

**INTEGRATED SAFEGUARDS DATA SHEET
APPRAISAL STAGE**

Report No.: ISDSA14766

Date ISDS Prepared/Updated: 10-Aug-2016

Date ISDS Approved/Disclosed: 13-Aug-2016

I. BASIC INFORMATION

1. Basic Project Data

Country:	South Africa	Project ID:	P149521
Project Name:	Development Carbon Capture and Storage in South Africa (P149521)		
Task Team Leader(s):	Nataliya Kulichenko		
Estimated Appraisal Date:	22-Jun-2016	Estimated Board Date:	16-Sep-2016
Managing Unit:	GEE08	Lending Instrument:	Investment Project Financing
Is this project processed under OP 8.50 (Emergency Recovery) or OP 8.00 (Rapid Response to Crises and Emergencies)?			No
Financing (In USD Million)			
Total Project Cost:	36.50	Total Bank Financing:	0.00
Financing Gap:	0.00		
Financing Source			Amount
Borrower			13.50
Carbon Fund			23.00
Total			36.50
Environmental Category:	A - Full Assessment		
Is this a Repeater project?	No		

2. Project Development Objective(s)

The Project Development Objective (PDO) is to assess the feasibility of, and build expert capacity for, carbon capture and storage in South Africa.

3. Project Description

The proposed Technical Assistance Project (TAP) will include the implementation of two independent components: (1) the preparation and implementation of the Pilot Carbon Storage Project (PCSP); and (2) the preparation of a Front End Engineering Design (FEED) for the Carbon Capture Pilot Plant (CCPP). The PCSP constitutes the majority of the project activities and costs, because the

priority is to demonstrate that CO₂ can be stored in the South African geological formations. Component 1: Pilot CO₂ Storage Project. Component 1 of the proposed TAP, the PCSP, will involve the investigation and characterization of a suitable CO₂ storage site and the subsequent injection, storage, and monitoring of CO₂ in the identified storage site. The selected geological site formation must have sufficient capacity for the designed volume of CO₂ to be stored, be able to keep the CO₂ contained under a cap-rock and through other trapping mechanisms, have sufficient permeability to allow the CO₂ to be injected, and be somewhere in the order of 800 meters or deeper below the surface. Before, during, and after the geological storage, the CO₂ will be monitored to ensure that it is behaving as modeled and projected. The volume of CO₂ to be stored as part of the PCSP is between 10,000 -50,000 tCO₂. The location considered for storage investigation will be in the Zululand geological basin in the Umkhanyakude District Municipality (DM) in the KwaZulu-Natal Province of South Africa. According to the CGS, the Zululand estimated theoretical storage capacity is 500 MtCO₂.

The primary aims of the PCSP are:

- (ç To demonstrate safe and secure CO₂ handling, injection, storage, and monitoring activities in the South African geological formations;
- (ç To enhance the South African expert and technical capacity, including technical capacity of previously disadvantaged South African individuals and women, for the development and operation of CO₂ handling, injection, storage, and monitoring activities;
- (ç To raise awareness of the potential importance of Carbon Capture and Storage (CCS) technology for greenhouse gas (GHG) mitigation to the Republic of South Africa; and
- (ç To facilitate the adoption of CCS legal and regulatory frameworks in the Republic of South Africa.

The Government of South Africa (GoSA) started the execution of the PCSP several years ago (as part of the CCS Roadmap implementation). There are seven stages of the PCSP development, as presented below. The stages three through six will be supported by Component 1 of the proposed TAP:

- (ç Stage 1: Project Initiation ➤(this stage has already been completed by SANEDI.
- (ç Stage 2: Data Analysis and Project Planning ➤(this stage is being undertaken with the support of the Bank through the Programmatic Technical Assistance, PTA (P151193).
- (ç Stage 3: Geological Investigation and Site Selection;
- (ç Stage 4: Schematic and Detailed Engineering Design;
- (ç Stage 5: Procurement and Construction;
- (ç Stage 6: Storage Operation; and
- (ç Stage 7: The implementing agency, South Africa National Energy Development Institute (SANEDI) and the GoSA will complete the closure of the PCSP after the completion of the TAP.

Stages 3 through 5, supported by the proposed TAP, will involve the exploration and shortlisting of potential sites for the PCSP implementation, the confirmation of a final site, and the design, and construction of the PCSP facilities. Stage 6, Storage Operation, will include the CO₂ delivery (by trucks) to the site, and CO₂ injection into the selected geological formation. The injection will be undertaken in accordance with an operational plan with the aim of meeting the objectives of the PCSP. The Storage Operation Stage is expected to carry out a program of CO₂ injections under various conditions, such as short- and longer-duration injections, testing of different injection rates, as well as testing of different monitoring technologies, protocols and operational conditions. Throughout the Storage Operation Stage, comprehensive, best-practice monitoring and verification

protocols will be developed and applied to ensure that the project is operating within the safe operating window and that the CO₂ is behaving as expected and modeled. The injection of CO₂ is expected to last between 12 and 24 months. However, this may be extended if additional activities are needed and safe to perform to achieve further benefits. These additional activities could include the continuation of the CO₂ injection and/or monitoring and/or testing of the earlier stored CO₂. A decision to end the injection and complete the Operational Stage of the PCSP will be taken by the SANEDI PCSP Technical Advisory Panel during a review of the Stage 6 performance.

In the course of implementation of the PCSP, a comprehensive project management program will be developed and maintained, including the preparation of a PCSP execution plan and a PCSP risk assessment and management plan. The PCSP will be delivered, utilizing an approach with decision points, which are taken at the end of each stage.

Component 2: CO₂ Capture Pilot Plant. This component involves the preparation of a FEED study for a capture pilot plant to be built at a coal-fired power plant under construction in South Africa. The CCPP will be designed to be a CO₂ capture learning facility for the industry and academia and to serve as a hub for capacity building on CO₂ capture technologies across South Africa and in the region.

The execution of the CCPP is being undertaken in five stages. Component 2 of the proposed TAP will support only Stage 2, as outlined below. Stages 3 and 4 will be prepared and completed upon securing additional financing from the GoSA and/or the donors.

- (€ Stage 1: Pre-Feasibility ➤(this Stage is supported through the PTA.
- (€ Stage 2: FEED (to be supported by the proposed TAP);
- (€ Stage 3: Pilot Capture Plant Procurement and Construction;
- (€ Stage 4: Pilot Capture Plant Operation and Testing; and
- (€ Stage 5: Pilot Capture Plant Decommissioning.

Stage 2 will involve design of a CO₂ capture plant and its cost refinement, including the technical integration of the pilot capture plant into the host Kusile Power Plant. Stage 2 will be completed with the sign-off of the FEED study by SANEDI and the owner of the host plant, EESKOM. Stages 3 to 5 will be undertaken after the completion of the FEED study, if and when sufficient funding has been secured.

4. Project location and salient physical characteristics relevant to the safeguard analysis (if known)

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For Component 1, the Zululand Basin has been selected between the two basins, which were under consideration at the concept stage of the exploratory work. Exact locations for exploratory drilling have not been identified or selected yet, but the traverses for seismic testing have been determined. The traverses are located within the uMkhanyakude District Municipality, which hosts the iSimangaliso Wetland Park, a UNESCO World Heritage Site. The traverses do not penetrate the Park boundary. Approximately half of the traverses length is within the Park buffer zone, but always along the roads or established public tracks. The seismic survey does not involve explosives and is consistent with the activities permitted within the buffer zone. In addition to the Park, the area contains extensive smaller wetlands and significant areas that have been disturbed by agricultural activity. Approximately two-thirds of the seismic survey will be carried out in road reserves, where little or no vegetation pruning will be necessary. More extensive pruning will be required for the remaining one-third along public tracks and firebreaks, but root systems will not be disturbed. Up to three wells will be drilled, intended to be located on disturbed land.

The preliminary design for the CO₂ Carbon Capture Plant is for a 50 tons/day CO₂ facility, to be

located on a 50m square plot, entirely within the footprint of the ESKOM owned Kusile coal-fired Power Plant, which is under construction in the Emalahleni district, Mpumalanga province of the Republic of South Africa. The US Export-Import Bank provided US\$805 million to finance the construction of the plant. ESKOM has prepared a comprehensive Environmental and Social Impact Assessment for the Kusile Power Plant that is found to be consistent with the Bank's environment and social safeguards policies. It is anticipated that the Kusile Power Plant will be completed in 2022. Component 2 of the TAP will only however cover the CCPP Front-End Engineering Design but not the consecutive stages of the CCPP development.

5. Environmental and Social Safeguards Specialists

Helen Z. Shahriari (GSU07)

Sanjay Srivastava (GEN01)

Thomas E. Walton (GEN01)

6. Safeguard Policies	Triggered?	Explanation (Optional)
Environmental Assessment OP/BP 4.01	Yes	<p>The PCSP (Component 1) could cause significant environment and social impacts due to injection of CO₂ into deep, permeable geologic formations. A site specific ESIA with ESMP for the storage facility will be prepared when the location is known, to analyze the risks and impacts associated with leakage of CO₂ through the impermeable confining stratum (caprock); release of CO₂ via the injection well; induced seismicity; degradation of water quality in shallow aquifers as a result of drilling exploration and injection wells, or due to leaking CO₂; and changes in soil chemistry and micro biota caused by leaking CO₂. A separate ESIA with an ESMP has already been prepared for the seismic survey and test drilling that will provide the data necessary for storage site selection.</p> <p>Eskom has prepared an ESIA for Component 2, which is consistent with the requirement of OP4.01. Eskom will update this ESIA when more detail is available on the design of the CCPP and will incorporate the associated mitigation and monitoring measures in the ESMPs for construction and operation of the Kusile plant.</p>
Natural Habitats OP/BP 4.04	Yes	<p>The site specific ESIA for the carbon storage site will assess possible direct or indirect impacts on any critical or natural habitats once the site/location has been identified. The ESIA for the seismic survey and drilling has determined that there will be no impact on critical natural habitat, i.e., the iSimangaliso Wetland Park World Heritage Site and no significant conversion of other natural habitat.</p> <p>The CCCP does not impose any additional impact on habitat beyond that already associated with the Kusile</p>

		power plant.
Forests OP/BP 4.36	No	There is no possibility of presence or impacts on Forest resources
Pest Management OP 4.09	No	There is no possibility of involvement of pesticides
Physical Cultural Resources OP/BP 4.11	No	There is no possibility of presence or impacts on Physical Cultural Resources
Indigenous Peoples OP/BP 4.10	No	There is no possibility of presence or impacts on IPs community.
Involuntary Resettlement OP/BP 4.12	No	The project is unlikely to involve any involuntary resettlement
Safety of Dams OP/BP 4.37	No	
Projects on International Waterways OP/BP 7.50	No	
Projects in Disputed Areas OP/BP 7.60	No	

II. Key Safeguard Policy Issues and Their Management

A. Summary of Key Safeguard Issues

1. Describe any safeguard issues and impacts associated with the proposed project. Identify and describe any potential large scale, significant and/or irreversible impacts:

Component 1 of the TAP has environment and social risks that will require mitigation. Technically, large CCS projects run the risk of having significant environment and social impacts due to injection of CO₂ into deep, permeable geologic formations. If the operation is not planned properly, potential adverse events could include leakage of CO₂ through the impermeable confining stratum (cap-rock); release of CO₂ via injection wells; induced seismicity; degradation of water quality in shallow aquifers (as a result of drilling exploration and injection wells, or due to leaking CO₂); and changes in soil chemistry and micro biota caused by leaking CO₂. Managing the risks of these impacts depends on proper selection of an injection site based on extensive geological data, application of good industrial standards in the design and installation of wells and tanks, and implementation of adequate monitoring systems and procedures. As part of the selection process for the proposed locations in the PCSP, sites will be pre-evaluated using a number of specific criteria, including the identified potential environmental and social impacts. Presently, available information indicates that the magnitude of these impacts will not be significant. For example, because of the pilot nature of the project, local seismic events that might occur when fluids are injected underground (similar to geothermal projects), will likely be small or negligible. Workplace and community health and safety risks from a sudden CO₂ release (either from the well or a ruptured storage tank) are not expected to be an important issue, either, since any release would involve a relatively small amount of gas, and it would be into an open rather than into a confined space. Therefore, the gas would disperse in the atmosphere quickly.

Other impacts, not unique to CO₂ injection, that will need to be managed are those associated with exploration (temporary access roads and wells drilling); with the construction of facilities (permanent access roads and storage, compression, and injection equipment); and with transport of

<p>CO₂ to the site by trucks. The potential impacts of the exploration identified in the ESIA include: contamination of water supply aquifers during test drilling; contamination of surface waters and wetlands by fuel or drilling fluid spills; chance finds of archaeological importance; and exposure of workers to noise and other workplace hazards. The ESMP provides measures to prevent or mitigate these potential impacts. No large-scale or irreversible impacts are anticipated from the exploratory activities or the pilot plant itself.</p>
<p>2. Describe any potential indirect and/or long term impacts due to anticipated future activities in the project area:</p>
<p>No significant indirect or long-term impacts are anticipated from the seismic survey and drilling, or from the pilot capture and storage facility. Should the pilot carbon capture plant prove successful, larger-scale capture and storage projects may be constructed that would likely have adverse environment and social impacts, and would require a comprehensive ESIA.</p>
<p>3. Describe any project alternatives (if relevant) considered to help avoid or minimize adverse impacts.</p>
<p>Initial plans considered using the cut lines cleared during the 1970s seismic survey and opening the existing oil exploration boreholes. However, the grown indigenous vegetation has reclaimed the cut lines, and the positions of the old wells could not be located using the available co-ordinates. The siting of new deep wells will only be confirmed on the basis of interpretation of new digital seismic profile data. Siting of the deep wells will take into consideration the public concerns over shallow groundwater, extensive wetlands, proximity of conservation areas, homesteads and agricultural sites. If possible, the deep wells will be located in disturbed commercial timber plantations that have well maintained road networks. The siting of the eventual carbon storage site will take into account the findings of a separate ESIA that will be prepared when a preferred area has been identified. Locating the CCCP within the Kusile Plant results in no significant impacts beyond those of the power plant itself.</p>
<p>4. Describe measures taken by the borrower to address safeguard policy issues. Provide an assessment of borrower capacity to plan and implement the measures described.</p>
<p>The proposed implementing agency is the South Africa National Energy Development Institute. SANEDI is a legal entity responsible for the preparation and implementation of the TAP, including the overall planning and implementation of the Pilot Carbon Storage Project and Carbon Capture Pilot Plant. The ESIA prepared by SANEDI includes a detailed ESMP for the seismic survey and drilling. The ESMP calls for an appointment of an independent Environmental Control Officer (ECO) to monitor and report on ESMP implementation – an arrangement that is standard procedure in the South African safeguards system – and contains terms of reference for the ECO. It also outlines a training and awareness program for the contractors – impact management for the capture plant. Mitigation and monitoring measures for the capture plant will be incorporated into the ESMS that Eskom has put in place for the Kusile plant.</p>
<p>5. Identify the key stakeholders and describe the mechanisms for consultation and disclosure on safeguard policies, with an emphasis on potentially affected people.</p>
<p>The South Africa Center for Carbon Capture and Storage (SACCCS), operating under SANEDI, initiated a CCS Public Engagement Project (CCS PE) in May 2012. National and Local Stakeholder Engagement Plans were prepared and rolled out in a phased manner in consultation with key strategic stakeholders. The focus of stakeholder interaction with uMkhanyakude DM is through their established community liaison network that was established during the public participation around the Environmental Management Framework studies, prepared for the municipality in 2010. Public participation is mainly through the ward committee system.</p>

B. Disclosure Requirements

Environmental Assessment/Audit/Management Plan/Other	
Date of receipt by the Bank	13-Jun-2016
Date of submission to InfoShop	26-Jul-2016
For category A projects, date of distributing the Executive Summary of the EA to the Executive Directors	
"In country" Disclosure	
South Africa	15-Mar-2016
<i>Comments:</i> "In country" Disclosure ➤(March 15, 2016 (Component 2 ESIA) and June 13, 2016 (Component 1 ESIA).	
If the project triggers the Pest Management and/or Physical Cultural Resources policies, the respective issues are to be addressed and disclosed as part of the Environmental Assessment/Audit/or EMP.	
If in-country disclosure of any of the above documents is not expected, please explain why:	
n/a	

C. Compliance Monitoring Indicators at the Corporate Level

OP/BP/GP 4.01 - Environment Assessment	
Does the project require a stand-alone EA (including EMP) report?	Yes [<input checked="" type="checkbox"/>] No [<input type="checkbox"/>] NA [<input type="checkbox"/>]
If yes, then did the Regional Environment Unit or Practice Manager (PM) review and approve the EA report?	Yes [<input checked="" type="checkbox"/>] No [<input type="checkbox"/>] NA [<input type="checkbox"/>]
Are the cost and the accountabilities for the EMP incorporated in the credit/loan?	Yes [<input checked="" type="checkbox"/>] No [<input type="checkbox"/>] NA [<input type="checkbox"/>]
OP/BP 4.04 - Natural Habitats	
Would the project result in any significant conversion or degradation of critical natural habitats?	Yes [<input type="checkbox"/>] No [<input checked="" type="checkbox"/>] NA [<input type="checkbox"/>]
If the project would result in significant conversion or degradation of other (non-critical) natural habitats, does the project include mitigation measures acceptable to the Bank?	Yes [<input type="checkbox"/>] No [<input type="checkbox"/>] NA [<input checked="" type="checkbox"/>]
The World Bank Policy on Disclosure of Information	
Have relevant safeguard policies documents been sent to the World Bank's Infoshop?	Yes [<input checked="" type="checkbox"/>] No [<input type="checkbox"/>] NA [<input type="checkbox"/>]
Have relevant documents been disclosed in-country in a public place in a form and language that are understandable and accessible to project-affected groups and local NGOs?	Yes [<input checked="" type="checkbox"/>] No [<input type="checkbox"/>] NA [<input type="checkbox"/>]
All Safeguard Policies	
Have satisfactory calendar, budget and clear institutional responsibilities been prepared for the implementation of measures related to safeguard policies?	Yes [<input checked="" type="checkbox"/>] No [<input type="checkbox"/>] NA [<input type="checkbox"/>]
Have costs related to safeguard policy measures been included in the project cost?	Yes [<input checked="" type="checkbox"/>] No [<input type="checkbox"/>] NA [<input type="checkbox"/>]

Does the Monitoring and Evaluation system of the project include the monitoring of safeguard impacts and measures related to safeguard policies?	Yes [<input checked="" type="checkbox"/>] No [<input type="checkbox"/>] NA [<input type="checkbox"/>]
Have satisfactory implementation arrangements been agreed with the borrower and the same been adequately reflected in the project legal documents?	Yes [<input checked="" type="checkbox"/>] No [<input type="checkbox"/>] NA [<input type="checkbox"/>]

III. APPROVALS

Task Team Leader(s):	Name: Nataliya Kulichenko	
<i>Approved By</i>		
Safeguards Advisor:	Name: Nathalie S. Munzberg (SA)	Date: 11-Aug-2016
Practice Manager/ Manager:	Name: Sameer Shukla (PMGR)	Date: 13-Aug-2016