ABSTRACT SUMMARY

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Abstract Summary

This abstract below is a summary of a consultancy assignment that was completed for DFID South Africa between February 2013 and March 2014 by a team commissioned though the Evidence on Demand Framework Agreement and is based on the final more detailed synopsis report delivered to DFID on 29 September 2014.

Background

The South African National Carbon Sink Assessment provided an unprecedented opportunity to explore the nature of terrestrial carbon stocks and fluxes at a national scale and to evaluate all climate change mitigation opportunities within the land-use (AFOLU) sector. Work had previously been done on carbon stocks and fluxes, in particular biomes, as well as climate change mitigation activities at a project scale in certain locations, however a comprehensive analysis at a national scale had been lacking and certainly needed.

First estimate of terrestrial carbon stocks and fluxes

The national carbon stock consists of a set of linked and interacting sub-stocks (called 'pools') which change over time: slowly in the case of soil carbon, moderately quickly in the case of woody biomass, and rapidly in the case of herbaceous and litter carbon. The carbon flows between the pools, and between the land and the atmosphere, land and ocean, and land and human systems are called fluxes.

Terrestrial Carbon Stocks in South Africa

The main determinants of terrestrial carbon stocks are plant-available moisture, temperature, soil conditions and vegetation cover. Soil, woody-plant and herbaceous biomass carbon stocks increase from the arid areas in the western part of the country, to the moister eastern seaboard of South Africa. Carbon stocks in the Karoo and desert biomes are very low, while the highest carbon stocks per hectare are found in the coastal and montane forests. The spatial extent of these forests (and plantation forests) is small compared to the extensive grassland and savanna biomes, which have intermediate per-hectare carbon stocks, and thus dominate the national stock accounts (Map 1, Tables 5 and 6). The grassland biome contains many planted trees, which add to their carbon stocks. Carbon stocks in the fynbos are quite low, due to frequent fires. Stocks in intact thickets are quite high, given the dry environments in which they occur in the southern and Eastern Cape, but their spatial extent is small.

Terrestrial Ecosystem Carbon Fluxes in South Africa

In the undisturbed 'equilibrium' state, Gross Primary Production approximately equals ecosystem respiration (Reco + Fire) over the long-term and at large scales. Simply put - for all the additional carbon that is accumulated in biomass through plant growth each year, an equal amount is released back into the atmosphere through respiration and fire. Although South Africa is not 'undisturbed' and the global carbon cycle is currently not at equilibrium, the balance between production and respiration remains quite close to zero.

Modelling the effect of predicted climate change and elevated atmospheric CO_2 on terrestrial carbon stocks

First we need to understand how the terrestrial carbon stocks and fluxes (reported in Section 1.1) may change in the future, and second, how the outcome of land-based climate change mitigation activities (identified in Section 2) may be influenced by changes in climate and

elevated [CO_2]. Due to pure time and cost practicalities, a modelling approach is typically used to assess the potential influence of changes in climate and elevated [CO_2] on carbon dynamics in terrestrial ecosystems.

Two principle scenarios were modelled:

- The effect of climate change and elevated [CO2] on existing carbon stocks in each vegetation type;
- And, the effect of climate change and elevated [CO2] on the rate of carbon sequestration during the restoration of degraded ecosystems.

The first scenario will allow one to understand the potential impact of climate change on the national terrestrial carbon stock and activities that reduce emissions from deforestation and forest degradation (REDD). The second will provide an estimate of the influence of climate change on afforestation, reforestation and grassland management activities as well as the rate of biomass accumulation in the context of Biomass to Energy initiatives.

Modelling of '2020' Future South African Land-Cover

The modelled '2020' land-cover dataset is not strictly linked to that specific year, but is rather an interpretation of a likely scenario in approximately 10 – 15 years' time. The future changes are based on potential landscape changes arising from either planned or highly likely land-use changes, associated developments, and resultant land-cover changes, linked (if possible) to current or proposed legislation. Geographical restrictions on land-cover and land-use changes have been included within the modelling process by using current and potentially protected, conserved and environmentally sensitive areas likely to be safeguarded from change through an EIA or similar legislated processes. The reported areas of each land-cover cannot be seen as exact measurements, but rather as comparative modelled areas, which approximate to real-world land-cover area statistics. Due to the modelling processes and data inputs used, it should be clearly understood and communicated to all end-users that the 2020 land-cover product, as with the 2001, 2005 and 2010 land-cover products, has been developed ***specifically*** in support of the DEA carbon stock reporting information needs and should ***not*** be considered a new national land-cover dataset for wider application without full knowledge and understanding of the manner and processes by which it has been generated. Full disclosure of the data sources, data inputs, data modelling and final model outputs are provided in Section 1.4 report.

Understanding potential climate change mitigation opportunities

The concept of land-use based climate change mitigation is certainly not new in South Africa. Several parties located in the public and private sectors have extensive experience in implementing climate change mitigation and adaptation options. Moreover, substantial expertise exists in the development of related ecosystem service and ecological infrastructure activities.

Eight prominent land-use based climate change mitigation activities were identified:

1. Restoring sub-tropical thicket and forests;
2. Restoration and management of grasslands;
3. Commercial small-grower afforestation;
4. Anaerobic biogas digesters;
5. Biochar production and application;
6. Reduced Emissions from Degradation and Deforestation;
7. Reduced Tillage;

8. Biomass to energy.

Supporting Policy: Current status and future needs

1. A review of existing policy – the NCCRP noted that an audit and gap analysis of various sector policies must be undertaken to identify areas of weakness and to establish a firm foundation from which the development of policy responses can be designed. The review was guided by the White Paper as well as the outcomes of Section 1 and 2.
2. Suggested future amendments to policy – this component focused on two broad objectives, (i) addressing the gaps and issues identified in the initial review, and (ii) creating an enabling environment for the eight climate change mitigation opportunities identified in Section 2 of the National Carbon Sink Assessment.

Key Results

Five key outcomes that are important to members of Government that focuses on climate change matters and sustainable resource management:

1. The majority of South Africa's terrestrial carbon stock is located belowground in grassland and savanna ecosystems;
2. Climate change itself may not present a considerable risk to land-use based mitigation activities;
3. Eight principle mitigation opportunities were identified but they differ in terms of "readiness" and their additional social and environmental benefits;
4. There are two predominant barriers to implementation: a lack of clear incentives and institutional support;
5. The close alignment between land-use based climate change mitigation and adaptation and restoration of ecological infrastructure needs to be formally acknowledged and leveraged.

Potential Next Steps

Taking direction from national policy and the outcomes of this National Carbon Sink Assessment, we assume that the overall long-term goal is broadly three-fold:

i. To improve our understanding of carbon stocks and fluxes to fulfil South Africa's national GHG reporting requirements and to allow Government to direct policy and implementation from a position of knowledge.
ii. To realize all climate change mitigation activities that are reasonably possible in terms of social, economic and environmental implications
iii. To create alignment with existing programs and policy to ensure a cohesive approach to natural resource management that is effective and efficient.

FINAL REPORTS PRODUCED AS PART OF THE CARBON SINKS PROGRAMME

- Section 1 - March 2014
- Section 2 - 07 July 2014
- Section 3.1 - 01 May 2014
- Section 3.2 - 23 June 2014
- Synopsis - 29 September 2014
- Abstract summary - 07 November 2014