Coal</td>
<td>Mining</td>
<td>X</td>
<td></td>
<td>Foundation member GCCSI. Invests around 250 Million AUD to reduce GHG footprint and supports R&amp;D/demo low emission tech. (Xstrata, 2009)</td>
</tr>
<tr>
<td>23</td>
<td>Air Liquide</td>
<td>Industrial Gases</td>
<td></td>
<td></td>
<td>Potential CO₂ supplier</td>
</tr>
</tbody>
</table>


### 3.7 FURTHER FINANCING OPPORTUNITIES

There are other financing opportunities that are not that relevant at the current stage of the Test Injection Project, but may be looked into at a later stage, and once the overall project design has been further developed. The financial products of most banks, development banks or other financial institutions are not relevant to the Test Injection Project. The same applies to certain large funds and facilities that support energy projects with an energy production and commercial angle. Finally, some foundations could be approached early as interesting partners - although they will not provide direct funding at a large scale - in order to leverage more public or private funding and to support the further development of the concept. Some opportunities are currently just out of reach for Test Injection Project. See also chapter 4.

Banks such as the EIB, the IFC, Caisse de Depots, CDC Group, Overseas Private Investment Corporation, Nordic Investment Bank or the Dutch Entrepreneurial Development Bank FMO – excluding specialised funds, facilities or other instruments managed by some of them and that may provide funding for CCS activities or rather the Test Injection Project (see above) – that invest in mitigation activities at large scale through their conventional financial instruments will not be interested in the Test Injection Project. Their typical equity (e.g. venture capital and growth funds, mezzanine funds supporting small and medium-sized project developers and enterprises (SME), investment activities covering technology transfer and business incubators...
and debt products such as direct loans, loan guarantees and soft loans are only applicable to commercial undertakings.

Certain funds with a focus on Africa will only be of interest if the Test Injection Project could be packaged together with the following phases of the CCS road map – phase II being a demonstration project and phase III, the commercial scale (see also chapter 5) - and an energy component added to the project design. The Africa Enterprise Challenge Fund (AECF), for example, could potentially be used to further develop the concept if a long term view with two or three phases and a commercial or rather energy production component were to be added to the project. The same applies to the Private Infrastructure Development Group. In general, contributions towards energy savings and the promotion of environmentally friendly energy use are (the) most sought after (criteria), next to GHG emission reductions.

Other initiatives are simply too vague or not fully developed at present, so it is not advisable to further investigate them at this point in time. The AfDB’s Clean Energy Financing Partnership Facility or its Clean Energy Access and Climate Adaptation Facility for Africa could potentially be of interest to the Test Injection Project, but these opportunities do not yet seem fully developed. The ACP Renewable Energy and Energy Efficiency Facility, involving the EIB and the IFC, is still under appraisal and would cater for more commercial projects. Another mechanism with unclear benefits for a project like the test injection is the UNFCCC’s Technology Mechanism, which is currently being developed.

Furthermore, the underlying project or organisational structure should lend itself to commercially and economically sound projects, such as special project development or purpose vehicles, energy service companies (ESCOs), small scale renewable energy and energy efficiency service and supply companies, or innovative public-private partnership structures. Instruments like the Global Climate Partnership Fund (GCPF) or the Sustainable Energy Fund for Africa (SEFA) would provide interesting finance opportunities if these pre-conditions could be met.

Finally, whilst some foundations like the Clinton Foundation may not provide a huge amount of direct funding, they may nonetheless be valuable partners. They can offer strong government ties and links to other valuable stakeholders, or provide access to advisory services and expertise. Many will focus on demonstration and commercial projects however, which would necessitate a broader approach and long(er) term perspective for the Test Injection Project. Similarly, organisations like the Renewable Energy & Energy Efficiency Partnership (REEEP) would not be of interest with regards to funding for the project itself, but rather for financing the further development of the concept to increase and broaden the funding base.

Some opportunities are not relevant to the current, known project design, or are already known or rather used by the SAFECCS project, therefore have not been further investigated. The European Financing Partners (EFP) or the Interact Climate Change Facility (ICCF) both private companies funded by public sources from 12 and 11 EU member states respectively, for example. They would require a commercial orientation. EFP was replenished with €230 Mio in 2009, whereas ICCF provides from €10 Mio to €45 Mio per eligible project.

Another principally interesting fund, the Global Energy Efficiency and Renewable Energy Fund (GEEREF), is structured as a fund-of-funds that invests in private equity funds specialising in providing equity finance to SMEs. The EIB’s window for South Africa from 2007-2013 has €900 Mio allocated, with infrastructure and private sector projects being prioritised. Only a more advanced and commercial project concept would allow a developer to further look into the EIB funding for South Africa.

Two EU funding sources have not been further assessed because they are either known and are already used for the further planning of the Test Injection Project (i.e. the SAFECCS project), or would require a similar approach with regards to requesting and spending funding as under EuropeAid, focussing on research. The 7th Framework Programme for Research seems not to be
relevant EU funding opportunity for the Test Injection Project though as in the next energy call, at present, the CCS part focuses on mitigation and remediation.

4 Discussion

This section presents the broad conclusions of this study, outlining the strengths, weaknesses, opportunities and constraints for financing the further development and implementation of the Test Injection Project. In particular, issues surrounding the currently known project design are analysed, which determine the basic funding opportunities available under this scenario. This is followed by a description of the general prerequisites and options to improve the funding base and options for an appropriate financing model.

4.1 PROJECT DESIGN ISSUES

The most important issues for the Test Injection Project that need to be tackled from a financing point of view revolve around the question of how to secure public and private support in the current economic climate, and determining the incentives to best position the project to do so. The current ‘post financial crisis climate’ is not conducive to obtaining large investments in risky technologies, what with spending cuts appearing almost across the board everywhere. The public seed funding for CCS is limited, and largely limited to and in industrialized countries, with CCS not being a ‘low-hanging’ technology or (mitigation) ‘fruit’. It is crucial to secure government support both from the South African government and, with the help of the local government, (financial) support from donor countries, whilst bringing the private sector on board at the same time, or rather opening the door and creating relevant incentives for private sector participation.

The mitigation aspect and the elaboration of related carbon or climate finance components will be crucial in this context. Finally, the uncertainty around the safe storage of the CO2 in the selected on-shore basin in South Africa does not contribute positively to the position of the project with regards to raising funds.

Targeted public funding for CCS projects

Compared to the approx. US$16 billion pledged for demonstration projects in developed countries – excluding funds for CCS projects from the EU ETS or the UK energy levy of £4 billion and £9.5 billion respectively - no further public funding at larger scale has yet been committed for (demonstration) projects in developing countries according a strategy paper by the GCCSI (2011). The same report estimates the additional cost (above non-CCS facilities) to cover capital expenditure and operating costs for at least six demonstration projects in developing countries to be at least $11 billion. In April 2012 the UK Department of Energy and Climate Change (DECC) responded to the need for additional public funding and announced the allocation of up to £60 million to support the development CCS technology in emerging markets.

Support by the South African government

Government support, here by the South African government, is crucial during the early stages of CCS development or rather the test injection in this case. The government should:

- provide capital support and funding (assistance), i.e. through own resources and/or assistance with approaching donor countries;
- develop a cap-and-trade system and/or implement a carbon tax with tax exemptions or rather revenues allocated to CCS development, including or in particular for the test injection;
- cooperate and work with the World Bank and other development banks in the context of (soft) loan programmes and other debt finance instruments once the necessary pre-conditions have been fulfilled (see below);
proactively engage in the negotiations and discussions around CCS in the CDM to promote CCS in the CDM and ensure that the, remaining obstacles are removed as soon as possible with a view to submitting the methodologies and projects for approval by the UNFCCC to allow for revenue generation through carbon finance; and

- support the further development and financing of the Test Injection Project with regards to tapping into other climate finance options such as through the design of a CCS related NAMA, preparing a submission for the emerging GCF or through negotiations with the EU or Japan about support through their respective bilateral mechanisms.

**Public seed funding**

On the one hand, the public sector, here the South African Government, potentially in tandem with donor governments, clearly needs to take the lead in providing seed funding to kick start basic pilot, test or R&D projects such as Test Injection Project or rather co-fund CCS pilot and demonstration projects in developing countries like South Africa. On the other hand, collaborating with the private sector from the outset is crucial for projects like the test injection and in general with a view to additional finance (incl. in-kind or equipment) in the short run. The collaboration is also important to allow for the early development of commercial components and prepare for the widespread and large-scale deployment of commercial CCS projects in the long run.

**Incentives for private sector participation**

The majority of CCS projects are led by well-established utility and energy companies with a wealth of engineering and geological expertise, or which complement their knowledge through relevant specialist partners, and have experience developing large, complex projects. This is important with a view to assembling the value chains to design and deliver commercially viable end-to-end projects. The economic aspects behind this approach will need to be taken into account when further developing the project design of the test injection. Building the project setup, or rather financially structuring the project, will need to consider how to move away from a pure R&D/test-injection perspective to a commercially more attractive proposition (see below).

**Elaboration of the climate change mitigation component**

The whole debate around the use of CCS stems from the fact that CCS offers a two-fold approach; mitigation of climate change whilst continuing with fossil-fuel based energy generation for a certain period of time, despite its high development costs. The fate of most, if not all, at least all projects in developing countries, CCS projects hinges on the creation and provision of incentive mechanisms, in particular during the early stages of pilots or tests and demonstration phases. Climate finance mechanisms are therefore of key strategic importance for projects like the test injection as part of the financial structuring, and to support capital raising measures from public and private sources.

The elaboration of a climate or carbon finance component will be crucial for the Test Injection Project with a view to tapping into the $30 billion ‘fast track’ finance announced in the Copenhagen Accord in 2009, or rather the $100 billion annual climate finance by 2020. The overall size of the project – size as in mitigation potential – will play a role in how much climate finance can potentially be mobilized, and which mechanisms may apply (see below). Next to the size issue, the project will need to closely monitor the further developments with a view to which mechanism(s) will be best suited to its unique situation and when the different mechanisms will be available and come into play. At the international level, the most immediate opportunities are the CDM, NAMAs, a bilateral mechanism such as pursued by Japan (or a special agreement with the EU), and the Green Climate Fund, whilst the introduction of a carbon tax and/or an emissions trading scheme are discussed in South Africa (see also chapters 3 and 4).
At the international level, the CDM seems to be very advanced with regards to the eligibility of CCS under the mechanism. However, finalising the technicalities around security issues related to CO₂ storage, leakage, liabilities, or Monitoring, Reporting, and Verification (MRV) may still take a year and prevent CCS projects from accessing carbon finance through the CDM just yet. Nevertheless, the CIAB believes cap-and-trade will be an effective driver for CCS during the later stages of CCS development and the commercialisation phase and when CCS technologies are widely available (IEA 2008). This is related to energy providers and electricity generators, who will be important users of CCS technologies when they become commercially interesting, being able to pass on additional costs related to emission permits to the consumer–competing in national or regional markets. The application of such an approach or expansion of such statements to a developing country context like in South Africa is not straightforward though.

Initiatives like the inclusion of CCS within the EU ETS are important for the further promotion of CCS in Europe and in general, but have currently only a limited impact on the situation in developing countries like South Africa. Only if this were to be linked to the import of carbon credits from CCS-CDM projects into the EU ETS, for example, would such developments have a direct positive impact on the development of CCS in South Africa and other developing countries. According to The Stern Review (Stern 2007), the impact of pricing carbon on the economy under a cap-and-trade system is not that different to a carbon tax. However, the carbon tax may be able to induce the development of CCS earlier than cap-and-trade, in the event that the South African government reinvests the tax revenues, amongst other, in the further promotion and development of CCS. This approach seems to be most interesting and relevant in the context of getting public financial support from the South African government for financing the Test Injection Project.

**Mandatory price supports and feed-in tariffs**

Mechanisms that are not applicable under the current scenario for the Test Injection Project, or only at a later stage or phase, depending on decisions relating to the final project design, are mandatory price supports and feed-in tariffs, as well as subsidized capital. Mandatory price supports and feed-in tariffs such as those being used in the EU to support renewable energy deployment, for example, are usually appropriate and applied in developed countries with mature electricity production and distribution infrastructures with experience in supporting renewable energy and low-emissions technologies.

These mechanisms allow for the use of existing regulatory frameworks and market structures with low intervention. Neither the regulatory framework nor market structures are in place in South Africa, nor is an energy component in the currently known test injection project design foreseen. Financial support from the World Bank or other development banks or agencies in the form of loan subsidies, developed countries’ export credits, and direct technology transfer have not been that successful as yet in accelerating CCTs and CCS deployment in developing countries. The currently known Test Injection Project scenario does not cater for the relevant criteria for subsidised capital for environmentally important projects with global impacts (see also chapter 3).

**Preferred funding mechanism for projects in developing countries**

Another interesting line of thought has been followed by the CCUS Action Group with regards to providing additional support from developed countries to implement CCS (demonstration) projects in developing countries. The CCUS Action Group recommended requesting an international CCS body, such as the as the Carbon Sequestration Leadership Forum (CSLF) or the Global CCS Institute, to recommend a preferred funding mechanism for projects in developing countries (WRI 2011). SACCCS should be prepared to be part of any first steps and related processes in this direction, to voice the need for support to projects in developing countries such as South Africa.
4.2 BASIC FUNDING OPPORTUNITIES

The currently foreseen project design for the Test Injection Project, i.e. a first CO₂ test injection of a couple of tens of thousands of tonnes, allows for a rather limited selection of finance mechanisms and related sources or intermediaries. A mitigation or rather climate finance component should definitely be developed to help to attract basic grant funding from relevant multi- and bilateral sources. In the following, sources and intermediaries are listed according to priority or rather likelihood of providing funding. Attracting private sector participation or contributions and further grant funding, or making use of debt finance is hardly feasible under the current scenario - approaching sources for pure research funding may still be an option.

Development of a mitigation component

The development of a mitigation component, i.e. baseline study and GHG avoidance under project scenario, will be helpful to attract grant funding, in particular climate-specific or relevant funding, as well as other climate finance. In the context of traditional carbon finance approaches, such as the CDM with trading of CERs being part of the revenue stream of a project, the actual CER revenues are dependent on a) the size of the project or rather CO₂ stored and b) the price per tCO₂. Therefore, it seems a one-off test injection of a couple of tens of thousands of tonnes (i.e. 30-50,000 tonnes CO₂ max.) would rather be an additional sweetener on top of a mostly grant based funding structure, as compared to a rather significant generation of revenues as part of the overall financial structure, in the event that the CDM were applied under this scenario.

Additional problems with the abovementioned outstanding issues regarding finalising the approval criteria for CCS projects under the CDM, to allow for the development and submission of CDM methodologies and the actual approval of projects by the CDM Executive Board seemed to have been solved at CoP 17 in Durban. This would allow considering the development of a CDM component for the test injection in 2012 with a view to submitting the relevant documentation as soon as submissions were possible and as part of the first round of CCS project submissions. The underlying problem with the actual size of the project and related transaction costs would still apply, however.

Applying new emerging climate finance mechanisms such as NAMAs or bilateral (crediting) mechanisms, such as those already used by the Japanese government and also considered by the EU, may allow for a more flexible approach with regards to the currently known CO₂ storage during the test injection and (to be developed) scenarios for follow-up phases after the test injection and related increased CO₂ storage. These mechanisms, or rather what is currently known about them, would however still require a baseline study and estimations of GHG avoidance by storing CO₂ in the geological formations – including the test injection and another phase(s) beyond the test injection – to justify larger financial commitments under these mechanisms. The same approach would also work for the CDM with a view to increasing the number of CERs and related revenue generation (see below).

Finally, the GCF will most likely become operational during 2013, potentially being able to provide funding under a first tranche in 2014. This fund would also require the preparation of a mitigation component for the Test Injection Project to be able to apply for funding. As with a NAMA or the bilateral mechanisms, certain flexibility with regards to a probably needed long term perspective may apply to funding requirements for the GCF. A weak link to phases 2 and 3 of the South African CCS road map may be enough to receive funding from the GCF.

A mitigation component will need to be elaborated for the Test Injection Project to tap into climate finance mechanisms as well as attract other funding sources, as outlined below. In the case, no changes are made to the project design – although a weak link to phases 2 and 3 being potentially made - the most promising climate finance mechanisms, with a lot of uncertainties related to their final design and eligibility criteria, are:

- A NAMA (pilots already under development and financially supported elsewhere)
- Bilateral mechanisms
• Green Climate Fund

In all the above cases, the amendment of the Test Injection Project design with a view to incorporating a more long term perspective and the subsequent phases of the CCS road map would increase the chances of receiving more funding. If such a phased approach were applied, the CDM might also become much more interesting again, maybe even representing the best climate finance option, due to the established regulations and procedures. However, if the problem with the project size would be solved the market for selling CERs from a South African CCS project would still remain.

For example, the current regulations would exclude South Africa from exporting CERs into the EU ETS after 2012, currently the main market for CERs post-2012. A deal could still be arranged with the EU outside this route or with an individual EU member state. Another obstacle may be quality or rather restrictions related to industrial gases or large-scale industry projects that may prevent a South African CCS project from selling CERs into the EU or other schemes like in Australia. A small pilot project such as the test injection – not generating large amounts of revenues from CERs but with an additional energy or EGR component though – may face fewer difficulties in finding a sponsor in this limited market.

At the moment the role of the UNFCCC’s Technology Mechanism with regards to financing is unclear, therefore cannot be further analysed or recommended as a finance mechanism. Most likely the mechanism will be complementary to the actual (new) finance mechanism, the GCF.

Once the mitigation component has been elaborated in the context of one or more of the above climate finance mechanisms and the foreseen project design further clarified, the South African government should be approached to garner the required support – approaching them in parallel with the elaboration of the mitigation component being even better. Then the relevant multi- and bilateral programs and sources should be approached, as well as potentially interested or rather identified private sector players.

Multilateral programs

The following multilateral programs seem to be the best candidates for a first round of applications when mainly pursuing grant opportunities with a rather weak link to phases 2 and 3 of the South African CCS road map:

• Carbon Partnership Facility
• CCS Trust Fund
• Partnership for Market Readiness
• Special Climate Change Fund/GEF
• Green Climate Fund15
• Public-Private Infrastructure Advisory Facility

The majority of the above funds and facilities are managed by entities belonging to the World Bank Group. This is not a surprise, as the World Bank is and has been a reliable trustee of public and private funds for some time when it comes to promoting and piloting advancements in the climate mitigation field, and related technologies and finance mechanisms. After further clarifications and elaboration of the Test Injection Project design with a clearly elaborated CDM component and/or energy efficiency/generation component, more funding opportunities would open up (see also chapter 3. and below).

15 This depends on the final timeline of operationalizing the GCF and if the GCF will be able to start distributing part of the fast-start finance in 2014.
Bilateral programs

The relevant bilateral sources and programmes analysed in chapter 3 should all be approached with respect to receiving bilateral grant funding from these donor countries and their respective programs. Candidates among bilateral programmes are:

- International Climate Initiative
- French Global Environment Facility
- Prosperity Fund Programme
- International Climate Fund
- Hatoyama Initiative/Fast-Start Financing

In addition to the above initiatives and programmes, the South African government, supported and guided by SACCCS or partners such as participating in the SAfECCS project, could act as a door opener for donors with a view to developing a project or programme around the test injection, with funding earmarked for CCS in South Africa being channelled through the usual bilateral development agencies, unless the project or SACCCS could directly apply and receive the funding. The governments and its subordinate departments and agencies analysed in chapter 3 should all be contacted.

National funds and programs

Certain national funds may not apply yet as the commercialisation phase of CCS in South Africa is still several years away. However, the more technology innovation focussed grants look more promising i.e. the funds managed by the Technology Innovation Agency. However, it should be noted that the amount of funding may be limited compared to what is needed and may only apply to part of the Test Injection Project scope. Many of the national grants or funds require that the project facilitates business development in the country with a focus on capacity development and technology innovation. The design of the project and business model chosen would have to meet certain criteria in order to apply for such grants as listed below. The business case should thus focus on future job creation, industrial development as well as development of local businesses if one wants to make use of the full suite of local grants/funds available.

Private sector participation

A well-elaborated concept with committed or pledged public contributions from the South African government and/or other multi- or bilateral sources, building on a better defined and elaborated mitigation or carbon finance component, may trigger (limited) co-finance for the test injection, or at least initial in-kind contributions from private sector players, with corporate equity coming in at a later stage. Approval and commitment of finance or any significant in-kind contributions to a project like the test injection, beyond the sheer interest of the R&D departments of major international and national corporates from CCS relevant sectors and backing from their equity and bond holders, will however only materialise off the back of a more long term perspective with a commercially interesting proposition in the (near) future (see below). Among the analysed, selected private sector players the following prioritisation can be made:

1. Priority – power and oil and gas companies plus technology providers
2. Priority – mining and steel plus trading houses
3. Priority – engineering companies and CDM project developers and buyers

This prioritisation derives from the assumption that energy and oil and gas companies are continuously targeted by governments to further reduce emissions, therefore they are at the forefront of developments and technologies, including CCS and CCT, related to assisting them in their efforts. Engineering companies will be less inclined to invest in such a project and CDM developers or buyers will only be interested once the last technicalities for CCS in the CDM have been resolved, a certain credit volume can be generated (size issue) and the demand for
such credits from South Africa is there. Approaching private players at the same time, based on an interesting proposition with a commercial perspective, when discussing the project with governments and referring to these discussions at both ends, may be helpful in creating a momentum and an atmosphere for commitments.

Potential ways to offer sponsors a certain value in return include:

- A stake in any IP generated including any value of the knowledge of the underground to e.g. the mining sector, geothermal energy.
- Preferential rights to carbon credits and/or carbon offsets generated by CCS in the future (i.e. during the subsequent demonstration and commercialisation phase).
- Training of personnel of potential future suppliers to future CCS projects.

Engaging with companies that are members/sponsors of SACCCS via SACCCS should definitely be pursued first. In addition, meetings with Anglo American, BHP Billiton and/or, Arcelor Mittal, as they are not members of SACCCS but have expressed a general interest in CCS should be considered.

National-level instruments

Two instruments currently being discussed at the national level that could potentially become interesting with a view to financing the Test Injection Project are a local carbon tax and tax incentives. As illustrated in Table 1 below, for most sectors, the combination of the basic threshold and further proposed allowances to be added to this threshold, would result in a large total percentage of the overall greenhouse gas emissions volume that will not be liable to the carbon tax.

**Table 1: Proposed emissions thresholds for sectors (National Treasury-2, 2012)**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Phase 1 Basic Tax Free Threshold</th>
<th>Maximum Trade Exposure Allowance</th>
<th>Process Emissions Allowance</th>
<th>Total16</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>60%</td>
<td>-</td>
<td>-</td>
<td>60%</td>
</tr>
<tr>
<td>Petroleum (coal to liquid)</td>
<td>60%</td>
<td>10%</td>
<td>-</td>
<td>70%</td>
</tr>
<tr>
<td>Petroleum - oil refinery</td>
<td>60%</td>
<td>10%</td>
<td>-</td>
<td>70%</td>
</tr>
<tr>
<td>Iron &amp; steel</td>
<td>60%</td>
<td>10%</td>
<td>10%</td>
<td>80%</td>
</tr>
<tr>
<td>Aluminium</td>
<td>60%</td>
<td>10%</td>
<td>10%</td>
<td>80%</td>
</tr>
<tr>
<td>Cement</td>
<td>60%</td>
<td>10%</td>
<td>10%</td>
<td>80%</td>
</tr>
<tr>
<td>Glass &amp; ceramics</td>
<td>60%</td>
<td>10%</td>
<td>10%</td>
<td>80%</td>
</tr>
<tr>
<td>Chemicals</td>
<td>60%</td>
<td>10%</td>
<td>10%</td>
<td>80%</td>
</tr>
<tr>
<td>Pulp &amp; paper</td>
<td>60%</td>
<td>10%</td>
<td>-</td>
<td>70%</td>
</tr>
<tr>
<td>Sugar</td>
<td>60%</td>
<td>10%</td>
<td>-</td>
<td>70%</td>
</tr>
<tr>
<td>AFOLU17</td>
<td>60%</td>
<td>-</td>
<td>40%</td>
<td>100%</td>
</tr>
<tr>
<td>Waste</td>
<td>60%</td>
<td>-</td>
<td>40%</td>
<td>100%</td>
</tr>
<tr>
<td>Fugitive emissions: Coal</td>
<td>60%</td>
<td>10%</td>
<td>10%</td>
<td>80%</td>
</tr>
<tr>
<td>Other</td>
<td>60%</td>
<td>10%</td>
<td>-</td>
<td>70%</td>
</tr>
</tbody>
</table>

Organisations that invest with the aim to reduce their carbon intensity during the first phase would be considered for some additional relief. It is envisaged that the tax free threshold(s) will

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16 Total: the total threshold including allowances resembling the percentage of the volume of the overall greenhouse gasses emitted by a certain party in a certain sector that will not be liable to the carbon tax.

17 AFOLU – Agriculture, forestry and other land use.
be reduced in the second phase defined as the period 2020 to 2025, and that it(they) may be replaced with an absolute emission threshold. In addition to the tax free threshold and allowances there will be a maximum offset percentage of 5% or 10% depending on the sector. The offset percentage is the percentage of the total volume of GHGs that one is allowed to offset by buying emissions reductions from other South African projects. As an example it is indicated in the 2012 Budget Review (National Treasury-1/2, 2012) that one may buy CERs. When buying these CERs, the volume it represents can be deducted from the taxable volume of greenhouse gas emissions as per the 5% or 10% maximum. Although the Test Injection Project is of a small scale i.e. 10 000’s of tonnes CO$_2$ stored and will take place in 2016, it is envisaged to be followed by a Demonstration in 2020 of in the order of 100,000’s of tonnes CO$_2$ and commercial scale is envisaged to begin around 2025 with storage in the order of millions of tonnes of CO$_2$ per year. Considering these future volumes a carbon tax that is potentially avoided by means of applying CCS, either by reducing the greenhouse gas emissions of a certain party/ies or by selling the emission reductions as an offset, they can contribute substantially to the longer term business case.

For example, at the initial stages, the electricity generation sector would have a 60% reduction in tax and would therefore pay 48 ZAR per tonne CO$_2$e emitted. However, it is anticipated that the full tax rate of 120 ZAR per tonne CO$_2$e envisaged to be introduced in 2013 would escalate at 10% per annum until 2020. Thus, the expected tax rate in 2020 will be 234 ZAR per tonne CO$_2$e which is quite significant as the tax free threshold may fall away in 2020. If the tax rate would further increase by 10% on an annual basis until 2025, the rate would be 377 ZAR per tonne CO$_2$e. A report by the Zero Emissions Platform (ZEP) indicates that from 2025 onwards, CCS technology is expected to become more competitive commercially provided the emission allowance price reaches 35 EUR per tonne CO$_2$ (Saether 2011). Assuming exchange rates don’t vary too much and stay around 10 ZAR per EUR, this would mean that an emission allowance of 350 ZAR per tonne CO$_2$ would be needed to make CCS commercially competitive and in this way possibly providing a sound longer-term business case for CCS.

Obviously, the above perspective for the electricity generation sector is just an example and future CCS cost in the local context of South Africa should be further investigated to substantiate this potential outlook for 2020-2025. Moreover, the carbon tax is still under design and has only been clarified to a certain extent in the latest budget review and it is stated that a draft policy paper will be published for comment in 2012 (National Treasury-1/2, 2012).

Considering the fact that the carbon tax and several other instrument like the carbon budget and tax incentives discussed below are still under design, there could be an opportunity for government to build a more dedicated mechanism for CCS into the overall design.

For the longer term however an interesting business development perspective may develop in regard to the creation of CCS businesses in South Africa. An interesting successful example to highlight in this regard is Norway where preferential conditions for CCS created by a carbon tax and substantial government financial support for CCS developments resulted in a substantial CCS industry developed with Aker Clean Carbon providing CCS engineering services and SINTEF providing R&D support, both providing services internationally. Moreover, the Technology Centre Mongstad (MTC) is envisaged to develop a CCS R&D and demonstration programme with TCM partners Gassnova, Statoil, Shell and Sasol having made a clear commitment to technology improvement and investing approximately 750 Million Euro in the construction and development of the technology centre.

CCS is one of the flagship programs in South Africa and thus there is some focus on how CCS can support assist in achieving South Africa’s emission reduction targets. Currently there is no discussion about extending the tax allowance from energy efficiency to a mechanism that includes CCS. However, it might be possible in the future that when further developing the CCS flagship program, that a similar tax allowance for investments in cleaner technology projects including CCS is be proposed (pers. com. Ramalope, D., DEA, 2012).e R&D tax incentive is an
initiative by South African government to encourage private sector investment into scientific and technological research activities. The incentive is co-ordinated by the Department of Science and Technology (DST), with an approvals committee made up of members from DST, South African Receiver of Revenue (SARS) and the National Treasury.

At the present time the carbon budget appears to be only a process informing the government with regards to the carbon intensity of certain sectors, the average carbon performance of certain sectors (i.e. baselines) and in what way sectors are vulnerable to international competition when applying emission mitigation policies such as the carbon tax.

Risk management and finance enhancement mechanisms

Instruments like green or low-carbon bonds or finance enhancement mechanisms - such guarantees do not cater to the current project design. This is due to the fact (that) the underlying project would need to be viable or rather a compelling economic case would need to be provided to convince investors. Even with a small energy production/efficiency component, the economic case would not be convincing enough but loan guarantees should be able to play a role at a later stage, particularly when taking CCS to commercial scale in South Africa. Loan softening is least likely to play a role for financing the test injection, whereas a demonstration plant could definitely benefit from project development grants and loan softening. In the event if CERs are generated, an ERPA loan may be an option.

In summary, the basic project design needs to be clarified, agreed upon and elaborated, including the technical details, costs, timelines and potential phases (see below). The mitigation component should be elaborated first, followed by approaching multilaterals and donor countries together with the South African government, as well as initiating discussions with selected private sector players. Once public or governmental funds are committed and first down payments have been made, further commitments from the private sector can be sought, although initial private sector participation or expressions of interest will be required from the beginning to be able to make a convincing case to (host and donor) governments. Start with facilities and grants available for CCS then building a commercial case with government support – bridging the financial gap and building the case, economically and environmentally.

4.3 GENERAL PREREQUISITES AND OPTIONS TO IMPROVE THE FUNDING BASE

Development of project concept

The development of clear and forward-looking project concept – at best with an outlook or weak link to the subsequent phases of the CCS roadmap – based on transparent financial structure to be able to know how much funding is needed for which components or activities, assuming a stepped approach and the addition of an energy component.

Involvement of the South African government

Involvement and proactive engagement of the South African government, in particular those departments that lead on the development of relevant regulatory frameworks at the national and international level and in charge of fiscal policies, and/or those leading on donor relations. In order to be able to attract finance for the Test Injection Project, a clear project concept together with a financial structure is essential with a view to eventually developing a business plan. The final design of the actual test injection will determine CAPEX and OPEX and eventually the overall costs as well as costs of certain items. A clear costing overview based on a financial needs analysis will be required for any funding organisation.

Business plan and cost estimates

A full-fledged business plan needs to be prepared whilst summaries of the financial needs or first cost estimates would be used for a project concept note. Furthermore, the overall costs will help
to determine the financial structure with regards to how much resources may be mobilised through innovative or rather climate finance mechanisms. The past couple of years have shown that a clearly elaborated, better with carbon sold, carbon finance component (here the CDM), can significantly contribute to the attractiveness of a project with respect to attracting further finance. The current low CER prices are not conducive for attracting further investments, however.

As part of this process, SACCCS will need to decide on the overall timeline and structure of the project. In particular, a decision will need to be made whether the project continues to focus on the test injection only or to what extent the Test Injection Project could be seen and presented as the pilot and phase 1 of a larger programme with several phases – planning a (small) demonstration plant in phase 2 and going commercial in phase 3.

**Project setup options**

Catalysing larger financial needs and preparing a key mitigation technology such as CCS for demonstration and later commercialisation whilst opening the project for private sector participation and contribution at an early stage, may require a longer planning horizon to allow for the step-wise, sequenced bundling and blending of different financial instruments. Such an approach would require distinguishing between the three phases, the test injection, demonstration plant and commercial scale.

Focusing on the test injection alone, the funding base will be restricted to (public) grants and similar R&D funding, including (limited) climate finance but largely excluding carbon finance from the CDM (see above). Carbon finance and larger sums of climate finance will not be applicable to scenarios such as this, and any loan and equity components will most likely be excluded. However, an added, small commercial component in the form of an energy efficiency or generation component may allow for the inclusion of some (more) carbon or climate finance and a small loan component, but not at significant scale. In any case, even most of the public grant funding will rely on the elaboration of the mitigation aspects of the project (see chapter 3).

**Table 2: Comparison of project setup options**

<table>
<thead>
<tr>
<th>Option 1 – test injection only</th>
<th>Option 2 – test injection with additional value creation (e.g. energy efficiency/generation or EOR/EGR)</th>
<th>Option 3 – test injection as part of a phased approach</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pros</strong></td>
<td><strong>Pros</strong></td>
<td><strong>Pros</strong></td>
</tr>
<tr>
<td>• Rather simple project set up and design features</td>
<td>• Increases chances for (small) carbon finance or larger climate finance component</td>
<td>• Allows blending more financial instruments, therefore increased capital raising ability</td>
</tr>
<tr>
<td>• Largely grant based funding without any expectations of returns on investments</td>
<td>• Potentially loan component</td>
<td>• More attractive to private sector and lenders</td>
</tr>
<tr>
<td>• Improved framework conditions to attract private sector and certain lenders</td>
<td>• Improved framework conditions to attract private sector and certain lenders</td>
<td></td>
</tr>
<tr>
<td><strong>Cons</strong></td>
<td><strong>Cons</strong></td>
<td><strong>Cons</strong></td>
</tr>
<tr>
<td>• Rather difficult to move beyond grant/R&amp;D funding and receive larger climate finance sums or benefit from loan programmes</td>
<td>• Requires adding a completely new component to the project design</td>
<td>• Extremely complicated project setup and design features, which require a long term perspective</td>
</tr>
<tr>
<td>• Low attractiveness to private sector and lenders</td>
<td>• Increased initial costs</td>
<td>• High(est) risk profile</td>
</tr>
</tbody>
</table>
A carbon finance component – linked to an energy/commercial component - may allow for forward sales of carbon (credits) from phase 2 or 3 or an ERPA loan with phase 1, the test injection, being the pilot and partly financed by advanced payments against future delivery of carbon credits. Option 2 and even more Option 3 would increase the ability to blend various types of funding and support from grants and R&D type funding, technical cooperation, and to soft loans and related programmes, whereas Option 1 will largely rely on grant/R&D funding. CCS projects, even more so in a country like South Africa, are still perceived as very risky with a lot of inherent uncertainties.

Another option to increase the commercial attractiveness of the project significantly, in particular with regards to attracting private sector players from the oil and gas sector, could be by adding an EGR or EOR component at the site, if feasible and applicable. It would need to be further investigated whether an EOR or EGR component would hamper the application of certain climate finance mechanisms such as the CDM.

As mentioned above, the likelihood of including equity and debt finance will increase when applying Option 2 and even more under Option 3. In addition to the commercial orientation, project development grants and loan softening programmes will typically require certain financing models such as a special purpose company. Loan guarantees or bond schemes could only be considered under Options 2 and 3. The risks and uncertainties, also affecting the financial structure of the project, further increase with option 2 and even more with option 3.

The support and early involvement of the South African government is crucial to support or partly lead on discussions with donor country governments with regards to preparing funding applications for their facilities, funds or funding programs. In addition, the South African government should play a leading role together with other developing countries, with CCS on the agenda in the relevant international forums such as the UNFCCC, where support mechanisms and allocations of public funding are decided upon. However, the realisation of Options 2 and 3 in the context of the Test Injection Project seem less likely, therefore are not further discussed in this report.

Attracting the private sector

The abovementioned government support is also required to pave the way for any kind of private sector participation because without governmental support the private sector will be reluctant to participate, or rather to invest in high-risk activities and technologies that still have a long way to go before becoming commercially interesting. PPPs are however essential, even at such an early test stage to further develop CCTs, share the costs and risks related to CCS projects such as the test injection and better address the first mover barriers. Last but not least, such a setup will sow the seed and steer the project development towards a more long term, economic route through to demonstration and commercialisation phase.

Apart from the equipment suppliers, economic incentives or at least a clear economic perspective will be required to encourage power or oil and gas companies to join a consortium around the Test Injection Project. Bringing corporates on board would in turn help to create a more convincing case for lenders. The issue at hand is that the current Test Injection Project design, i.e. phase I of the CCS road map, does not foresee even limited, commercially interesting activities.

Dedicated public financial support mechanisms

Due to the significant costs of the further development of CCTs and CCS and limited availability of conventional public funding, specific public financial support mechanisms, tailor-made to CCS are being discussed. Discussions around and about such innovative support mechanisms may be helpful in discussions with the South African government and overseas governments when traditional grants are not an option, or rather more public funding is required beyond first grant commitments. Two categories can be distinguished (GCCSI 2010):
• *input-based support mechanisms* – providing financial support in setting up and running CCS projects and infrastructures, regardless of the outcome in terms of successfully stored CO$_2$, and

• *performance-based support mechanisms* – providing financial support based on the successful storage of CO$_2$, or based on delivering a product (e.g. generating electricity) while storing CO$_2$.

Table 3: Overview of input-based and performance based support mechanisms and potential relevance to the Test Injection (adapted from GCCS 2010)

<table>
<thead>
<tr>
<th>Input-based support mechanisms</th>
<th>Performance-based support mechanisms</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phase 2 and option 2 (depending on scale)</td>
<td>Phase 1 and option 2</td>
</tr>
<tr>
<td>• Direct capital grants (by government)</td>
<td>• Standard storage payments</td>
</tr>
<tr>
<td>• Equity/ownership position (by government)</td>
<td>• Contract for differences (in carbon market price)</td>
</tr>
<tr>
<td>• Operating cost subsidies</td>
<td>• Power purchase agreements</td>
</tr>
<tr>
<td>• Tax measures</td>
<td></td>
</tr>
<tr>
<td>• Debt financing (by government)</td>
<td>Phase 2 and option 2 (depending on scale)</td>
</tr>
<tr>
<td></td>
<td>• Power purchase agreements</td>
</tr>
<tr>
<td></td>
<td>Phase 3 (and 2) and option 3</td>
</tr>
<tr>
<td></td>
<td>• Tax measures</td>
</tr>
<tr>
<td></td>
<td>• Bonus and malus regimes</td>
</tr>
<tr>
<td></td>
<td>• Feed-in-tariffs</td>
</tr>
</tbody>
</table>

The above mechanisms are discussed in the context of large(r), demonstration projects, therefore do not apply to the test injection scenario, apart from two performance based support mechanisms. Standard storage payments could be an interesting mechanism for Option 1, not looking beyond the current phase, the test injection. The government would provide a pre-established subsidy that is paid per unit of CO$_2$ successfully stored. Payments could flow to the CCS project developer. However, as discussed previously, these mechanisms or payments are linked to the size of the project, the amount of CO$_2$ stored, or rather additional CO$_2$ avoided through another project component. Payments linked to a couple of tens of thousands of tonnes may not make a significant contribution to cover the expected costs of the Test Injection Project but depending on the price per unit of CO$_2$ successfully stored a small contribution could be possible.

4.4 FINANCING MODEL

The difficult funding situation for CCS globally, as well as in South Africa, will require the development of a financing model tailored to the specific situation of the Test Injection Project, in the light of its overall project design. Financing models that could be applicable to Test Injection Project based on the foreseen project design are:

• Trust Fund
• Investment Promotion Vehicle
• Special Purpose Vehicle
Trust Fund

A Trust Fund would allow for the combination of various sources of funding or rather types of financial products and have already been used for environmental or climate change projects. This model would be particularly suitable if the (initial) resources for the project were to come from government sources and/or the South African government would be heavily involved or even own the project. This model would allow for the inclusion of equity, debt and other financial products next to grants. Such an approach would allow for starting only with the test injection, if enough (grant and R&D) funding can be secured, with a rather loose or rough concept of phases 2 and 3 prepared that can be further developed and adjusted over time.

Investment Promotion Vehicle

The objective of an Investment Promotion Vehicle or Agency (IPV/IPA) would be to develop and manage a range of financial services designed to facilitate private sector financial flows into CCS in South Africa, after having secured initial or first public funding. Foremost of these activities would be an investment packaging and marketing facility to disseminate information on, and provide streamlined access to, the full range of financial resources, incentives, and mechanisms available to CCS at the local, regional and global level. Depending on the needs of the investor or the investment, the IPA would bring these various funding lines together as part of a finance structuring service designed to address specific barriers to CCS investment. Such a facility would seek to attract private sector equity and debt financing from venture, institutional or portfolio sources, using catalytic public sector or other concessionary funding over time.

Fig. 5: Overview investment promotion vehicle concept

Like the trust fund model, an investment promotion vehicle would be well suited to a rather flexible approach with regards to the project design and the further development of SAFeccs. The investment promotion vehicle model would also still cater for Option 1 with a rather loose concept of phases 2 and 3. Such an agency or vehicle would probably benefit and be more successful the more concrete the scenarios under phase 2 and 3 are, or would become more successful over time.

Special Purpose Company

Project finance refers to financing structures wherein the lender has recourse only or primarily to the assets of the project and looks primarily to the cash flows of the project as the source of
funds for repayment. The main difference from the above understanding of a trust is that a Special Purpose Company (SPC) is mainly formed to raise funds by collateralising future receivables. Most SPCs raise funds from the market. Under project financing, a SPC is usually established to undertake the project and clearly define the legal limits of the project entity. The SPC enters into contracts with suppliers and buyers, and with companies to provide construction, operation and other specialised services.

A project finance structure allows the raising of large amounts of capital and limited recourse to the assets of project sponsors. The disadvantages of the structure include potentially significant set-up costs and project-specific risk assessment and management. Establishing a SPC would make more sense if a commercial component were to be added to the test injection. However, it may still be a workable model for the Test Injection Project only.

5 Recommendations

5.1 POSITIONING THE TEST INJECTION PROJECT

Development of mitigation component

The development of a mitigation component, i.e. baseline study and GHG avoidance under project scenario, in the context of the relevant climate finance mechanisms will be helpful to attract grant funding, in particular climate–specific or –relevant funding, as well as other investments.

Support and engagement of South African government for funding from multi and bilateral sources

Funding from multi- and bilateral sources and programs for the CCS Test Injection Project in South Africa would first and foremost require the proactive support and engagement of the South African government, in almost all cases relevant to the currently foreseen scenario. Government-to-government interactions will definitely increase the chances of additional direct grant funding, including supranational organisations such as the EU, depending on the final project/financial structure and design next to the abovementioned multi- and bilateral funds and programs. The governments and its subordinated departments and agencies identified in chapter 3 should all be contacted through or with the support of the South African government.

Project concept with planned, phased funding approach

A well-elaborated concept with committed or pledged public contributions from the South African government, including the relevant national grant programs and funds, and/or multi- or bilateral sources, building on a better defined and elaborated mitigation or carbon finance component, may trigger (limited) co-finance for the Test Injection Project or at least initial in-kind contributions from private sector players with corporate equity coming in at a later stage. Approval and commitment of finance or any significant in-kind contributions to a project like the test injection beyond the sheer interest of the R&D departments of major international and national corporates from CCS relevant sectors and backing from their equity and bond holders will however only materialise on the back of a more long term perspective with a commercially interesting proposition in the (near) future (see also below).

Opportunities through local grant funding options

The national financial mechanisms and grant funding options for the Test Injection Project are currently limited. However, several financial mechanisms like the carbon tax, carbon budget and investment allowances are under development and will strengthen the business case for CCS in the longer term when potentially large volumes will be stored underground, thereby incentivising local stakeholders to start preparatory investments. Moreover, local grant funding options may provide opportunities along the angles of skill development and technology innovation &
exploitation. The latter will depend highly on how the Test Injection Project will be structured and what the envisaged local partners and their role will be. A further discussion with SACCCS on this matter to obtain concrete inputs would be required as a next step.

Exclusion of certain finance mechanisms and instruments depending on project design

Certain finance instruments and mechanisms are more or less excluded from the financial structure when applying the currently foreseen project design, i.e. the pure test injection. Instruments like green or low-carbon bonds or finance enhancement mechanisms such as guarantees do not cater to the current project design. This is due to the underlying project would need to be viable or rather a compelling economic case would need to be provided to convince investors. Loan softening is least likely to play a role for financing the test injection.

In the case of further pursuing a pure R&D project without any long-term perspective or commercial add-on, including a partner organisation from the country where funding is sought after in the consortium is definitely of advantage or rather required. There are examples where funding will only be made available with partners from a certain group being involved such as in the case of the EU. The same applies for research related funding from overseas where local partner organisations will need to be part of the consortium, at least in many cases.

5.2 IMPROVING THE FUNDING BASE

The three main prerequisites to increase the funding base for the Test Injection Project are:

- The development of forward-looking project concept, linking the Test Injection Project with the demonstration plant at least or even phase 3 of the CCS road map without compromising the potential need for a gap between the test injection and phase 2 or even the complete stop of all further activities related to the further rollout of the CCS road map in South Africa.
- Involvement and proactive engagement of the South African government, in particular those departments that lead on the development of relevant regulatory frameworks at the national and international level and in charge of fiscal policies or rather lead discussions with donor governments. Furthermore, the involvement of the government will be required when approaching donor country governments.
- Early involvement and creation of incentives for the participation of the private sector.

In order to be able to attract financing for the Test Injection Project a clear project concept together with a financial structure is essential with a view to eventually develop a business plan. The final design of the actual test injection will determine CAPEX and OPEX and eventually determine the overall costs and costs of certain items. A clear costing overview based on financial needs analysis will be required for any funding organisation. A full-fledged business plan needs to be prepared whilst summaries of the financial needs or first cost estimates would be used for a project concept note.

The past couple of years have shown that a clearly elaborated, better even partly sold, carbon finance component, can significantly contribute to the attractiveness of a project with respect to attract further finance. This may not necessarily apply to new emerging climate finance mechanisms next to the CDM.

The support and early involvement of the South African government is crucial to support or partly lead on discussions with donor country governments with regards to preparing funding applications to their facilities, funds or funding programs. In addition, the South African government should play a leading role together with other developing countries with CCS on the agenda in the relevant international forums such as the UNFCCC where support mechanisms and allocations of public funding are decided upon.
SACCCS should ensure that major corporates from the utility, fuel suppliers and/or equipment manufacturing sectors are involved in the project from the initial stages. Apart from the equipment suppliers economic incentives or at least a clear economic perspective will be required to encourage power or oil and gas companies to join a consortium around the test injection. This issue at hand is that the current SAfECCS project design does not foresee even a limited, commercially interesting, or even planting the seeds for commercially more attractive, activities in the future.

With regards to private contributions from companies based in South Africa, a high level analysis of some ‘CCS commitment’ indicators including any publicly stated interest or (potential/current) involvement in CCS has been performed. It is clear that there are several industrial players that could play a role as sponsor and/or partner in the Test Injection Project. However when further engaging with a shortlist of parties to assess options for potential private contributions (in-kind and/or financial) any further, it is required that in preparation of these meetings, three important questions need to be addressed with SACCCS:

- What is the potential benefit package for sponsors in return for their contributions?
- How is the Test Injection Project going to be organized and structured (e.g. as a venture)?
- And as a result: what may the overall business case for participants look like?

For a large part these questions overlap with further information required for engaging with local grant providers as well. When moving forward developing the planned concept note inclusive of addressing the aforementioned questions, a sound basis for approaching organisation that could potentially invest in, or fund the Test Injection Project could be there.

5.3 FINANCING MODEL FOR THE TEST INJECTION

When leaning towards raising funds only for the test injection the Trust Fund or IPV model seem to be well suited for the Test Injection Project. They would still allow for the development and incorporation of economically viable activities into an evolving project concept over time. A SPC could also be an option.

5.4 PARTNERS CLOSE TO THE DONORS

Last but not least, it should be pointed out that when relying largely on grants, or even more so in the case of research funding as under Option 1, the test injection, having (a) partner organization(s) based in the donor country or region (e.g. the EU) is definitely an advantage. In the case a rather (pure) research oriented approach will be applied the same list of donor countries in chapter 2 would apply with adding the research departments to the list of organisations. Furthermore, relevant research organisations in the relevant countries would need to be identified to be able to prepare a proposal and receive funding.

5.5 PROPOSED NEXT STEPS AT THE LOCAL LEVEL

The following list of meetings/actions to take place are suggested which need to be discussed further and finalized in collaboration with SACCCS:

Development of concept note addressing basics of Test Injection Project business case

- Preparatory meeting with SACCCS, Climatekos and EcoMetrix.
- Development of a draft concept note including concrete inputs obtained from SACCCS and integrating national and international funding/market mechanism considerations.
• Meeting with SACCCS and industrial partners involved in SACCCS to discuss first draft concept note and specific ideas from industrial partners on financing and structuring.
• Update of the draft concept note incorporating the above.

Understanding and exploring possibilities to include CCS in Financial Mechanisms

Potential meetings in this regard with:
• JSE to discuss future carbon trade platform.
• Carbon Budget Division to discuss carbon budgets, alignment with other mechanisms and possible future inclusion of CCS incentives.
• Tax Policy Unit - Environmental and Fuel Taxes (National Treasury) to discuss the carbon tax, getting a clear understanding of the position of sectors most relevant for the application of CCS.

Understanding and exploring Contributions from potential Local Grant Providers

Potential meetings in this regard with:
• Technology Innovation Agency
• National Research Foundation

Exploring potential contributions from selected Industrial Parties not partnering in SACCCS

• Anglo American or BHP Billiton
• Arcelor Mittal

The above meetings and actions are proposed in order to obtain inputs required for the assessment of local financial mechanisms and funding options. After receiving these inputs and execution of the assessment, the concept note can be further developed using the main findings and conclusions. Moreover, in regard to certain market mechanisms which are still under design it will be possible to provide inputs for the potential inclusion of CCS.

In regard to the funding of the Test Injection Project in itself, it is likely that a combination of national and international grant and private funding should be envisaged. The currently envisaged budget requirements of the Test Injection Project are in the order of ZAR 300 to 450 million. International funding practice shows that for this size of budgets generally a PPP is required where direct stakeholders/beneficiaries provide co-funding to complement the budget provided by grant funding programmes.
Appendix 1  Glossary and key terms

ACP - African, Caribbean and Pacific Group of States
ACSP - African Carbon Support Program
AECF - Africa Enterprise Challenge Fund
AFD - French Environment Agency
AfDB - African Development Bank
AusAID - Australian Government’s Overseas Aid Program
BMU - German Environment Ministry
BMZ - German Development Ministry
Brownfield – a site which has already been used for industrial purposes/building and is to be re-used/developed or a project building on existing man made developments
CADF - Carbon Asset Development Fund
Carbon – A term referred to meaning carbon dioxide or sometimes also other GHGs within the context of climate change mitigation.
Carbon finance – The facilitation of the financing of projects that reduce greenhouse gas emissions by means of capitalizing on these reductions by means of selling carbon credits. One carbon credit represents one tonne of CO$_2$ emissions avoided compared to a pre-defined baseline.
CCS - Carbon Capture and Storage
CCT - Clean Coal Technology
CCTAF - Climate Change Technical Assistance Facility
CCUS – Carbon Capture Use and Storage
CCX - Chicago Climate Exchange
CDM – Clean Development Mechanism
CER - Certified Emission Reduction
CF- Carbon Fund
CFI - Commercial Financial Institutions
CIAB – Coal and Industry Advisory Board
CIAB - Coal Industry Advisory Board
CIDA - Natural Resources Canada, Canadian International Development Agency
CO2 – Carbon Dioxide
CoP - Conference of the Parties
COPM - Cabinet Office of the Prime Minister
CPF - Carbon Partnership Facility
CTCN - Climate Technology Centre and Network
CTIF - Cleantech Innovation Facility
DECC - Department of Energy and Climate Change
DEG - German Investment and Development Company
DFID - Department for International Development
DoE – Department of Energy
EC – European Commission
ECM/ECBMR – Enhanced Coalbed Methane/Enhanced Coalbed Methane Recovery
EFP - European Financing Partners
EGR – Enhanced Gas Recovery
EIB – European Investment Bank
EMIC - E.ON Masdar Integrated Carbon
EOR – Enhanced Oil Recovery
EPA - Environmental Protection Agency
ERPA - Emission Reductions Purchase Agreement
ERU - Emission Reduction Units
ESCO - Energy Service Companies
EU ETS - EU Emissions Trading System
FCO - Foreign and Commonwealth Office
FGEF - French Global Environment Facility
FM – Finance Mechanism
GCCSI – Global CCS Institute
GCF - Green Climate Fund
GCF – Green Climate Fund
GCPF - Global Climate Partnership Fund
GEF - Global Environment Facility
GHG - Greenhouse Gas
GIZ - German International Cooperation
Greenfield – a new site for development which has not previously been utilised for building/industrial purposes
ICCF - Interact Climate Change Facility
ICF - International Climate Fund
ICI - International Climate Initiative
IFC – International Finance Corporation
IGCC - Integrated Gasification Combined Cycle
IKLU - Initiative for Climate and Environment Protection
IP – Intellectual Property
IPA – Investment Promotion Agency
IPCC - Intergovernmental Panel on Climate Change
JBIC - Japan Bank for International Cooperation
J CCS - Japan CCS Co.Ltd.
JCIA - Japan International Cooperation Agency
JI - Joint Implementation
JSE – Johannesburg Stock Exchange
KEPCO - Korean Electric Power Corporation
KfW - Kreditanstalt fuer Wiederaufbau/German Development Bank
METI - Ministry of Economy, Trade and Industry
MEXT - Ministry of Education, Culture, Sports, Science and Technology
MHI - Mitsubishi Heavy Industries
MoE - Ministry of the Environment
MoF - Japanese Ministry of Finance
MRV – Monitoring, Reporting, Verification
NAMA - National Appropriate Mitigation Action
NeCF - NEFCO Carbon Fund
NEDO - New Energy and Industrial Development Organisation
NORAD - Norwegian Agency for Development Cooperation
ODA - Official Development Aid
OTC - Over-the-counter
PMR - Partnership for Market Readiness
PPA – Power purchase agreement
PPP - Public-Private Partnerships
R&D – Research and Development
REEEP - Renewable Energy & Energy Efficiency Partnership
SAfECCS - South Africa – Europe Cooperation on Carbon Capture and Storage
SCCF - Special Climate Change Fund
SEFA - Sustainable Energy Fund for Africa
SME - Small and Medium-Sized Enterprise
SPV - Special Purpose Vehicle
TEC - Technology Executive Committee
Test Injection Scoping Study – The test injection scoping study was undertaken by TNO, CGS and EcoMetrix for SACCES from 2010 – 2012.
Test Injection Project – Experiment to inject carbon dioxide into a geological formation in order to ascertain the suitability of South African rock formations for CO₂ storage
UNFCCC - United Nations Framework Conference on Climate Change
USAID - United States Agency for International Development
Appendix 2 Examples of similar projects and their funding strategies

Projects dealing with Carbon Capture and Storage (CCS) technologies have been undertaken in various parts of the world to date. Listed below are some projects similar in nature to the Test Injection Project in the sense that the projects were for research and testing purposes only and were not intended for large scale carbon dioxide storage but instead aimed at providing valuable knowledge for future larger scale CCS developments. These similar projects may serve as examples of how private-public partnerships and/or consortia are formed to enable the accumulation of financial contributions required for funding such projects.

OTWAY PROJECT-AUSTRALIA (OTWAY PROJECT, 2012)

The Otway project is a current project and is the first of its kind in Australia demonstrating deep geological storage of carbon dioxide. In stage one of the project over 65,000 tonnes of carbon dioxide were stored in a depleted gas reservoir and monitored. Stage two of the project focusses on storage in saline formations and is currently under way.

The project budget of 40 Million AUD is funded by a collaboration of funding mechanisms including national governmental funding, bilateral funding and private/public funding by members of the Cooperative Research Centre for Green House Gas Technologies (CO2CRC). CO2CRC is a collaborative research organisation focused on carbon dioxide capture and storage which has participants from Australian and global industry, universities, research bodies and state and international government agencies.

In July 2011, a South African delegation funded by the Global CCS Institute and led by SACCCS, visited CO2CRC and the Otway project. During this visit the way in which the second stage of the project was structured was clarified. This second stage is very differently structured than the first stage and includes a solution for the insurance against project risks as well as a solution for the protection/exploitation of the intellectual property between the partners:

- A non-profitable test injection operating company made up of the partners/sponsors was set up. This set-up includes an agreement to share in the risk of operating the storage test and potential financial liabilities where the partners are liable for the excess thus reducing the insurance premium. The financial contributions to this entity are tax deductible.
- A for-profit technical Intellectual Property (IP) company was also set up in order to secure the IP among the partners and in doing so partners may share in any revenue upon commercialisation of the IP.

The objectives of the CO2CRC in the Otway project project may be a bit different from those of the Test Injection Project the Otway project in the sense that research is a more prominent objective. As stated by CO2CRC on their website, their research objective is: “effectively model CO2 behaviour in the sub-surface, demonstrating safe storage of the gas, verify that the gas remains in the deep sub-surface, and contribute to development of technologies capable of making deep cuts in greenhouse gas emissions”.

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KETZIN CO2 SINK PROJECT – GERMANY (CO2 SINK, 2012)

The Ketzin project was the first European on-shore carbon dioxide storage project. The project started in April 2004, the first test injection started in June 2008 and an amount of 60,302 tonnes of CO2 has been injected underground up to April 2012. The project was developed as “an in situ laboratory for CO2 storage to fill the gap between the numerous conceptual engineering and scientific studies on geological storage and a fully-fledged onshore storage demonstration.”

The funding was obtained from the 6th European Framework Programme (FP6), the German Federal Ministry of Education & Research as well as industry partners. Likewise the local funding/grants offered in SA could be a means of obtaining funding for the Test Injection Project, however there are specified approaches to obtain such grants which are discussed in Section 3.

Although no publicly available information was available concerning any arrangements regarding Intellectual Property (IP), the contract with the European Commission under FP6 and related consortium agreement generally provides in agreeing on ownership and rights to exploit IP generated during the project as well as what information will be made available publicly to inform direct stakeholders and the public in general. Also this project may be somewhat different from the Test Injection Project as its main objective is research.

RECORD POLAND (RECOPO-1, 2005)

The RECOPOL project was a combined research and demonstration project which aimed at reduction of CO2 emissions by means of CO2 storage in coal seams in the Silesian Coal Basin of Poland. The project began in 2001 and only about 760 tonnes of CO2 has was injected between 2004 and 2005. Funding was provided by the European Commission (50%) and the governments of both Poland and the Netherlands. The total funding was 4 Million EUR including drilling and operating costs (RECOPOL-2). In general, similar arrangements regarding IP can be expected as for the project in at Ketzin.
Appendix 3  References


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