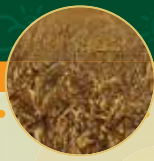


South African National Carbon Sink Assessment:

Assessment: suggested future amendments to policy

section FOUR





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Acronyms

AFOLU	Agriculture, Forestry and Other Land Use
ARC	Agricultural Research Council
CARA	Conservation of Agricultural Resources Act
CDM	Clean Development Mechanism
COP	Conferences of the Parties
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DFID	Department for International Development
DME	Department of Minerals and Energy
DMOSS	Durban Metropolitan Open Space System
DNA	Designated National Authority
DTI	Department of Trade and Industry
DWA	Department of Water Affairs
EIA	Environmental Impact Assessment
GHG	Greenhouse Gas Emissions
IPAP	Industrial Policy and Action Plan
IPCC	Intergovernmental Panel on Climate Change
LUPO	Land use planning ordinance
MTSF	Medium-term Strategic Framework
NAMA	Nationally Appropriate Mitigation Actions
NCCRP	National Climate Change Response Policy
NDP	National Development Plan
NEMA	National Environmental Management Act
NERSA	National Energy Regulator of South Africa
NFA	National Forests Act
NFU	National Facilitation Unit
NGO	Non-governmental organization
NGP	National Growth Path
NPAES	National Protected Areas Expansion Strategy
REDD	Reduced Emissions from Deforestation and Degradation (through planning and regulation)
REDD+	Reducing emissions from deforestation and forest degradation in developing countries; and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SANBI	South African National Biodiversity Institute
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
SIP	Strategic Infrastructure Projects
SPLUMA	Spatial Planning and Land Use Act
UNESCO	United National Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard

Introduction

Building on the previous section, this analysis focuses on creating a policy environment that enables and encourages a reduction in emissions from the land-use sector and stimulates activities that lead to an increase in the size of the national terrestrial carbon stock.

In terms of the scope of the analysis and its boundaries, the aim is to provide Government with an understanding of potential changes that may need to be made to policy to create an enabling environment for the rollout of climate change mitigation activities. The decision to include the changes or how they may be incorporated into a specific policy document is beyond the scope of this analysis.

Two broad areas in which policy may need to be reviewed, were identified during the development of the two initial components and extensive stakeholder engagement:

- The first focuses on creating an enabling environment for the eight principal land-use based climate change mitigation activities identified in the second section of the project.

- The second aims at guiding current and future land-use decisions in a manner that reduces release of carbon into the atmosphere and maintains and increases the size of the national carbon pool over the long-term.

The distinction between these two broad areas is due to the nature of required activities. The first focus area is driven by the outcomes of the mitigation option analysis in Section 2 of the National Carbon Sink Assessment (NCSA). It is more immediate and specifically focuses on creating an enabling environment for the eight identified implementation options as well as creation of a National Facilitation Unit (NFU) and National Payment Facility. The second focus area is far broader in scope, considering the management of carbon stocks and land-use based GHG emissions in all landscapes, beyond the boundaries of formal mitigation activities. Stakeholders repeatedly identified this area as a missing element and therefore it has been give clear separate consideration below.



Section 1 – SECTION 4

Creating an enabling environment for formal climate change mitigation activities

Phase 2 of the NCSA focused not only on identifying the principle land-use based climate change mitigation activities, but also on understanding the costs thereof and how to create an enabling environment for the expanded rollout of activities across the country. The analysis was informed by the outcomes of Section 1 and an extensive stakeholder engagement process where the project team met with members of local and national Government as well as parties based in the private and NGO sectors.

The outcome was the identification of eight principal mitigation options (Table 1) as well as the need to create a National Facilitation Unit (NFU). The rationale for the NFU is based on the need to address a similar set of barriers that were repeatedly identified by several practitioners and are often common across a number of different types of mitigation activities - for example, the need for a cost-efficient monitoring, reporting and verification mechanism.

Table 1. The eight principle land-use based climate change mitigation activities in South Africa

Activity	Sub-class	Spatial extent (ha)	Reduction per ha per yr (tC)	Emission reduction per yr (tCO ₂ e)
Restoration of sub-tropical thicket, forests and woodlands	Sub-tropical thicket	500 000	1,2	2 200 000
	Coastal and scarp forests	8 570	1,8	56 562
	Broadleaf woodland	300 000	1,1	1 210 000
Restoration and management of grasslands	Restoration - Erosion Mesic	270 000	0,7	693 000
	Restoration - Erosion Dry	320 000	0,5	586 667
	Restoration - Grasslands	600 000	0,5	1 100 000
	Avoided degradation mesic	15 000	1,0	55 000
Commercial small-grower afforestation	Eastern Cape	60 000	1,5	330 000
	KwaZulu-Natal	40 000	1,5	220 000
Biomass energy	Country-wide			1 990 316
	Bagasse - Country-wide			328 955
Anaerobic biogas digesters	Country-wide			3 642 408
Biochar		700 000	0,3	641 667
Reduced tillage		2 878 960	0,1	1 055 619
Reducing deforestation and degradation	Through planning	unknown		
	Through regulation	unknown		
Total				14 110 193

Please see the Section 2 report for a detailed description on how the activities were identified and assessed.

In addition to the need for a NFU, field practitioners and entities within local and national Government listed a broader set of issues and barriers to implementation that they had either experienced or observed (Table 2). On further consideration of the list, two important findings become apparent.

The **first** finding is that the eight identified mitigation opportunities (Table 1) exist on a ‘continuum of readiness’, from those that could be realized in the near-term, to those that require substantial additional research and development prior to implementation:

- **Short-term options** – Biomass energy, anaerobic biogas digesters and commercial afforestation are well positioned for implementation and expanded rollout in the near term. Each opportunity has been thoroughly researched, is well known and in certain cases, implementation has already started (e.g. for internal electricity generation needs). As discussed in detail in Section 1.3, a small number of important obstacles need to be addressed and then implementation could occur at scale.
- **Short to medium term options** – The opportunity to restore sub-tropical thicket, forests and woodland as well as the restore and manage of grasslands is

relatively well known, with substantial research already undertaken on the biophysical and financial feasibility of ventures as well as the design of appropriate models. Although these activities may not rollout as quickly as the short-term options above, if a number of key barriers were addressed, significant implementation could occur in the short- to medium- term.

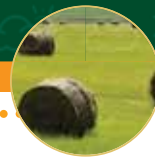
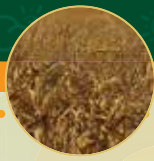
- **Medium to long-term options** – Opportunities for Biochar, reduced tillage and REDD (through planning and regulation) are less well advanced than the activities listed above. This should not discount their value and importance. It would be prudent to initiate research into the biophysical, financial and implementation aspects of these activities to ensure that they are brought on line as soon as possible.

The **second** finding is that there are two important barriers that are common across nearly the full set of projects: (i) a lack of long-term sustainable financial incentives for land-use based climate change mitigation activities, and (ii) the absence of a national or provincial facilitation unit that addresses crucial capacity, awareness and efficiency issues. From stakeholder discussions, it was noted, if these two common barriers were adequately addressed and resolved, that especially the first five activities could be rolled out relatively quickly in the near term.¹²

Table 2. Barriers shared amongst the Top 8 implementation opportunities

Activities Barriers	REFOR	GRASS	COMMFOR	BIOMASS	BIOGAS	BIOCHAR	AGRIC	REDD
Lack of consistent, sustainable financial incentives	X	X	X			X	X	X
High cost of monitoring, evaluation and certification	X	X	X			X	X	X
Difficulty in accessing capital / prohibitive interests rates			X	X	X			
Extent or existence of carbon benefits unclear						X	X	
Land tenure challenges		X						X
Limited understanding of key carbon sequestration metrics						X	X	
Limited technical knowledge and training support		X				X	X	

¹² The challenges presented by these barriers have also been raised in other forums, recently, for example, by the African Group’s submission to the UNFCCC’s Subsidiary Body for Scientific and Technological Advice 38th session held in June 2013 (UNFCCC 2013).



In the policy analysis below, we first consider these two more predominant common issues (the need to create a National Facilitation Unit as well as long-term sustainable financing) and then focuses on policy considerations specific to each form of mitigation activity. Whereas the two common issues dominate, there are a number of particular, but vital barriers that need to be addressed for certain mitigation options to be realized.

1.1 Addressing common barriers: support for a NFU and long-term finance

Lack of consistent, sustainable financial incentives

Stakeholders consistently stressed the extent to which a lack of clear and consistent financial incentives for land-based climate change mitigation activities inhibited their ability to implement large-scale initiatives. Due to the opacity of the carbon markets both in terms of demand and pricing, perceived risk inhibited greater project development.

The first risk involves financial commitments to a cost-heavy certification process. Secondly, stakeholders were concerned about their ability to successfully enter into and negotiate a favorable carbon offsets purchase agreement. In recent years, international carbon markets have declined steeply with regard to both total volume demanded and price. A recent study by the Interim Forest Finance Project, forecast that demand for REDD carbon credits between 2015 and 2020 would only absorb 3% of the total expected supply. Stakeholder statements corroborate anecdotal evidence, which suggests that certification of a well-designed project is no guarantee of market access, sales or favorable pricing which would justify upfront development costs and long-term management.

Carbon markets aside, stakeholders noted that short-term grants, subsidies, and donor or corporate support was not sufficient to ensure long-term project viability. Land-based climate change mitigation interventions (biogas and biomass energy aside) require long-term management and upkeep of substantial areas of land to ensure permanence. Short-term financial support is insufficient to meet this need, and subjects a project to the threat of potential abandonment and consequent land conversion.

High cost burdens of monitoring, evaluation and certification

Stakeholders voiced concerns over the monitoring, reporting and verification expectations, and questioned the efficacy of such obligations. They shared experiences of attempting to develop carbon projects using internationally recognized methodologies, citing the extensive research timelines and the slow certification process. One group, not short on manpower or technical expertise, noted that

even after two years the certification process remained on going. Stakeholders noted that such burdens made it near impossible to rely on the carbon offsets income stream, despite the original, commonly held belief that the sale of generated emission reduction units (carbon offsets), represented a safe and sure form of finance.

Unlike energy or industrial carbon offset projects, projects originating from the land-use sector tend to have higher monitoring, reporting, and verification burdens. Methodologies approved by the CDM and the VCS for REDD+ and afforestation/reforestation activities typically require in-depth, field-based measurements and assessments, multi-temporal satellite imagery analysis at numerous intervals over a historic time-period and the development of spatial statistical models to illustrate before and after project scenarios. This usually requires project developers to rely on outside, technical service providers, further driving up development costs. These methodological requirements differentiate the land-use sector from other carbon-offset types, which tend to rely on pre-determined conversion factors and have fewer complicated variables to monitor. Validation costs, before the roll-out of the actual project, can be inhibitory.

The burdens on the land-use sector in the carbon offsets space is clearly illustrated in the penetration of the asset class into the market. Of the 7,448 registered projects under the CDM (February 2014), only 52 are land-use projects (0,6%). Fifty-one of these are reforestation/afforestation projects, while the remaining one is a soil conservation initiative. Thirteen projects are based in Africa, primarily in Uganda and Kenya. Under the VCS, 83 land-based projects have been registered, or 0,7% of the total 1,153 projects that have been validated to the standard. Thirteen of these projects were developed in Africa, and only one small-scale project is based in South Africa, though it has yet to verify any emission reductions for sale. Considering that only one of 135 total registered land-based projects across both the CDM and VCS is based in South Africa, and that it has yet to sell credits through either of these standards, it is not surprising that project developers in South Africa question the validity of the approach in driving wide-scale implementation of land-based climate change mitigation projects.

Difficulties in accessing upfront capital / prohibitive interest rates

Practitioners developing biomass to energy, biogas and smallholder commercial forestry stressed that these interventions require high upfront capital investments. Without privileged access to favorable interest rates, grants or subsidies, developers were concerned that projects may have difficulty in moving beyond the feasibility stage. It was noted that smallholder commercial forestry groups, in particular, face challenges in securing favorable interest rates, as banks have historically viewed these groups as

a high credit risk. Similarly, biogas and biomass to energy projects, whilst dependent on well-tested technologies typically imported from Europe, have had little large-scale uptake in South Africa and thus remain relatively unknown to local finance institutions. The novelty of the technology has resulted in difficulties in securing capital.

It should be noted though, that access to capital at favorable interest rates was noted as the only significant barrier to implementation noted for smallholder commercial forestry. If this issue could be addressed, significant implementation could occur at scale in the near term.

1.1.1 Addressing common barriers through policy reform

Three overarching policy reforms were identified that once implemented, will fast track the rollout of land-based climate change mitigation activities. These policy reforms address the common barriers discussed above as well as the capacity, efficiency and awareness issues raised in the Section 2 report focused on the feasibility and potential structure of implementation models. By addressing these barriers, the top five principal implementation opportunities (reforestation of forests and thicket, grassland rehabilitation, small-scale commercial forestry, biomass to energy and biogas) could rollout in the short to medium term, reaching scale within 10-15 years. The recommendations are detailed below.

Development of a National Facilitation Unit

As noted, the majority of stakeholders voiced the need for an overarching facilitation unit that could provide awareness, extension and research support, create and deploy an efficient national monitoring, reporting and verification system, and facilitate efficient and sustainable financial incentives for climate change mitigation activities. Given the specific complexities and challenges of land-based climate change mitigation activities, it is foreseen that an entity dedicated to their support, development and integrity is essential to their realization.

An Act of Parliament would be required to establish the National Facilitation Unit, its objectives, governance, financial structure, legal standing, staffing and so forth. The location of the unit in Government would be determined following the appropriate stakeholder consultation procedures.

The concept of a National Facilitation Unit, its rationale and potential initial structure is described at length in Section 2 report on implementation options and models. It should be noted that the intention would be to start small. In light of the government's commitment to decrease inefficiencies in departments it is envisaged that the NFU would start as a lean organization, staffed with only the most essential posts. An initial focused team of 4-6 individuals could address many of the identified obstacles facing the Top 5

implementation opportunities and commission dedicated research programmes on the remain three. Once there is good 'proof of concept', the unit would be gradually increased in size. Discrete and replicable pilot-projects would be undertaken with the support of the NFU as a means for establishing proof of concept.

Establishment of a Payment Mechanism Facility

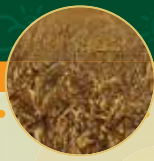
Practitioners within Government and private sector noted that a centralised national-level payment mechanism should be established to streamline payments for compliant activities, provide financial management oversight, explore new potential sources of funding and finance for climate change mitigation activities and ensure the appropriate disbursement of incentives. This is especially important for smaller projects and emerging landowners who have little access to international funding and carbon revenues.

The adoption of a national-level approach to mitigating climate change through land-based activities will necessarily require an institutional structure to ensure that payments (incentives) are processed and distributed in a timeous manner. It will also help avoid duplication in funding efforts, which are currently fragmented and inefficient, and have different application requirements and standards.

It is envisaged that through an Act of Parliament, the legal basis for establishment of a payment mechanism facility will be authorized. The Act should cover, but is not limited to considerations such as primary objectives, functions and duties, governance and management, the types of revenue streams the mechanism can accept, and financing of the mechanism. The primary roles of the payment mechanism would be to:

- Manage payments to individuals or entities that have successfully undertaken land-use based climate change mitigation activities, based on a net reduction in Greenhouse Gas emissions, and based on a schedule that will encourage the continued participation of implementers.
- Identify and develop new income streams from which payments can be made (see next section below for more detail)
- Facilitate strategic forms of financial support to new progressive implementation options that may have greater strategic national value (e.g. the restoration of high-altitude grassland catchments in line with the proposed SIP 19 focused on ecological infrastructure, sustainable water services and job creation in remote rural areas).

A considerable stakeholder engagement process would be required within government to determine where the payment mechanism would be located, and what department or Ministry will be responsible for its management. Such an exercise is beyond the scope of this particular piece of



work, and should be given considerable attention in future phases of the project.

Creation of demand for implementation activities

A recurrent shortcoming in a number of national-level efforts to develop land-based carbon offset programmes, REDD+ in particular, is the primary focus on the architecture of assessing, approving, monitoring, certifying and reporting on emissions reductions. Whilst critical to the success of a program, these efforts have not been complemented by the equally important exercise of determining a source of long-term demand to fund project implementation. For this reason, it will be important for the Payment Mechanism Facility, once established, to focus its efforts first and foremost on the identification of potential income streams, and the types of policies that may need to be established to promote their access. Without this necessary demand identified and secured, a national-scale initiative will risk losing the confidence and buy-in of its potential participants.

Understandably, this approach presents a conundrum. On one hand, there is significant legislative effort and resource allocation required to establish an Act to create a Payment Mechanism Facility. Once established, it may be discovered that demand for land-based climate change mitigation activities is minimal to non-existent. On the other hand, a Payment Mechanism Facility presents a unique opportunity to explore demand and income stream diversification through an established institutional entity embedded in government. It may be that an interim Payment Mechanism Facility is created, with an agreed timeline for establishing an early revenue stream from which pilot projects can be undertaken. Dissolution of the entity could be a measure of last resort in the event that demand cannot be established.

It is envisaged that a number of income streams would flow into the facility, diversifying revenue outlets and reducing reliance on a single source of finance. Both market and non-market sources for payments should be considered. These would be streamlined into one account, from which payments to project developers would be based on adherence to a single set of validation, monitoring and reporting protocols. Amongst the revenue streams that the Payment Mechanism Facility could consider, it is recommended that the following be analyzed, both in terms of potential uptake of carbon offsets and for favorable pricing.

South African Carbon Tax Policy:

In early discussions with members of Treasury, the possibility of recognizing land-use sector activities in a carbon offset mechanism and the recycling of carbon tax revenues were considered. The roll-out of land-use based climate change mitigation activities aligns with South Africa's greater climate change mandate, which is to reduce GHG emissions, reduce exposure of the rural poor to climate change, and promote ecosystem-based adaptation. In the

next phase of development, it is recommended that the DEA work closely with Treasury to explore the ways in which the eight implementation activities can benefit from the tax – through offsets, revenue recycling or a combination of both. Potential means for structuring the offsets approach to best promote land-based projects is discussed below in “Development of a National Facilitation Unit.”

International demand for carbon offsets:

Although current demand for land-based carbon offsets is low, as are prices, there is growing international interest in and consensus around the need to finalize finance mechanisms for REDD+. To-date, the majority of REDD finance has been directed towards “readiness” and capacity building, but not towards long-term payment mechanisms for certified emissions reductions. During the UNFCCC annual meeting (COP), held in Warsaw in 2013, it was agreed that REDD financing is critical to development of the activity, and should come from international groups such as the Green Climate Fund. As a new international climate agreement should be reached in 2015, it is envisaged that a single set of rules will facilitate project developers’ access to REDD-specific funds during the 2015-2020 “interim” period. This “interim” period covers the five years during which an international compliance market, which will include REDD+, is to be negotiated. It is also a period during which access to REDD+ finance has been highlighted as a critical gap. It is provisionally expected that a UNFCCC-regulated international compliance market would come into effect in 2020. In addition, there are on-going discussions around the land sector post 2020.

It is recommended that the Payment Mechanism Facility work with the relevant government authorities to ensure that South African policies are aligned with both the interim period and that South Africa plays a pro-active role in forming international REDD+ policy so that it is aligned with South Africa's (and Africa's) context and needs. Of particular importance, is the growing consensus that REDD+ activities should include the broader landscape surrounding forests, so as to include agriculture, soil management, and grazing activities into a REDD accounting framework. As there is a large opportunity for such interventions in South Africa, it is recommended that the Payment Mechanisms Facility team participate in international climate negotiations and preparation, and contribute to the architecture of these agreements and funding mechanisms relating to the AFOLU sector. Although these payments have been difficult to access in the past, the focus appears to be shifting away from “readiness” to payments for results-based REDD+ efforts, and could signal a new and progressive era in REDD+ funding. Work has already begun on the finance architecture for the results-based payments of REDD+ activities (UNFCCC decision 10/CP.19). It is envisaged that the GCF will play a key role in the results-based funding of REDD+ (UNFCCC decision 9/CP.19). The country REDD+ national entity or focal point that will be designated in terms

of UNFCCC decision 10/CP.19, should also work closely with the PMF on issues relating to international support for implementation of REDD+ activities.

Funds associated with Nationally Appropriate Mitigation Actions (NAMAs):

Nationally Appropriate Mitigation Actions (NAMAs) are “concrete projects, policies, and/or programmes that shift a technology or sector in a country onto a low-carbon development trajectory” (UNDP 2014). NAMAs allow countries to undertake large-scale sectorial initiatives that at once reduce GHG emissions and meet local development needs. The institutional framework for (NAMAs was established at the Bali United Nations Climate Change Convention (UNFCCC) Conference of the Parties (COP) in 2007. During the Copenhagen COP (2009), a number of countries submitted the first reports on their NAMA efforts. In 2010, at the Cancun COP, it was determined that developing countries would undertake “nationally appropriate mitigation actions in the context of sustainable development, supported and enabled by technology, financing and capacity-building, aimed at achieving a deviation in emissions relative to ‘business as usual’ emissions in 2020” (UNFCCC, 2010). At this time, it was determined that both domestic and internationally financed NAMAs could be developed.

To-date, 95 NAMAs have been developed, as well as a number of feasibility studies across 35 countries. NAMAs have had a consistent focus on energy supply, transport and energy efficiency while only 6% have been devoted to forestry and agriculture (Ecofys NAMA database 2014, Center for Clean Air Policy 2013). Over half of the NAMAs remain in the concept and planning phase, with only two reportedly in the implementation stage (Center for Clean Air Policy 2013). Of these, 44 NAMAs have been entered into the UNFCCC reporting database (Center for Clean Air Policy 2013).

NAMAs can either be funded by the host country (the SA Green Fund, for example), or through bi-lateral agreements, overseas development assistance and climate funds (for example, the Green Climate Fund, the Global Environment Facility’s new NAMA support portfolio). No particular policy changes appear to need to be made in South Africa to submit a NAMA to the UNFCCC and seek finance both domestically and abroad. The Payment Mechanism Facility should play a role in preparing funding documentation, managing engagement with potential funders, and negotiating contracts and finance windows. It should lobby for the inclusion of land-based mitigation activities in the roster of South African NAMAs, to ensure that the sector is not sidelined in favor of more traditional NAMA activities in the energy, transport and building sectors.

Government subsidies and grants:

The Payment Mechanism Facility team should collaborate with the Minister of Finance and Treasury to consider the ways in which the government fiscus can support payments to land-based climate change mitigation actions. Budget allocation to the eight principle mitigation opportunities will support a number of government priorities – from job creation, ecological infrastructure development and management, to climate change adaptation, clean energy production and food security. Careful alignment with programmes with pre-existing earmarked budgets are likely to unlock specific grants and subsidies, ensuring an optimal deployment of financial resources.

1.2 The policy environment of the top 8 activities and potential barriers

The analysis in this section aims to understand the extent to which relevant policies support the rollout of land-based climate change mitigation opportunities at a national scale, and which, if any, changes may be required in policy to create a more favorable implementation environment. In all instances it was found that there are no policies that explicitly prohibit the implementation of any of the eight proposed activities.

Policy support for each climate change mitigation activity is reviewed in three phases:

1. An assessment of whether a mandate for undertaking the activity exists within the Top 30 policies identified in the initial policy review (see Section 3.1 report: “Review of Existing Pertinent Policies”), or other relevant policies as deemed appropriate:
 - By determining whether there is a broad level of support for the mitigation activity.
 - By determining whether there is a clear, articulated focus on the activity
 - By identifying which, if any targets, exist to guide implementation of the activity
1. A review of particular barriers that may currently impede the national-scale rollout of the activity
2. Discussion of the types of changes to policy that would strengthen the mandate for each activity. This phase also includes identifying the ways in which policy might address the project specific barriers discussed in point (2).

For further reference, Annex A provides an extensive list of each of the policies described in this section that broadly support the 8 implementation activities.



1.2.1 Restoration of sub-tropical thicket, woodlands and forests

Pertinent policies

Table 3 provides a summary of the policies that either broadly support, make direct reference to or provide targets for the reforestation of forest and thicket biomes in South Africa. The list demonstrates that although there is broad-level support for restoration efforts generally, fewer policies provide a clear focus on the activity. Targets for restoration of forests and thickets are limited. This could also be attributed to the lack of concrete and accurate nationally quantified deforestation and degradation rates.

Is there broad support?

There is recognition across the 13 policies listed in Table 3 that the restoration of degraded ecosystems is an important contribution to management of the country's environmental resources. Across the 13 policies, there is broad level support for the restoration of forests and thicket biomes. The policies cover the following considerations:

- A commitment to restoring natural ecosystems, not only for climate change purposes but also for the variety of ecosystem services e.g. water regulation and soil fertility
- Recognition of the contribution that natural ecosystems make to sequestering carbon, and how sustainable management of these ecosystems can contribute to a comprehensive national climate change mitigation and adaptation response
- The legal basis from which “duty of care” is attributed to the individual or entity responsible for environmental harm and to undertake remediation of the site in question
- A commitment to the development of financial instruments to incentivize ecosystem rehabilitation activities
- The legal basis by which areas impacted by disasters may require active rehabilitation and restoration efforts

Table 3. Overview of policies supporting restoration of forests and thicket biomes

Policy	Broad support?	Clear focus on the activity or biome?	Targets?
National Climate Change Response Policy	X	X	
National Forests Act	X	X	
National Environmental Management Act	X		
NEM: Biodiversity Act	X		
Disaster Management White Paper, Act and Framework	X		
National Development Plan	X	X	
Carbon Tax Paper	X		
Guidelines regarding the determination of Bioregions and the preparation of and publication of Bioregional Plans	X		
Environmental Sector Plan	X		
National Strategy for Sustainable Development and Action Plan 2011-2014	X		X
Integrated Growth and Development Plan		X	
Woodlands Strategy	X	X	
Strategic Plan 2012/13-2016/17 for DAFF	X	X	X

Is there a clear focus on the activity or biome?

Both the *National Climate Change Response Paper* (NCCRP) and the *National Development Plan* (NDP) highlight the need to restore the thicket biome. The NCCRP calls for the restoration of sub-tropical thicket in the Eastern Cape as part of its Climate Change Response Public Works Flagship Programme. Furthermore, it notes that South Africa has legally binding, international commitments to enhance

the carbon stock of its forests. The *National Development Plan* seeks to restore vegetation cover in biomes, including the thicket biome. In addition, *The Integrated Growth and Development Plan* seeks to provide funding to ensure the implementation of forest restoration plans. The most explicit directive for the restoration of forests is found in the *National Forests Act*, which provides the Minister with the “powers to intervene urgently to prevent deforestation

and to rehabilitate deforested areas (Chapter 3, part 4)” and lays out the procedures through which this should be undertaken.

Are there clear targets?

Two policies present targets for the restoration of forests and thicket. The *National Strategy for Sustainable Development and Action Plan* commits to restoring 3.2 million hectares of land affected by degradation by 2014. This target does not explicitly state if thicket or forests will be restored, although it is likely that some percentage of the 3.2 million would be allocated to these biomes. The *Strategic Plan 2012/13-2016/27 for DAFF* commits to coordinating the rehabilitation of 50,000 hectares of indigenous forests, woodlands and agricultural land. It is not clear what fraction of the total hectares is allocated to each of the three land types.

Although there is mention of both thicket and forest restoration, these do not form integral, expanded parts of any policy. Commitments do not appear to be backed by detailed plans, resource allocation, and clear roles and responsibilities as yet.

What are the unique barriers to implementation?

The most important barrier to implementation noted by practitioners is the absence of a long-term payment mechanism. This has been noted in section focused on common barriers above. In addition, this barrier combined with a lack of clear targets to support the rollout of sub-tropical thicket and coastal forest restoration provides little clear direction to either responsible government departments or potential project implementers on the required pace and extent of restoration efforts. Clear government signals on its perceived restoration needs would assist in facilitating project implementation by the private and non-profit sectors.

Important areas for consideration

Thirteen of the Top 30 policies in the initial policy review include text supportive of ecosystem restoration. The mention of both thickets and forests in the *National Development Plan* and the *National Climate Change Response Policy*, both recent documents, demonstrate a growing awareness of the importance of long-term maintenance and rehabilitation of these biomes in the context of climate change mitigation. However, the lack of distinct targets for these two biomes may need to be addressed. Clear targets do not support the recognition of the importance of restoration efforts.

Further areas for consideration:

- A key area may be enhanced interdepartmental planning and coordination. For example, the

Department of Environmental Affairs (DEA) and the Department of Agriculture, Forestry and Fisheries (DAFF) could jointly agree to particular thicket and forest restoration targets. The minimum baseline opportunity presented in the Phase II Implementation report, of 500,000 hectares of thicket, 8,570 hectares of coastal forests and 300,000 of broadleaf woodlands could be used as a guide for the allocation of resources and capacity.

- Determination of the target can be further substantiated by a national forestry mapping and inventory process, whereby the areas most affected by degradation and deforestation are identified, as well as the location of areas best suited to short- and near-term interventions. This exercise is required under the *National Forests Act*.
- Once a target is agreed, it should be integrated into the next iteration of the *Strategic Plan for the Environmental Sector Plan 2009-2014*, the *Integrated Growth and Development Plan (DAFF)*, the *Strategic Plan 2012/13-2016/17 for DAFF*, and other relevant departmental or cross-departmental plans and strategies.
- Assuming that a *National Framework Response on Climate Change Mitigation and Adaptation* is adopted to support the NCCRP, the adoption of clear targets by the Minister may be a key driver to implementation.
- The NCCRP requires that the Ministry responsible for each Near-term Priority Flagship Programme, including thicket restoration, develop a framework that directs implementation, details expected mitigation and adaptation outcomes, plans sustainable development benefits and monitors and evaluates progress. The framework could consider and commit to the targets for thicket and forest restoration.
- The implementation of UNFCCC REDD+ in SA can assist greatly in up scaling this mitigation option. However, this will have to be pro-actively driven by the responsible department.

1.2.2 The restoration and management of indigenous grasslands

Pertinent policies

Table 4 provides a summary of the policies that broadly support, make direct reference to or provide targets for the restoration of grasslands. The results demonstrate that although there is broad-level support for restoration and conservation efforts generally, fewer policies provide a clear focus on the activity. Only the *National Protected Areas Expansion Strategy* sets a clear target for conservation of grasslands, although no policy directly states the area of grassland that may benefit from restoration efforts.



Table 4. Overview of policies supporting restoration and management of grasslands

Policy	Broad support?	Clear focus on the activity or biome?	Targets?
National Climate Change Response Policy	X		
Presidential Delivery Agreement No 10	X	X	
National Environmental Management Act	X		
NEM: Biodiversity Act	X		
NEM: Protected Areas Act	X		
National Protected Areas Expansion Strategy	X	X	X
Disaster Management White Paper, Act and Framework	X		
National Development Plan	X		
Carbon Tax Paper	X		
Guidelines regarding the determination of Bioregions and the preparation of and publication of Bioregional Plans	X		
Environmental Sector Plan	X		
National Strategy for Sustainable Development and Action Plan 2011-2014	X		
Integrated Growth and Development Plan			
Conservation of Agricultural Resources Act	X		
Strategic Plan 2012/13-2016/17 for DAFF	X	X	
The Grasslands Programme (launched in 2008)	X	X	

Is there broad support?

The *National Climate Change Response Paper* (NCCRP) commits South Africa to explore, develop and implement various incentive measures that could indirectly lead to reductions in land-use based GHG emissions, including biodiversity and conservation management property tax exemptions (10.7). The White Paper focuses on the realization of ecosystem-based adaptation opportunities, aiming to promote the conservation, rehabilitation and restoration of ecosystems with high potential to improve climate resilience. Although grasslands are not specified as priority areas in this context, the principles held in the NCCRP apply particularly to this important biome.

Given the importance of the biome to national carbon stocks and water resources, many of the principles held in the policies and noted below apply to the biome, although specific programmes that address the restoration and management of the grassland biome are not specifically identified,

There is recognition across the policies presented in Table 4 that the restoration of degraded ecosystems is an important contribution to management of the country's environmental resources. The following principles are recognized within legislation, plans, strategies, guidelines and programmes:

- A commitment to restoring natural ecosystems, not only for climate change purposes but for the variety of ecosystem services (e.g. water regulation, food and fodder production)
- Recognition of the contribution that natural ecosystems make to national carbon stocks, and how sustainable management of these ecosystems can continue to contribute to a sound national climate change mitigation and adaptation response
- Recognizing that intact biodiversity is vital for sustainable economic growth and development
- A commitment to the development of financial instruments to incentivize ecosystem rehabilitation efforts
- The legal basis by which areas impacted by disasters may require active rehabilitation and restoration efforts
- A recognition that grasslands are subject to degradation pressures requiring urgent conservation action

Is there a clear focus on the activity and biome?

The grassland biome is the focus of a specific South African Biodiversity Institute (SANBI) Programme that works jointly with relevant government departments at the national and provincial level. The programme maintains several practical strategies with the sectors whose activities bear consequence for the grassland biome, including the agriculture and mining sector. Agriculture

takes place on approximately 65% of the biome, and while mining occupies considerably less land area, the consequences for land, soil structure and soil carbon and water can be considerable and frequently extend beyond the site of the mining activity. In addition, the *National Protected Areas Expansion Strategy* (NPAES) seeks to conserve a certain portion of the country's ecosystems. It notes that grasslands in particular are under clear threat of conversion from various land development pressures and seeks to integrate more grassland areas into the country's protected areas network.

Are there clear targets?

Only the *National Protected Areas Expansion Strategy* provides clear, time-bound and region specific targets for grassland conservation. It seeks to integrate an additional 4.2 million hectares of grasslands into the country's protected areas network over a 20-year period, thereby securing 14% of the country's grasslands.

Presidential Agreement No 10 commits in Output no 4 to protecting biodiversity through the following (though specific grassland targets are not mentioned):

- Expansion of the conservation estate from 12% to 14% of total area of South Africa
- Developing climate change adaptation frameworks for major biomes and aquatic systems (including grasslands)
- Protection of agricultural land – setting a target to protect 81% of high potential agricultural land

The *National Strategy for Sustainable Development and Action Plan* commits to restoring 3.2 million hectares of land affected by degradation by 2014. However, the percentage allocated to grassland conservation is not specified. The *Strategic Plan 2012/13-2016/27 for DAFF* commits to coordinating rehabilitation of 50,000 hectares of indigenous forests, woodlands and agricultural land. A percentage of the agricultural land may fall within the grassland biome.

Aside from the NPAES, the policies providing targets are often not complimented by commitments in the form of detailed plans, resource allocation, clear roles and responsibilities. Targets are limited and tend not to be site or time-period specific.

What are the unique barriers to implementation?

As reported in Phase 1 of the project, over 60% of South Africa's terrestrial carbon stocks are located in grassland and open savanna ecosystems. Within these open systems, over 95% of carbon stocks are located in the belowground soil carbon pool that is relatively stable, unless the area is ploughed or subject to heavy degradation through overgrazing. In this context the following key challenges are noted with respect to agricultural policy and regulation

as it applies to activities impacting on grasslands.

- Many national policies promote the expansion and diversification of the sector, but tend not to promote improved agricultural techniques (cultivation or rangeland). In other words, promotion of conservation farming techniques does not often complement expansion targets.
- While the *Conservation of Agricultural Resource Act* (1983) asserts the mandate to practice soil conservation techniques, this aspect (or the Act) is not a core strategic component of strategies and plans promoting agricultural expansion.

Due to the high impact of its nature, mining also presents a threat in terms of maintaining and improving this biome for carbon stock and ecosystem service purposes. Large parts of the biome cover significant coal reserves, for which exploration license have been granted. Although regulations are in place to assess and consider mining applications in the context of the environmental impact, in both the *Mining and Petroleum Resources Development Act* (MPRDA) and NEMA, the tendency in South Africa is for the mining license to supersede existing land uses and land rights except where the latter falls within Special Nature Reserves, National Parks or Nature Reserves declared in terms of the National Environmental Management: Protected Areas Act, 2003.

Areas for consideration

A potential SIP19 focussed on Ecological Infrastructure for Water Security"

Many of the top policies include text supportive of maintaining biodiversity and conserving or rehabilitating ecosystem services. For example, *The Presidential Agreement No 10* commits to climate change adaptation frameworks within all biomes, and makes specific reference to ecosystem services, and environmental management for water resource protection amongst other objectives. Essentially many of these policies recognize the importance of maintaining and enhancing ecosystem service infrastructure, including water function and carbon storage services. Thus ecosystem services are recognized and reiterated at national level as a key component of infrastructure vital for the country's functioning.

As part of the *National Infrastructure Plan* Government identified 18 Strategic Integrated Projects (SIPs). Since the initial identification and publication of the SIPs in 2012, a further strategically important area has gained more serious recognition, notably the need to secure a long-term, resilient and sustainable source of water for South Africa in a cost-efficient manner. It has therefore proposed that an additional Strategic Integrated Project is developed that focuses on securing the provision of water services through the restoration and appropriate management of catchments. A large body of good local and international



research has shown that it is far more cost effective and sustainable to restore catchments and associated water services (ecological infrastructure) than rely on built solutions in the form of dams and filtration plants.

In addition to the provision of water services (the regulation of water quality, sedimentation, stream flow and flood and drought events), the restoration and management of intact ecological infrastructure restores the productive capacity of the land (for crop production and grazing), secures terrestrial carbon stocks, and provides extensive employment and skill development opportunities in remote rural areas.

It is therefore suggested that an additional Strategic Integrated Project is added in the form of “SIP19: Ecological Infrastructure for Water Security”. From national terrestrial carbon management point of view, on first inspection, it may form one of the principle vehicles through which to restore and maintain carbon stocks at landscape and regional scales in the country.

Expanded land use planning within municipal and communal areas

Within the grassland biome there is a broad diversity of land use types, land ownership regimes and governance structures. For example within the greater Drakensberg area catchment, land use may include communal farming, commercial farming, different municipal entities, conservation areas, forestry and mining. In the context of the diverse uses and governance, there is a need for expanded land use planning that has a strong participatory component. Municipalities could be the primary agencies to co-ordinate such an activity (for example, the Umgeni Ecological Infrastructure Partnership has brought together several municipalities with the collective purpose of land use planning for managing the greater catchment.) This model has good application within the greater grassland biome.

Restoration and management of degraded lands

Different farming practices take place within the biome. Whereas many farmers have benefited from long-term veld management programmes, there is a substantial population of both commercial and emerging farmers who require more targeted assistance. Such plans focus on existing veld condition, improvements to veld condition and ecological conditions and well as commercial viability. To establish these plans and during initial implementation, the farmer may need additional capacity and assistance.

Implementation of these land management approaches could take place through municipal capacity, provincial conservation organization, the Expanded Public Works Programme, NGOs, community organizations and the private sector. As an example, eThekweni Municipality currently implements grassland and forest management measures together with Working on Fire, Working for

Ecosystems, and the Wildlife Conservation Trust. This approach should however not undermine the need for core expertise within local and regional government.

It is recommended that these types of programmes be mandated and earmarked for resources through municipal level land use management schemes, required under SPLUMA. This policy vehicle presents an important opportunity to influence municipal-level decision-making. As SPLUMA has only recently been adopted, there is ample opportunity to influence the development and content of land use management schemes, which themselves devolve from SPLUMA's mandated national spatial development framework.

Setting national targets and objectives for the biome

Given the strategic importance of this biome for water resource supply, ecological services and carbon stocks, national objectives and targets should be set with respect to the management and rehabilitation of grasslands. The SA Carbon Sinks Assessment Phase II report conservatively estimates that 1.19 million hectares of grasslands could be restored.

Refinement of the target should be pursued through the identification and mapping of the location of areas best suited to short- and near-term interventions. Once a target is agreed, it should be integrated into the next iterations of the *Strategic Plan for the Environmental Sector Plan 2009-2014*, the *Integrated Growth and Development Plan (DAFF)*, the *Strategic Plan 2012/13-2016/17 for DAFF*, the *National Strategy for Sustainable Development and Action Plan* and any other relevant departmental or cross-departmental plans and strategies.

Assuming that a *National Framework Response on Climate Change Mitigation and Adaptation* is adopted to support the NCCRP, this should clearly request the relevant Minister(s) to adopt clear, time-bound targets for restoration and management of grasslands.

1.2.3 Community-based commercial afforestation

Applicable policies

There is a supportive policy environment for the development of the commercial small-scale afforestation sector (Table 5). The contribution of the sector to local job creation, the opportunity to empower emerging communities, and the GHG emission reduction potential has lent itself to regular inclusion in policy. The broad support across nine policies extends into a clear focus on the activity, where there is rich and informed discussion of the challenges facing the sector. Two policies present targets for the expansion of the sector by 100,000 ha. This target extends primarily to communities, as they often own land best suited to expansion of the activity. The potential to afforest 100,000 hectares has been extensively researched and is widely acknowledged as practicable.

Table 5. Overview of policies supporting commercial small-scale afforestation

Policy	Broad support?	Clear focus on the activity or biome?	Targets?
National Climate Change Response Policy	X	X	
National Forests Act	X	X	
Industrial Policy and Action Plan	X	X	X
Carbon Tax Paper	X		
Integrated Growth and Development Plan	X	X	
Strategic Plan 2012/13-2016/17 for DAFF	X	X	
Framework for the National Forestry Programme	X	X	
Forest Sector Transformation Charter	X	X	X
Forestry 2030 Roadmap	X	X	

Is there broad support?

Nine policies provide broad support for commercial small-scale afforestation, including a strong legislative framework presented in the *National Forests Act*. Support covers a number of considerations and demonstrates that there is substantial political will to see the activity develop to its full capacity:

- Recognition of the value of commercial forestry to the economy and to job creation
- Provision of the legislative backdrop which allows for the delivery of technical, material and financial support to community forestry activities
- Affirmation that carbon offsets can originate from projects that support rural development
- Commitments to facilitating the access of commercial small-scale farmers to forestry activities, through extension support, partnerships with private-sector actors, favorable financial packages that reduce interest burdens, and land reform assistance
- Pledges to improve the contribution of emerging farmers and introduce principles of transformation into the sector
- A commitment to growing the sector, notably with support to the licensing process to fast-track development and by developing spatially appropriate transport corridors to improve market access

Is there a clear focus on the activity or biome?

Almost all policies provide a clear focus on expanding and improving participation rates in commercial small-scale forestry. The NFA provides the legislative foundation for promoting the activity, which authorizes the Minister to provide assistance to community forestry, ranging from technical, managerial and extension interventions, to financial and material assistance. In addition, the Minister may develop nurseries or other relevant facilities, managed for the purpose of providing plants and seedlings to community forestry groups.

Following this, the *Forest Sector Transformation Charter* is the most focused plan, directed specifically at improving the participation rate of previously disadvantaged persons in the forestry sector. The Charter envisages facilitating collaboration amongst relevant government departments and private sector actors to provide technical and financial assistance to emerging farmers, and to facilitating the negotiation and resolution of land claims and outstanding land tenure issues. In addition, it recognizes the broader structural challenges facing emerging farmers, and calls for government-led investments into targeted road developments to drive market access. In each instance, the Charter provides detailed accounts of how these issues might be addressed, and notes the departments or organizations that should be partnered with to provide rapid transformation in the sector.

Generally, the policies recognize a gap in skills development and extension services, and promote a combination of government-led and private-sector partnerships to address this issue, including the revival of agricultural colleges. There is a recognition of the role that the private-sector has played to-date in encouraging the participation of communities in forestry programmes led by Mondi, Sappi and the SA Wattle Growers Union, and a commitment to continuing to foster and encourage these relationships. Moreover, there is an appreciation for the difficulties that community forestry groups encounter in raising funds to undertake forestry, in no small part due to investor’s unwillingness to commit funds to the long time horizons required to establish and grow plantations to maturity. From a practical perspective, there is also a commitment to speeding up the afforestation licensing process – be it positive or negative decisions of the process – to reduce both delays and speed up delivery of product to an undersupplied market.

The nine policies clearly identify the challenges facing emerging farmers and community groups interested in pursuing commercial forestry. However, the Charter



aside, there are very few practical solutions provided to address these types of issues. Commitments to address the challenges remain quite broad, supported by limited to no detail on the practical efforts required to manage them.

Are there clear targets?

Both IPAP and the Charter provide clear afforestation targets. IPAP calculates that upwards of 145,000 hectares of new plantation forest could be established, predominately in the Eastern Cape (100,000 ha), but also in Mpumalanga, Limpopo and KwaZulu-Natal. It highlights the opportunity to create 15,000 jobs through the establishment of 100,000 hectares. In alignment with IPAP, the Charter intends to support the establishment of 10,000 ha per annum, over a 10-year period, achieving a total addition to the plantation forestry estate of 100,000 ha. Moreover, it intends to facilitate securing land tenure rights for 50% of new plantation developments in Eastern Cape, where it believes there is substantial opportunity for the sector. The targets for 100,000 ha of establishment align with those proposed in the SA Sinks Phase II Implementation Report.

What are the unique barriers to implementation?

The barriers to implementation for commercial small-scale afforestation are well documented across policy. Stakeholders further confirmed these challenges. The most commonly cited barriers for the industry included:

- Lack of forest-sector specific technical skills and knowledge amongst smallholder participants
- A slow and inefficient afforestation licensing process, notably with regards the release of water permits
- Difficulties in accessing finance at interest rates that could justify long-term investments into forestry

Stakeholders in the established commercial forestry industry noted that they had encountered success in partnering with local communities to undertake plantation forestry activities. The forestry company provided technical training, seedlings, and transport support, in exchange for a pre-established off take agreement, which granted them privileged access to timber stocks at maturation. The partnership model had yielded considerable benefits for both parties. Communities benefited from the creation of local jobs, technical forestry and business skills, and the flow of substantial revenues into local communities.

It was recognized, however, that continuing to expand that support was dependent on the ability of communities to secure afforestation licenses within a reasonable timeframe, dependent on both an EIA and water license approvals. Stakeholders confirmed that the opportunity to include an additional 100,000 hectares into the country's commercial forestry estate was based on multiple, extensive analyses. These analyses demonstrated that these areas, from an ecological perspective, were fit for establishment – not posing unacceptable threats to

either biodiversity or water flow. It was noted that there is a backlog for water licensing applications through the Department of Water Affairs, for areas covering several thousand hectares of land. More importantly, however, it was noted that continued development of the smallholder sector would also be dependent on improving coordination amongst the various departments involved in the forestry licensing process – Department of Agriculture, Forestry and Fisheries, Department of Environmental Affairs and the Department of Water Affairs, as well as the Licensing Advisory Committee (LAC) that gives the final recommendation to the Department or responsible authority. Otherwise, stakeholders warned that it's difficult to maintain communities' interest in commercial forestry, as the long lag time in licensing presents an important opportunity cost.

In addition to the slow afforestation licensing process, stakeholders noted that smallholder forestry participants struggled to access bank funding. Aside from perception that community members presented a credit risk due to limited exposure to forestry management, banks were concerned by the lack of securitization emerging farmers could offer. In the instances where loans have been accessed, sometimes as a package from a forestry company in partnership with the Industrial Development Corporation, the interest rates can still limit profits considerably, putting into question the viability of the operation in the long-term. Stakeholders confirmed that the upfront establishment costs are approximately ZAR 5,000 per hectare, requiring significant capital outlays by communities for even moderate sized interventions (500 – 1,000 ha).

Areas for consideration

Currently, the delays in afforestation licensing are contributing to limitations in growth of the commercial smallholder forestry sector. The opportunity costs associated with the long delay in water licensing for afforestation may lead some communities to utilize land-holdings for potentially less profitable activities, and certainly ones that are unlikely to yield similar carbon sequestration benefits. Alternative activities may also not be accompanied by the same technical and financial skills development support afforded by the commercial forestry sector. In all, this suggests a potential net loss in community revenues, job creation, skills enhancement, and carbon sequestration gains. The following policy related actions could be considered:

- The *National Water Act* does not specify timelines for the water license decision-making process. The lack of clarity on timelines may contribute to the slow turnaround of applications. The Department of Water Affairs (DWA) states that the licensing process could take anywhere between three to twelve months, although during DWA's annual report to Parliament suggested far longer delays; it was noted that there

was a backlog of 1,420 applications, of which 18% had been pending since 2010 (Parliamentary Monitoring Group, 2013). Currently, a *Water Act Amendment Bill* has been tabled for review in Parliament. The proposed amendment to section four “water use” states “The Minister must align and integrate the process for consideration of a water use license with the timeframes and process applications for....” This alignment and integration extends to both the mining sector and any environmental authorizations considered under NEMA. It is recommended that the inclusion of afforestation in this amendment be clarified. In addition, and assuming the amendment bill covers afforestation, DAFF should collaborate with DWA to establish standards for optimal afforestation licensing timelines, considering the EIA requirements, as well as community needs. This will provide greater clarity to DWA on the required licensing timelines for afforestation, taking into consideration a number of important factors and processes, and reducing the risk that licensing processes will meet with delays.

- During DWA’s annual report to Parliament in April 2013, the department was asked to provide more specific information on the breakdown of licensing issues – if the backlog was due to either incomplete or poorly conceived applications, which was delaying the team, or rather in departmental inefficiencies. DWA confirmed that in the forestry sector, 80 applications in the Eastern Cape had been put on hold, due to the provision of unverifiable information, delaying delivery of licenses in the sector. It was suggested that for forestry in particular, the fault fell not with DWA in application delays, but rather in the quality of applications submitted. It is recommended that the Minister of Agriculture, Forestry and Fisheries draw on his/her powers established in chapter four, part three of the *National Forests Act* to provide support to community forestry. In particular, the provision of technical support to prepare complete applications based on sound scientific evidence will facilitate the licensing process. In 2013, DWA has confirmed that it has established a new unit focused exclusively on water licensing. It is expected, then, that improvements in the licensing applications should be met with greater

efficiencies in DWA and lead to a quicker turn-around in afforestation licensing.

Licensing aside, communities have faced significant hurdles in accessing finance on terms that favor the long-term commitments required to undertake forestry. For this reason, the following policy intervention should be considered:

- *The National Forests Act* provides the Minister with wide-sweeping powers to support community forestry. This includes the provision of financial and material assistance, which is left open to broad interpretation of what form that assistance might take. Given the high upfront capital costs required to undertake a commercial forestry venture, it is recommended that innovative financial mechanisms to support emerging farmers be developed. This might include, for example, a guarantee facility to attract private sector investment, improving the risk-adjusted return for potential funders and leading to reductions in interest rates. The Industrial Development Corporation or the Development Bank of South Africa might consider a moderate equity investment in community forestry (~25%), aggregated across a portfolio of small-scale forestry projects to encourage an increase in private sector investment. In all instances, the Department should promote and foster the continued participation of the established commercial forestry industry, to provide technical expertise and training. This will provide assurance to financial institutions that emerging farmers have the proper skills and knowledge required to undertake successful silviculture operations.

1.2.4 Biogas energy production

Pertinent policies

Table 6 provides a summary of the policies that broadly support, make direct reference to, or provide targets for biogas based energy generation in South Africa. The list of policies demonstrates that although there is a national level directive and impetus to provide an enabling environment for alternative energy generation, a specific focus on biogas energy is limited.

Table 6. Overview of policies supporting implementation of biogas digesters

Policy	Broad support?	Clear focus on the activity or biome?	Targets?
National Climate Change Response Policy	X		
White Paper on Renewable Energy	X		
Strategic Plan 2011/12 – 2015/16, Department of Energy			
Integrated Resource Plan for Energy (2010 & 2013)	X	X	X
Industrial Policy Action Plan: 2012/2013 - 2014/15	X	X	



Policy	Broad support?	Clear focus on the activity or biome?	Targets?
National Development Plan	X		
The Energy Act	X		
The DTI's Manufacturing Competitiveness Enhancement Programme	X	X	
Presidential Strategic Infrastructure Plan No 8	X	X	

Is there broad support?

The *White Paper on Renewable Energy* (2003) provides the basis for renewable energy promotion and generation in South Africa. It sets clear targets to achieve a diversified energy mix, with a specific target commitment of 10 000GWh of South Africa's energy requirement to be delivered through renewable energy sources (biomass, wind, solar and small scale hydro) by 2013.

The need to support diversified energy is taken up nationally in a number of policies and implementation plans. The *Presidential Infrastructure Plan* addresses this within SIP 8, which aims to support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the *Integrated Resource Plan*. The *2010 Presidential Delivery Agreements* include a plan to improve infrastructure (No 6: Infrastructure) and undertakes to ensure the "reliable generation, distribution and transmission of electricity" (Output 2). The Agreement aims to ensure a "Conducive Environment for Independent Power Producers" and to address the regulatory framework that favors Eskom through the introduction of an Independent System Operator. Addressing regulatory constraint includes ensuring an open and non-discriminatory access to the transmission grid.

In recent years a number of developments have taken place that give impetus to the emerging alternative energy sector. The National Energy Regulator of South Africa (NERSA) published a feed-in tariff scheme and criteria for renewable energy providers. In addition, the procurement round reached financial close in the latter part of 2012 according to the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). With respect to promoting opportunities for the biogas industry, REIPPPP has had limited offering, as it is underpinned by a long-term off take by ESKOM. The economics of biogas energy dictate that the more significant potential for biogas energy generation lies in situations where there is limited access to the grid, and is typically undertaken at small scale stand-alone (off-grid) schemes in domestic, small

holding, intensive commercial farm environments and for wastes generated from industrial processes¹³.

Of significance though, is one of the Flagship Programmes that has its origins in the *National Climate Change Response Strategy* viz. The Waste Management Flagship Programme. This Programme commits to investigating and implementing waste-to-energy opportunities available within solid-, semi-solid and liquid-waste management sectors, especially the generation, capture, conversion and/or use of methane gas. This Flagship Programme is championed by the Department of Minerals and Energy (DME) and has been initiated with the intention of rolling out a programmatic approach for waste-to-energy at municipal waste sites.

The policy environment demonstrates that the industry is gaining exposure and interest, with the focus primarily on providing energy solutions at a local government level.

Is there a clear focus on the activity?

While there is a clear focus on promoting and facilitating the implementation of renewable energy on a national level, the regulatory response and incentives to support and stimulate biogas generation have been slow to develop since most of the potential lies in providing stand-alone (off grid) solutions.

The following initiatives give clear support for biogas energy generation:

- The Waste Management Flagship Programme: The DME intends to roll out this initiative on a programmatic level at municipal waste sites. The DME and local government focus in this sector is ideal, as municipal waste sites are challenging for the private sector development, with uncertain outcomes (and additional hurdles with respect to local government requirements for procurement tenders¹⁴).
- Biogas digesters are capital intensive to establish, with large-scale digesters costing R2 million (fixed dome) and R5 million (stirred tank reactor generator).

¹³ Although the technological is well applied elsewhere in the world for municipal waste sites, South Africa has a poor waste management history and the diverse unsorted nature of the waste gives challenges to gas reserve estimates and reliable off take. This implies high risk for private sector investors to develop in this area.

¹⁴ There may be potential here for programmatic CDM registration to boost revenues for this programme – CDM registration has been obtained for the Durban Landfill gas to energy project.

The following two incentive schemes can materially reduce the payback period on capital and substantially increase the return on biogas investment

- Rebates under Eskom's standard offer, at R1.20 per kWh for units generating between 10kwp to 1MWp in 2012 serves as an incentivizing boost to the implementation of biogas generators offsetting some of the capital outlay barriers.
- Industry's Manufacturing Competitiveness Enhancement Programme, implemented by the Department of Trade and Industry (DTI), offers grants and incentives for green technology and resource efficiency improvements, including biogas technology

Are there clear targets? What are they?

The *Integrated Resource Plan* (2010 and updated 2013) makes provision for supply from biogas into the national energy mix as follows: biogas at 12.5 MW and 12.5 for Landfill Gas.

What are the unique barriers to implementation?

With respect to large scale biogas projects utilizing municipal waste streams, the *Procurement and Municipal Finance Management Act* and the *Public Finance Management Act* present significant obstacles. This legislation requires that any bid to provide a service to the public sector be put out to public tender. This implies that, for any private sector developer, the initial technical and feasibility assessments (on gas reserves for example) are done on risk, as this IP is placed in the public domain to a tender process that considers a range of criteria, not necessarily restricted to technical expertise. There is thus no first mover advantage to develop biogas infrastructure for municipal sites in this context.

Areas for consideration

Biogas energy generation has significant scope to be taken up and championed by programmes beyond the energy sector frameworks since this technology offers solutions for waste and water management as well as for rural development.

The benefits associated with implementation of biogas generators falls within a number of different ambits of national and local government, as this activity offers solutions both for waste and water management, within agricultural, municipal and industrial sectors. Thus there are a number of areas in government where this activity could be actively promoted (Department of Water Affairs Catchment Management Strategies, Municipal Integrated Development Frameworks etc.).

The issue of procurement legislation note above (relating to the *Procurement and Municipal Finance Management Act* and the *Public Finance Management Act*) presents a significant barrier that needs to be considered further.

With respect to biogas energy generation and the agricultural sector and the industrial sector¹⁵, several interviewed practitioners noted that while they have explored carbon revenues in detail (with several even going to the lengths of compiling CDM and VCS Project Design Documents), there is little demand for carbon offsets both locally and internationally. Furthermore, if a buyer can be identified, the price offered, generally does not substantiate the high costs of validation.

As noted in the analysis of common barriers above, clear demand for carbon offsets at a reasonable price, either from international markets or through an emerging South African carbon offset program, may significantly improve the financial viability of biogas based electricity generation.

1.2.5 Biomass energy generation

Pertinent policies

Table 7 provides a summary of the policies that either broadly support or make direct reference to biomass energy generation in South Africa. The list of policies demonstrates that although there is a national level directive and impetus to provide an enabling environment for alternative energy generation, the specific focus on biomass energy remains limited. Similarly, targets for biomass energy generation are limited.

¹⁵ For example, CDM registration was obtained (2006) for a scheme at PetroSA, where biogas from anaerobic wastewater was previously flared. An Independent Power Producer was established on site by an independent 3rd party and 4.2 MW of electricity is now generated and sold onwards to PetroSA, decreasing the dependence of PetroSA on the grid



Table 7. Overview of policies supporting implementation of biomass to energy

Policy	Broad support?	Clear focus on the activity or biome?	Targets?
National Climate Change Response Policy	X		
White Paper on Renewable Energy	X		
Strategic Plan 2011/12 – 2015/16, Department of Energy	X		
Integrated Resource Plan for Energy (2010 & 2013)	X	X	X
Industrial Policy Action Plan: 2012/2013 - 2014/15	X	X	
National Development Plan	X		
The Energy Act	X		
The DTI's Manufacturing Competitiveness Enhancement Programme	X	X	
Presidential Strategic Infrastructure Plan No 8	X	X	

Is there broad support?

The *White Paper on Renewable Energy* (2003) sets clear targets to achieve a diversified energy mix. While this and earlier policy iterations confirmed South Africa's commitment to a cleaner energy mix, the frameworks to support the development of the industry have been slow to develop. Specifically the support for the sector was delayed by a process of prolonged uncertainty relating to the National Energy Regulator of South Africa ("NERSA") Renewable Energy Feed-in Tariff Scheme ("REFIT"), which was finally published in 2007, but after much consultation, never made it into law. This was followed by the subsequent implementation of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP or colloquially, REBID), which was released in 2011. The first REIPPPP procurement round reached financial close in the latter part of 2012. REIPPPP is a well-structured programme that has successfully facilitated two rounds of competitive bids, with the third currently nearing financial closure.

REIPPPP is a competitive bidding system that includes significant requirement for local socio-economic development component, specifically localized production facilities and job creation. These criteria favor biomass energy projects, as by their nature they demand a higher labour component than energy generation through technologies such as wind and solar, and local sourcing is achievable.

There are several logistical and technical challenges with large scale biomass energy production (maintaining quality uniform fuel free of dust and moisture, transport logistics of fuel source to plant etc.), but the formal sugar and paper and pulp industry is ideally placed to operate in this space, as this sector tends to have more control and influence

over fuel sources and transport logistics. The viability of electricity generation in this sector relies on leveraging existing capacity and these industries already have internal generation capacity based on this fuel source, and are well positioned to generate additional energy and supply to the grid from this potential. The sugar industry, for example, estimates that it could generate an additional 780MW of electricity in the near term.

Is there a clear focus on the activity?

Biomass energy generation has been largely undertaken by the private sector viz. the forestry and sugar industries with the purpose of meeting internal electricity and power requirements with limited opportunity for expansion without a clear framework for power purchasing agreements. The frameworks now accommodate the inclusion of independent power producers, including biomass technology.

To date, one biomass energy project has been awarded through REIPPPP; this is a 17.5MW plant located at Mkuze in KwaZulu-Natal that will be fuelled through the combustion of sugar cane tops. Construction is set to begin in June 2014.

Are there clear targets? What are they?

The Minister has allocated 12.5 MW of the total energy mix to be generated from biomass technology.

What are the unique barriers to implementation?

There are no specific regulatory barriers to entry now that the procurement programme for power producers is in place (REIPPPP), however there are cases where historically biomass energy projects have been shelved due to the unwillingness from NERSA to facilitate uptake by the national grid.

Generation of energy using sustainable biomass fuel is capital intensive – operating costs are also high and relatively labor intensive. For this reason the application is best suited to existing commercial operators within the forestry and sugar production sectors that can leverage existing transport, processing facilities and head-office capacity. Costs and logistics present serious challenges for the rollout of biomass energy generation using alien plants as the biomass fuel stock, especially for new ‘greenfield’ operations. Significant investments would be required to finance harvesting, chipping and transport, and proactive government support would be required to develop viable solutions in this area.

Areas for consideration

In terms of potential policy considerations, biomass energy generation shares many of the concerns noted for biogas energy generation. Barriers to the supply of electricity to the national grid or to local municipalities need to be addressed. Moreover, clear, long-term sustainable demand

for generated carbon offsets would significantly improve the viability of ventures.

As noted above, entry into the sector by new, emerging operators that don’t have the opportunity to leverage existing transport and processing infrastructure will be difficult. Here, privileged financial packages that reduce capital cost burdens and associated debt may be required to allow the entry of emerging operators. This is especially for projects that utilize biomass from harvest alien invasive plants that may require extensive field operations.

1.2.6 The roll-out of biochar

Pertinent policies

There are a number of policies that broadly support efforts that could include biochar production (Table 8). However, no policy explicitly references or supports biochar, and there are no national-level targets in place that could drive the uptake of the technology.

Table 8 Overview of policies supporting the implementation of biochar

Policy	Broad support?	Clear focus on the activity or biome?	Targets?
Conservation of Agricultural Resources Act	X		
National Climate Change Response Policy	X		
National Development Plan	X		
National Strategy for Sustainable Development	X		
Biodiversity Act and Framework	X		
Environmental Sector Plan	X		
Integrated Growth and Development Plan	X		
Strategic Plan DAFF	X		
National Biodiversity Framework	X		
Strategic Plan for South African Agriculture	X		

Is there broad support?

A number of policies could be interpreted as being supportive of biochar implementation. With its suggested potential to increase soil carbon, retain moisture in soils, reduce fertilizer needs and increase crop yields, its use would be consistent with a number of broad policy objectives:

- Recognition of the agricultural sector’s contribution to GHG emissions, and the need to reduce those emissions
- Acknowledgement of the need to fund further research to explore soil conservation practices and disseminate that knowledge to farmers

- A recognition of soil degradation trends in South Africa and the threats to food security it poses
- An overarching commitment to improved farming practices, notably as they relate to soil conservation
- An imperative to remove alien invasive species, which could provide a source of biomass for biochar production

Is there a clear focus on the activity?

There is no mention of biochar amendment in the Top 30 policies or any of the other policies reviewed during the course of the initial policy analysis. It is possible that a policy or policies currently exist to support biochar application, but none were identified in the extensive catalogue development phase.



Are there clear targets?

There are no targets for biochar activities listed in any of the policies reviewed.

What are the barriers to implementation?

The major barriers for the implementation of biochar, as disclosed during the stakeholder engagement meetings, included a lack of understanding of the net GHG reduction benefits in a South African context and limited awareness of the concept amongst potential users. Concerns over the need for upfront capital and the potential structure of biochar production and transportation costs are also viewed as an inhibiting factor.

Areas for consideration

- Prior to the development and commitment to targets for biochar amendment, it is highly recommended that further analysis be undertaken to review biochar’s ability to reduce GHG emissions in a variety of South African crop and soil types. In addition, a study analyzing different approaches and technologies for pyrolysis is advised, in light of the potential increase of GHG emissions that the production phase can generate. This study should be complimented by an analysis of the available feedstock and production and transportation costs, to assess the financial viability of pursuing a national-level implementation initiative.
- As part of its various commitments to “sustainable agriculture” as highlighted in a number of its more recent strategies and plans, DAFF should include policy commitments to undertaking and exploring this research. This may not necessarily be linked to DAFF’s agricultural research budget but should be integrated

into the proposed National Facilitation Unit, and could, in the interim, be committed to the Agricultural Research Council’s research programme.

- At this stage it is not believed that direct reference to biochar amendment in documents such as the *National Climate Change Response Paper* or the *National Development Plan* is merited until a clear scientific consensus on the benefit and practicalities of biochar use is reached.
- Should its practicalities be proven, the *Conservation of Agricultural Resources Act* could be used to launch a biochar amendment scheme (see the section below for more information on the legal basis for CARA schemes).
- In the event that biochar is viewed as a viable, national-scale mitigation activity, then a regulation should be passed to ensure integrity of the biomass supply-chain. No biochar originating from degraded or deforested landscapes should be permitted for use in nationally approved programmes.

1.2.7 The adoption of reduced tillage practices

Pertinent policies

Table 9 provides a summary of the policy environment supporting the adoption of reduced tillage (conservation agriculture). It demonstrates that there is broad support across sixteen policies, of which half have a clear focus on the activity. Two policies provide targets for adoption of the activity, though these targets are considered inadequate in responding to the potential of the activity, even at conservative estimates.

Table 9 A list of policies supporting reduced tillage practices

Policy	Broad support?	Clear focus on the activity or biome?	Targets?
Conservation of Agricultural Resources Act	X		
National Climate Change Response Policy	X		
National Environmental Management Act	X		
Disaster Management White Paper, Act and Framework	X		
Air Quality Act and Framework	X		
Industrial Policy Action Plan		X	X
National Development Plan	X	X	
Carbon Tax	X		
Guidance on Bioregional Plans	X		
Environmental Sector Plan	X	X	
National Strategy for Sustainable Development	X		
Integrated Growth and Development Plan	X	X	
Strategic Plan 2012/13-2016/2108 DAFF	X	X	X

Policy	Broad support?	Clear focus on the activity or biome?	Targets?
Strategic Plan for Smallholder Producers	X	X	
National Biodiversity Framework	X	X	X
Strategic Plan for South African Agriculture	X	X	

Is there broad support?

Reduced tillage benefits from the highest level of broad policy support. The basis for supporting and pursuing conservation agriculture is found within a number of cross-sectorial policies. In particular, policies highlight the following considerations, which provide a supportive environment for conservation agriculture:

- The legal foundation from which the relevant Minister can introduce legally enforceable measures to limit agricultural practices deemed to be harmful to the environment
- The legal foundation from which harmful practices may be considered a disaster risk that must be managed
- A recognition of the contribution of agriculture to global GHG emissions and a commitment to reducing these emissions in South Africa
- An appreciation for the role that improved agriculture can play in sustainable natural resource management
- A recognition of soil degradation trends currently observed in the agricultural sector, and the threats this poses to the continued delivery of environmental services
- A commitment to undertaking improved agricultural practices, such as conservation agriculture, organic agricultural production, climate-friendly agriculture, and so forth.
- The potential inclusion of activities that reduce land degradation into the proposed Carbon Tax offsets mechanism
- A commitment to improving the agricultural policy environment to increase adoption rates of conservation agriculture and other forms of agricultural practices that deliver environmental benefits
- A commitment to supporting subsistence and small-scale farmers to adopt improved agricultural practices
- Acknowledgement of the on-going need to pursue focused research on improved farming practices and technologies

Is there a clear focus on the activity?

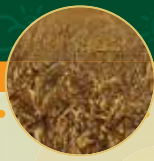
Eight of the policies specifically discuss the benefits of- or commitments to sustainable farming practices, organic farming, conservation farming, agro-ecological farming, minimum tillage or climate-smart agriculture. Unfortunately, these terms are often used interchangeably and with few clear definitions or descriptions of actual implementation. For this reason, the exact potential impact of these activities on soil carbon and decreasing GHG emissions remains

uncertain. This is an area of policy that would benefit from more precise definitions. The following commitments and support were noted in the eight relevant policies:

- *The Environment Sector Plan* supports the practice of organic food production through the use of agro-ecological models
- *The Industrial Policy and Action Plan* supports the growth of the organic agriculture industry
- *The National Strategy for Sustainable Development and Action Plan* supports conservation agriculture, organic farming and permaculture, and notes that programmes that support conservation agriculture must be reinforced
- *The National Development Plan* recognizes the need to refine research in the agricultural sector so as to focus on ways in which to improve sustainable agriculture outcomes, notably in the commercial sector. Additionally, the NDP mentions its commitment to rolling out new technologies that align with sustainable agricultural strategies, especially those that benefit subsistence and small-scale farmers
- *The Integrated Growth and Development Plan* notes the need to adopt conservation agriculture, particularly in ecologically sensitive areas. It commits to improving production efficiency in alignment with conservation agriculture principles
- *The Strategic Plan 2012/13-2016/17 for the Department of Agriculture, Forestry and Fisheries* commits to developing policies that support agro-ecological practices. It also recognizes the need to adopt climate-smart agriculture, through the practice of introducing conservation methods into farming systems
- *The Strategic Plan for Smallholders* pledges to support the adoption of conservation and agro-ecological agricultural practices
- *The Strategic Plan for South African Agriculture* commits to helping new farming entrants undertake soil conservation work and seeks to implement soil conservation programmes. It also commits to developing infrastructure and services that support sustainable land-use, and promote organic and environmentally friendly production

Are there clear targets?

Despite broad policy support for reduced tillage practices, there are few defined targets in place. The Department of Agriculture, Forestry and Fisheries in its *Strategic Plan 2012/13-2016/17*, pledges support to 15,000 smallholder



producers as part of its food security and increased food production strategy; it is not clear that these targets align with conservation agriculture practices. It also supports the rehabilitation of 9,500 hectares of agricultural land, but how that land might be farmed in the future is not clear. The *National Biodiversity Framework* commits to working with three “production sectors,” of which agriculture may be an early target, to reduce impacts on biodiversity. Again, the extent to which this may result in efforts to introduce reduced tillage remain unclear.

These targets suggest that while Government is committed to growing the subsistence, small-scale and commercial agricultural sectors, there is no compulsory need for the adoption of reduced tillage practices.

What are the unique barriers to implementation?

Several researchers and practitioners note that while the general principles of reduced tillage are well known, specific knowledge of the relationship between each form of reduced tillage and carbon sequestration in South African conditions is lacking. In addition, future research is required into the net GHG benefit of implementation, cost and production implications as well as the effect on other ecosystem services (e.g. water regulation, soil fertility). This lack of specific knowledge should not halt initial implementation. Rather initial implementation should be strategically designed to explore important research questions pertinent to potential national-scale roll out.

Areas for consideration

The policy environment already provides measures and means by which both research and implementation can be undertaken. Accordingly, it is not deemed necessary to update any national-level policies required to overcome the barrier discussed above. Instead, the discussion in this section covers some initial measures that can be pursued.

The mandate for research into conservation agriculture may originate from the Minister. As proposed in the draft amendment bill for the Agricultural Research Act (2013 proposed changes to the original 1990 Act), the Minister has the authority to specify research programmes for the Council to undertake. Given that the Act is likely to be approved by Parliament sometime within the coming year, this is an important opportunity to ensure that the conservation agriculture opportunity receives considered scientific attention by inclusion in the research portfolio.

Should the research outcomes prove favorable to national-scale adoption of the activity, the *Conservation of Agricultural Resources Act* provides the basis from which the Minister can undertake either a scheme or introduce control measures into farming systems. This would allow the agricultural activities to remain under the control and oversight of the Minister, whilst still supporting land-based climate change mitigation activities. Under a “scheme” the Minister, with approval of the Minister of Finance, can instruct that subsidies are provided to farmers for undertaking conservation agriculture activities, as these would support the principles of the Act. This scheme could easily dovetail with any pre-existing offset programmes, and would have the added benefit of aligning with the Minister’s own and potentially broader objectives for the agriculture sector.

Alternatively, the Minister has the power to establish control measures as they pertain to the cultivation of virgin soil, the use of agricultural land that has already been cultivated, and the restoration of previously degraded land (amongst other potential measures). Recognizing that such control measures may be both impractical to regulate in the subsistence and smallholder farmer sector, as well as potentially impose prohibitive cost burdens, it remains at the Minister’s discretion to determine which types of land-users may have to adhere to various control measures. A scheme, providing financial support, could be introduced at the same time to reduce potential cost burdens.

As described in the Phase II Implementation report, the minimum opportunity for conservation tillage interventions is expected to cover some 2.88 million hectares of land, assuming an adoption rate of 20% of total agricultural lands. Taking the size of the opportunity into consideration, the Minister or other mandated authority will need to ensure that a scheme or similar intervention cater to this potential. Department plans and strategies will need to take cognizance of the total size of the opportunity into consideration when developing targets.

1.2.8 Reducing Emissions from Deforestation and Degradation (REDD+)

Applicable policies

Like conservation agriculture, REDD+ enjoys strong policy support, both with regard to broad mandates, clear focus, and targets. Table 10 lists twelve policies establish broad support for the activity. Whereas eight policies support it explicitly, four policies provide targets that are related to REDD+.

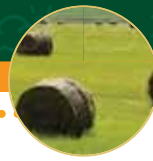
Table 10. A list of policies supporting REDD+ activities

Policy	Broad support?	Clear focus on the activity or biome?	Targets?
National Climate Change Response Policy	X	X	
National Forestry Act (1998)	X	X	
Disaster Management White Paper, Act and Framework	X		
National Environmental Management Act	X		
NEMA: Biodiversity Act and National Biodiversity Framework	X		X
Carbon Tax	X		
NEMA: Protected Areas Act	X	X	
Guidance on Bioregional Plans	X		
Protected Areas Expansion Strategy	X	X	X
Environmental Sector Plan	X		
A Woodlands Strategy Framework	X	X	X
National Development Plan	X	X	
Integrated Growth and Development Plan		X	
Strategic Plan – DAFF		X	X

Is there broad support?

REDD+ activities benefit from broad support, notably in regards to strong, explicit legislative mandates. There is strict conservation oversight of indigenous forests in South Africa. Although woodlands, in principle, are also meant to receive some measure of protection, this may not be realized to a similar extent. The support for the woodlands and forest biomes covers the following principles:

- A recognition that deforestation is a significant contributor to global GHG emissions, but that in turn, intact forests are valuable stores of carbon and play an important role in climate change adaptation strategies
- An acknowledgement of the rate of degradation of natural habitat in South Africa, forests and woodlands in particular, and the threats to ecological infrastructure that this poses
- A view that the conservation of indigenous forests in South Africa is critical, accompanied by clear targets for conservation in both natural forest and savannah landscapes
- An understanding of the important socio-economic benefits that forests and woodlands provide, notably to rural households
- A legislative mandate by which the relevant Minister can intervene to protect natural forests - individuals or entities found to be in violation of Ministerial edicts can be fined or penalized
- The legislative mandate by which forests can be declared as protected forest areas or a declared forest area
- The legislative principle that forbids the unwarranted, unsupervised destruction of natural forests and which allows the Minister to intervene urgently to halt deforestation
- The legislative framework for which a percentage of woodlands must be set aside for conservation purposes, and that all woodlands require classification
- The legislative mandate by which government can actively conserve a representative sample of the country's biodiversity and natural landscapes
- The provision by which destruction of natural forests and woodlands may qualify as a disaster, requiring immediate intervention and mitigation
- Commitments to developing fiscal instruments, such as carbon offsets or tax deductions, that will facilitate protection of critical biodiversity, such as forests and woodlands
- The provision of several important tools that allow government, individuals or entities to work to protect or sustainably manage ecosystems (Bioregional plans, Provincial Stewardship Agreements, Biodiversity Stewardship Agreements)
- A recognition of the role that research and development play in woodland and forest management, the need to develop norms and standards for overseeing the sustainable use of- and access to woodlands and forests, and the follow-up monitoring and reporting required to ensure long-term viability of these resources



Is there a clear focus on the activity or biome?

Both forests and woodland preservation benefit not only from a clear focus in departmental strategies and plans, but also in legislation, making them some of the few biomes in the country to benefit from such clear statutory emphasis. The basis for woodland and forest conservation flows from the *National Forests Act*, which considers that any destruction of natural forests should be avoided save under “exceptional circumstances” and then only with the approval of the Minister. The Minister can intervene to protect forests believed to be subject to degradation, or declare, through a mandated stakeholder process, that forests qualify as protected forest areas. Offences and penalties are meant to deter inappropriate forest use, exploitation or access. Measures for woodland conservation are also provided: the Minister must determine what percentage of woodland to conserve, which should be based on a classification of the resource and research where required. *The National Climate Change Response Policy* situates the importance of forests in the larger climate change challenge, noting their contribution to the national terrestrial carbon stocks and the need to support conservation efforts through the use of carbon offsets.

The *National Protected Areas Expansion Strategy* (NPAES), devolving from the *NEM: Protected Areas Act*, aims to integrate both forests and savanna ecosystems (including woodlands) into the country’s protected areas network. The *National Development Plan* supports NPAES. Moreover, *The National Development Plan, the Integrated Growth and Development Plan* (DAFF), and DAFF’s *Strategic Plan* all acknowledge the important ecosystem service benefits provided by forests, not least of all carbon sequestration and storage.

A *Woodlands Strategy Framework for the Department of Water Affairs and Forestry* (2005) provides the most focused assessment of the current state of woodlands management. It notes that the lack of identified target for woodland conservation, as mandated by the NFA, has acted as a deterrent for ensuring the integrity of the national woodland asset. It details a number of interventions that could improve the overall sustainable management of woodlands, including the development of a Woodlands Extension Service and an Advisory Support Programme, which would assist communities in undertaking management of communal woodland resources. It notes that challenges in woodland management due to lack of secure land tenure, leading to overexploitation of the resource. It proposes that a budget be developed specifically for woodlands research, notably into what comprises a sustainable forest use system.

Are there clear targets?

There are two distinct regimes governing potential REDD+ activities in South Africa. There are those that fall under NPAES, with clear, specified, measurable targets

for conservation of woodlands and forests. Outside of the existing and proposed protected areas network as designated in NPAES there is less clarity and limited detail on proposed management policies and targets.

The most ambitious targets are found in the *National Protected Areas Expansion Strategy*. It seeks to integrate a portion of the country’s natural forests and its savannah systems into the protected areas network, leading to a total protected area of 23% and 10% of each biome respectively. Although this is an important contribution, it does not, however, provide insight into how the remaining 77% and 90% respectively of these two resources will be managed. Conversely, in its *Strategic Plan 2012/13-2016/17*, DAFF intends to conduct an assessment of forests and woodland forest patches in one province, monitor 20 of these patches, and develop “systematic conservation planning for forests and woodlands” in three forests of the designated province. Although this exercise will provide important learning, and perhaps provide an efficient means for replication, it will need to be scaled up considerably into adequate national-level response. It is important to note that DAFF is tasked with ensuring that no natural forest be destroyed “Save under exceptional circumstances” (NFA) and is obligated by the policy to identify a percentage of woodlands to protect.

Targets in the *National Biodiversity Framework* complement these efforts. Although the Framework requires updating in 2014, having expired in 2013, its targets over the 2009-2013 period included the development of seven bioregional plans, the establishment of two new biosphere reserves (designated by UNESCO), six spatial provincial biodiversity plans, and the implementation of six stewardship programmes aligned with NPAES and based on the development of contractual relationships with landowners. The commitment to creating two fiscal or market instruments that would incentivize participation in biodiversity conservation was also made. These targets align with efforts to conserve forests and woodlands, and could result in improved conditions by which conservation of these biomes can be realized.

What are the unique barriers to implementation?

A barrier for implementation noted by several stakeholders within Government and the NGO sector, is a lack of information on the location of the country’s natural forests, the current status of its woodland assets, as well as the nature of predominant deforestation drivers within South Africa. Furthermore, clear woodland conservation goals were also highlighted as a hurdle to implementation by provinces, municipalities, and their implementation partners. Concerning woodlands in particular, stakeholders noted that the communal nature of landholdings can complicate commitment to biodiversity stewardship or similar agreements and may act as a disincentive for the development of sustainable woodland management practices.

Areas for consideration

By and large, the policy environment for REDD+ activities is well established and is not in need of substantive restructuring or alignment. The value of forest and woodland conservation, from a socio-economic and ecological perspective, is consistently cited across policy. The view that fiscal instruments, including offsets, should be established to encourage conservation is commonly held, and efforts are already under way to develop these. A clear pathway to conserve moderate percentages of these two resources is well articulated as part of the protected areas network process. A strong legislative framework supports these strategies, requiring that natural forests as well as woodlands receive protection, and that research, development and monitoring must be undertaken to ensure their integrity over time.

The following policy considerations would encourage REDD+ rollout, above and beyond removal of common barriers discussed in Section 1.1 above:

- It has been suggested that the challenge of sustainable forest and woodland management in areas under communal land-tenure, requires the development of sound, innovative implementation models that allow active community participation. Stakeholders anticipate that such models will require substantial policy support to address the issue of long-term permanence and associated viability.
- As noted above, an area target for woodland conservation needs be articulated to support implementation at provisional and local municipality scales. As noted in the *Woodlands Strategy Framework*, these targets need to be based on research that remains to be undertaken. This will allow the Minister to adhere to his/her legislative mandate with the support of robust scientific evidence.
- Development of REDD+ strategy/action plan and all the other elements as defined and required under the UNFCCC decision 1/CP.16 paragraphs 70,71, and 73 to leverage international support and generate carbon and non-carbon benefits from the implementation of REDD+ activities.





Section 2 – SECTION 4

Guiding current and future land-use beyond the scope of targeted mitigation activities

The stakeholder engagement process undertaken during the course of Section 2 was primarily aimed at identifying and understanding the nature of land-use based climate change mitigation activities in South Africa. Extended interviews were conducted to understand the nuanced details of implementation – the logistics thereof, required human resources, cost structures and so forth.

Towards the end of each interview, the party was asked to take a step-back and think beyond the strictures of the CDM, VCS and other predefined mechanisms¹⁶. Are there opportunities to mitigate climate change through land-use that we are missing because historically we have focused on neatly delineated project-scale initiatives? They were asked the questions: “If one could take a completely ‘blue-sky’ approach to land-use based climate change mitigation, what would you do?” “Which substantial opportunities are not being considered?”

Among the many great ideas put forward, two prominent areas for considerations were repeatedly identified. The first is the need to guide current land-use practices on private and communal land. The second is the need for appropriate and improved spatial and land-use planning.

The first area of consideration is based on Government and private-sector practitioners experience in the field. Many noted that while they are attempting to roll-out land restoration projects in particular areas, activities such as the deep ploughing of indigenous grasslands and the clearing of sub-tropical thicket and woodlands continue unabated. This may be understandable if the conversion of land is part of long-term development plan, but the area is often only farmed for 1-2 years before abandonment. In

addition, the financial income generated in the short period is often marginal. Practitioners therefore noted that there is good scope for new forms of incentive mechanisms that would facilitate the long-term sustainable management of land.

The second area of consideration – the need for appropriate and improved spatial land-use planning – was raised by field practitioners as well as local and national Government entities. It is based on a growing awareness of the importance of ecological infrastructure and services, and the need to plan and manage such infrastructure at landscape or even regional scales. Small project-scale land restoration activities may not deliver substantial climate regulation benefits, but especially the water services that are required by local communities and downstream urban economic hubs. Although “bioregional” and other forms of spatial planning are being undertaken in particular areas, stakeholders suggested that these efforts need to be extended significantly, in terms of geographic scope, intensity and follow-up.

Guidance has been taken from the results of Section 1 of the project to first, focus the analysis on the regions or biomes with substantial carbon stocks, and secondly, on areas in which land-use and associated carbon stocks are likely to change in the near future.

The analysis illustrated that although the highest carbon stocks per hectare are found in coastal forests, followed by moist savanna and thicket ecosystems (Fig 1), when the spatial extent of the land-cover type is considered, the majority of South Africa’s terrestrial carbon stock is located in grassland and open savanna systems (Fig. 2).

¹⁶ CDM – Clean Development Mechanism, VCS – Verified Carbon Standard

Approximately 30% of the national terrestrial carbon stock is located in grassland ecosystems and a slightly lower amount in the savanna biome (Scholes et al. 2013). In comparison, less than 5% of the national carbon stock is located in indigenous forest and sub-tropical thicket.

Furthermore, of particular interest in terms of developing implementation options and policy responses, is that over 90% of carbon stocks within the grassland and savanna biomes are located in the belowground soil organic carbon

pool. Although this is largest terrestrial pool of carbon in the country, little priority has been placed on it, due to the historical emphasis on forests and REDD+. These results suggest that a better balance of effort is required between grassland, savanna and forest ecosystems. Whereas, restoration efforts and current progress with sub-tropical thicket and forest biomes should not be curtailed, equal effort should be placed on maintaining belowground carbon stocks in grassland and savanna ecosystems.

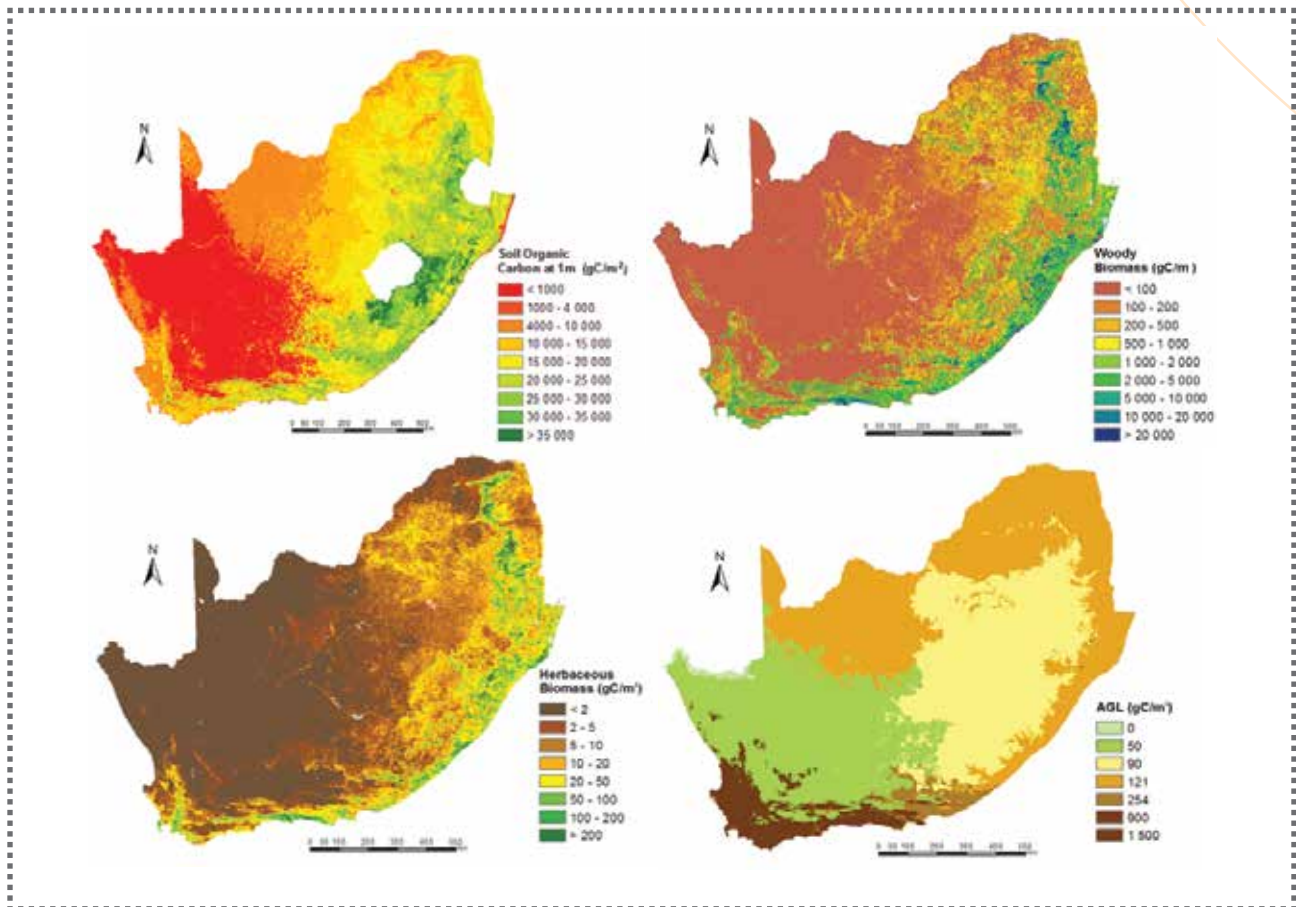


Figure 1. The components of the terrestrial carbon stock of South Africa. Top left: soil organic carbon to 1m in depth. Top right: the above- and below-ground woody-plant biomass pool. Lower left: above- and below-ground herbaceous biomass pool. Lower right: aboveground litter (Scholes et al. 2013)

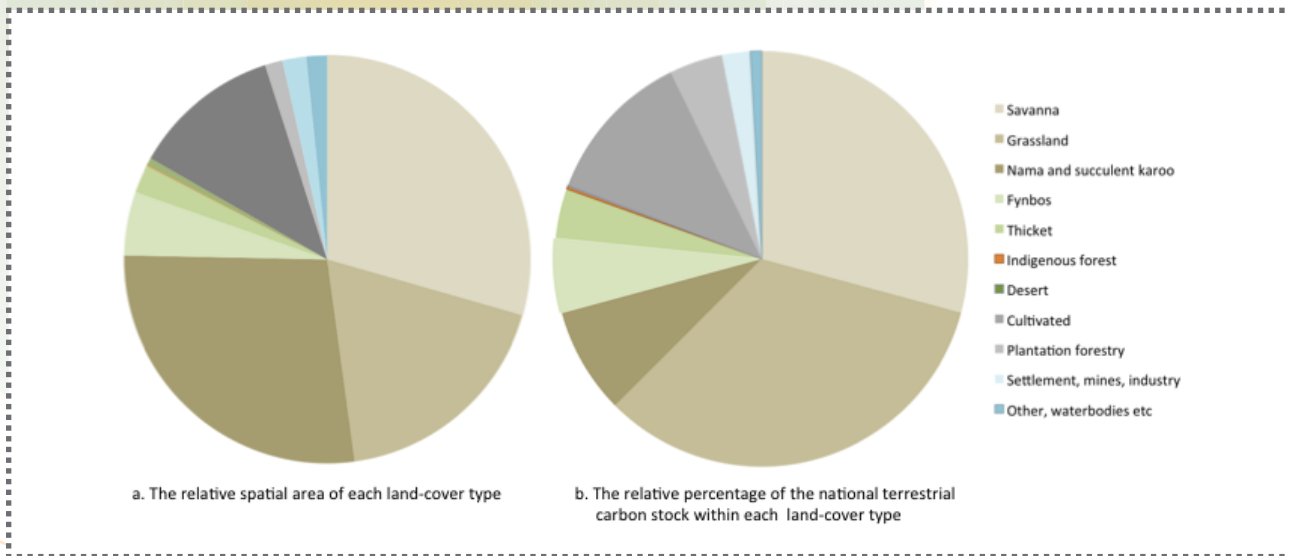


Figure 2. The relative contribution of each of the principle land-cover types in South Africa in terms of (a) spatial area and (b) terrestrial carbon stocks (input data from Scholes et al. 2013)

In terms of potential changes in land-cover, the analysis undertaken by GTI (2013) indicated that there is likely to be a considerable increase in the spatial extent of commercial crops, built environments and commercial forestry by 2020. The area affected by mining is also predicted to increase but to a far smaller extent (Fig 3). The majority of the expansion is likely to occur in areas that are currently indigenous grassland and savanna. There may therefore be good opportunity, not to halt the expansion of commercial crop and built environment, but to provide guidance through

policy that ensures that expansion occurs with the lowest impact, and possibly positive consequences for terrestrial carbon stocks, associated GHG emissions as well as a broader suite of ecosystem services.

In the review below, we focus on policies pertinent to the expansion of the built environment, mining areas, and commercial and small-scale; and their potential affect on terrestrial carbon stocks and associated ecosystem services.

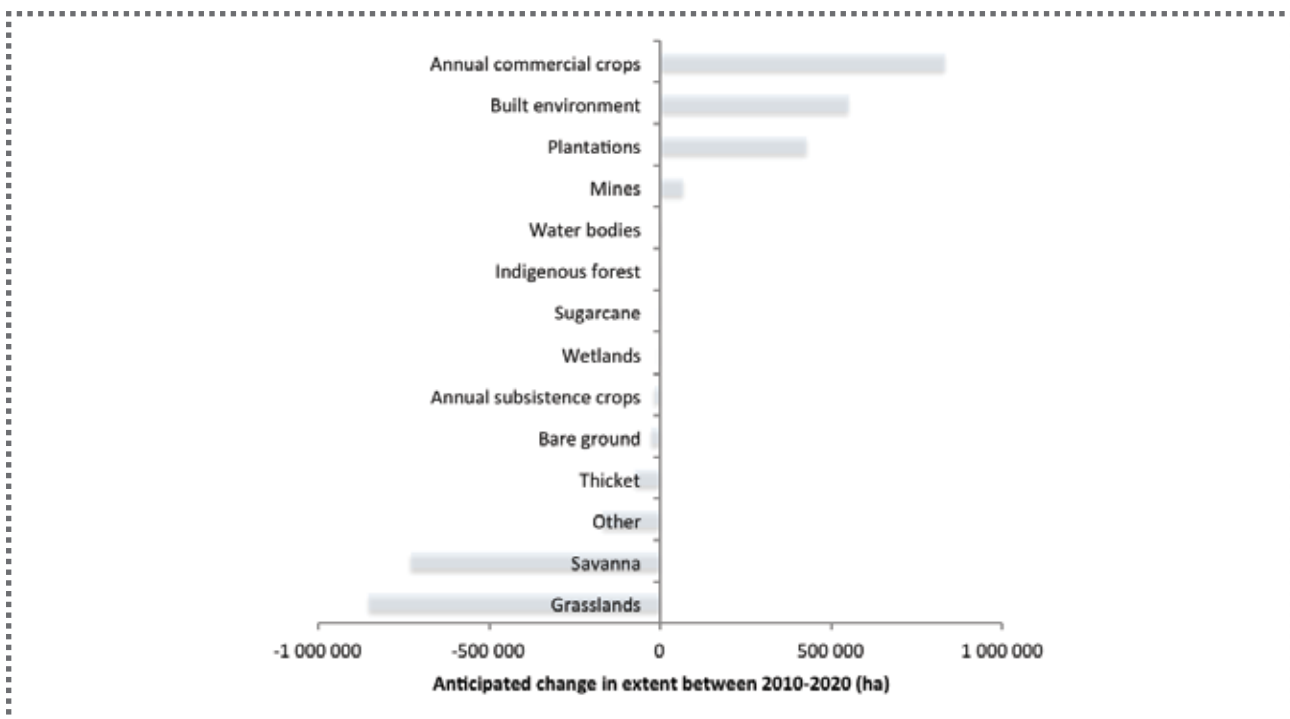


Figure 3. The anticipated change in the extent of each land-cover type in South Africa during the period 2010-2020. For further explanation and assessed changes for the 2000-2010 period, please see GTI (2013 pp 7-10).

2.1 Policies influencing the expansion of built environments

The built environment covers a substantial range of land-use types, including but not limited to service delivery infrastructure such as water, energy, telecommunications and health facilities, settlements in both urban and rural settings, and transport corridors, both road and rail. As part of its mandate, the Government has pledged to rapidly expand service delivery, to provide housing for its citizens, and to boost economic growth and trade through strategic delivery of road, rail and port infrastructure. This pledge has been articulated in a number of policies such as the *National Development Plan*, the *Medium Term Strategic Framework*, the *National Infrastructure Plan* and the *New Growth Path*. A coordinated response to expansion of the built environment should lead to a considered, responsible environmental approach, whereby NEMA's principles are adhered to and impacts on the environment are avoided, minimized or mitigated.

However, as illustrated in Section 1.4 of the SA National Carbon Sink Assessment focused future land-use scenarios (GIT 2013), there are cases where such development competes with other forms of land-use (e.g. mining, agriculture and conservation). This suggests that some policy interventions may be required to improve inter-governmental coordination and planning efforts.¹⁷

There are a number of acts, regulations and guidelines that already provide considerable direction, control and management over the spatial planning and land use development activities in South Africa (listed below). In-depth accounts of these policies can be found in the policy catalogue as well as in the policy analysis report (Section 3.1 of SA National Carbon Sink Assessment). What the following recommendation sections suggest is that policy efforts should not be focused on *amendments* to this legislation, but rather on realizing Ministerial authorizations to establish norms and standard, regulations and guidance.

Reinforcing legislation

- Local Government Municipal Systems Act
- Spatial Planning and Land Use Management Act
- Guidelines for development of spatial development frameworks, DRDLR
- National Environmental Management Act
- NEM: Environmental Management Framework Regulations
- NEM: National Biodiversity Act and National Framework

- Guidelines regarding the determination of Bioregions and the preparation of and publication of Bioregional Plans

Required suggested omissions / deletions to existing policy

This analysis suggested that no omissions or deletions are required in the existing body of policy.

Suggested new inclusions to policy

Within existing policy: Drivers

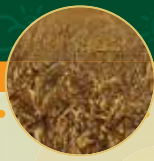
In a similar manner to strategies and plans influencing the growth of the agriculture and mining sectors, it is not clear whether the strategies and plans committed to expansion of infrastructure, settlements and transport corridors have adequately taken their potential impacts on the environment and other forms of land-use into consideration. Whereas it is understood that large infrastructure projects, housing developments and other built environment initiatives would be subject to an EIA, the EIA approval process does not extend into the domain of appropriate and adequate spatial planning. The cumulative effects on the environment of many projects that have passed an EIA, but without the context of a larger planning framework may not be desirable or meet the State's environmental obligations under section 24 of the Constitution. The newly adopted *Spatial Planning and Land Use Management Act* requires that the national government establish a spatial planning framework, which guides the content of both the provincial and municipal level frameworks, as well as the municipal level land use schemes. The Act provides spatial planning principles, and requires the Minister to develop norms and criteria to guide the planning processes across all spheres of government.

In view of the extensive built environment activities and expansion proposed in the policies and strategies, it is recommended that these strategies and plans be reviewed and potentially revised, to ensure that they adhere both to SPLUMA's (forthcoming) norms and standards, as well as against NEMA's principles. This will ensure consistency in deployment of the national spatial planning framework, as all national level policies driving expansion of the built environment will adhere to the same body of norms, standards and principles.

Within existing policy: Legislation

There is a strong legislative environment that guides land-use spatial planning and development. All of the policies listed above under "reinforcing legislation" require that the environmental impacts of land-use activities be

¹⁷As detailed in the Section 3.1 report of the South African National Carbon Sink Assessment, a number of policies may lead to an acceleration of land-use change, partially attributable to expansion of the built environment, whereas others encourage responsible natural resource use; a third group of policies advocate for improved management, control and planning processes to inform responsible land-use change (see Module 6 of the report)



taken into consideration in planning processes, and that appropriate measures be taken to avoid, minimize or mitigate those impacts in adherence with environmental legislation. NEMA provides the Minister with powers to restrict, investigate and monitor the environmental impacts of certain activities and in certain geographic regions. The *Local Government Municipal Systems Act* requires that each municipality develop an Integrated Development Plan, inclusive of a spatial development framework (SDF). With the recent introduction of the *Spatial Planning and Land Use Management Act*, the reinforcement of local and provincial level spatial development frameworks is provided. Municipal-level spatial development frameworks are meant to adhere to any locally relevant bioregional plans, and in the absence of those plans, refer to the provincial spatial biodiversity plan or any biodiversity sector plans. They are also intended to use the outputs of from a local strategic environmental assessment (SEA). Amongst other of elements reviewed and analyzed, the SEAs review vegetation types, soils, climate risks and biodiversity within a given region. Threats to vegetation cover must be assessed (such as agriculture) and the status of ecosystems is also reviewed. This important information feeds into the SDF development process.

The frameworks are complimented by municipal level land-use schemes, which must comply with prevailing environmental legislation. SPLUMA also provides the legal basis for the administration of land use schemes, which “have the force of law” and requires that no land use activities be undertaken if not provided for in the scheme. NEMA as well as the *NEM: Environmental Management Framework Regulations* provides the legislative backdrop that is meant to guide, inform and moderate spatial planning and land use development at all levels of government.

Through NEMA, a number of listed departments and Ministries are required to submit environmental management and environmental implementation plans, depending on whether they are listed in Schedule one or two of the Act. The purpose of the plans is to ensure harmonization of environmental policies plans and programmes across national departments. Each department is required to detail the ways in which each policy, plan and programme that may impact the environment and over which it has control adheres to the Act’s principles, and any other relevant norms and standards. At present, the departments covered include:

- Department of Environmental Affairs and Tourism
- Department of Land Affairs
- Department of Agriculture
- Department of Housing
- Department of Trade and Industry
- Department of Water Affairs and Forestry
- Department of Transport
- Department of Defense

- Department of Minerals and Energy
- Department of Health
- Department of Labour

This list broadly captures the national-level departments that are involved in creating policies, plans and programmes that identify and direct expansion of the built environment (notably the Land Affairs, Housing, Trade and Industry, and Transport departments). However, as observed in the 13 policies that currently drive land-use change, a number of these originate from the Presidency (the MTSF, NDP and NGP in particular). These “presidential” plans wield considerable influence over the planning processes within departments, and are regularly cited in their own policies, plans and programmes. They provide direction to many of the government’s activities and efforts.

The influence of policies such as the MTSF, NDP and NGP may also resonate in the implementation of SPLUMA. SPLUMA requires that national spatial planning framework be informed by norms and standards. These norms and standards, amongst other criterion, should “reflect the national policy, national policy priorities and programmes relating to land use management and land development.” It is highly likely that the national spatial planning framework will be influenced and guided to some degree by policies, plans and programmes originating from the Presidency.

Suggested new policies

Many of the proposed built environment initiatives are state run and to be paid through the fiscus (roads, energy infrastructure, low-income housing settlements, and so forth). In addition, given the extent to which spatial planning and land-use development is a government function, which is meant to dictate the rules, norms and practices by which the built environment expands, it was not considered appropriate to introduce incentives for the built environment sector. Similarly, SPLUMA already provides for penalties in its sections referring to contravention of municipal level land use schemes, so further introduction of fines, sentences or other types of measures was considered redundant. Instead, this section describes several actions that the relevant Ministers can take to improve the interpretation of, adherence to and clarity of certain Acts.

The following recommendations are intended to provide organs of state and development actors with more transparent, succinct information on the conditions under which expansion of the built environment should be pursued:

- Under SPLUMA, the Minister is requested to develop norms and standards. There are seven broad elements that they must give effect to, including the promotion of sustainable development and provision of a framework for desired land use patterns. These have yet to be published, and remain critical to the realization of the

Act's principles and stated objectives. These norms and standards could be developed with a view to ensuring the integrity of the country's ecological infrastructure, to recognizing the value of national terrestrial carbon stocks, and to ensuring that development activities are undertaken in a manner consistent with NEMA. Norms and standards could address, amongst other opportunities:

- **Means of measuring, defining, implementing and monitoring urban and peri-urban densification efforts to support improved decision-making for town and city planners.** Norms and standards could extend beyond criteria for maintaining or constructing individual buildings to encompass entire areas targeted for development. This should yield not only environmental benefits through measured reductions to urban sprawl, but also socio-economic returns and more efficient use and management of infrastructure and transportation systems.
- **Means of undertaking valuable mapping exercises that accurately capture landscape level ecological characteristics, including a carbon storage layer, other ecosystem services and land use types.** Avoiding disturbance to intact ecosystems, notably those with high carbon stocks, will be greatly facilitated through the use appropriate spatial scenario analysis. For example, the eThekweni Municipality makes use of such analysis, linked to its Durban Metropolitan Open Space System (DMOSS). As part of SPLUMAs norms and standards, notably 8.2.d.iv, which addresses the need for coherence across mapping systems, it is recommended that norms and standards for mapping requirements at the local level be specified. This should be at scale that will provide detailed, complete information on local ecosystems. This will lay the foundation for responsible development planning based on a complete, exhaustive understanding of municipal landscapes. It should lead to improved management of municipalities' terrestrial carbon stocks.
- **Means of enforcing NEMA's "polluter pays" principle.** Although the use of biodiversity offsets to address the residual impacts of development whilst helping the Government achieve conservation goals remains a contentious mechanism, it is recommended that application of this concept and approach at the national level be explored in more depth. There is legal precedence for biodiversity offset use in NEMA, and the National Biodiversity Framework. It is critical that an offset measure only be activated as a measure of last resort, in the event that the impact of a development on intact ecosystems cannot be avoided through application of SPLUMA, NEMA, and the EIA process. In all instances, the carbon offsets principles of *additionality* and *permanence* should be adhered to, to ensure that conservation (or potentially restoration) efforts target areas under threat of exploitation and will remain under conservation for a pre-defined period of

years, if not in perpetuity. Currently, KZN Wildlife is piloting an "offsets banking" scheme, supported by its *Norms and Standards for Biodiversity Offsets*. National government may wish to study and track the success of this pilot initiative as a preliminary step in determining the efficacy and suitability of this approach across the country. If offsets were considered a viable approach, then development of norms and standards through SPLUMA would ensure their adoption at the national, provincial and local levels.

- It is not clear the extent to which national departments listed in schedules one and two of NEMA have in fact regularly developed and reported on their environmental implementation plans and environmental management plans. This potentially limited participation may be linked to a lack of both clear guidance as well as regulatory measures to add more clarity to the process generally. Under chapter three of NEMA, section 11(8), the Minister is authorized to publish guidelines that help national and provincial departments prepare plans that meet the standards implicit in NEMA. In addition, the Department can prepare and issue regulations which would provide clarity on the contents of environmental implementation plans, specifically: how policies, plans and programmes comply with NEMA's principles, and how departments will manage their functions in compliance with NEMA and other relevant legislation. It is recommended that the Department draft both the guidelines and regulations and submit them to the review and approval procedures described in the Act.

2.2 Policy considerations relevant to the mining sector

Mining is a key sector in the South African economy, delivering significant economic growth potential in areas of prospecting, mining and beneficiation. However the growth of the sector has slowed in recent years due to depressed global commodity prices, rising energy costs and in the domestic sphere increasing input price pressure, falling domestic productivity and increasingly protracted labour disputes.

At a policy level, the intention to support and grow the sector is reiterated in the *National Growth Path*, the *National Development Plan*, and the *Economic Development Department Strategic Plan: 2012/13-2016/2017*. This is taken up with practical implementation in the *National Infrastructure Plan*, where specific Strategic Infrastructure Plans (SIPs) are intended to direct development of infrastructure corridors to enable mining intensification. The targeted areas of extraction are the Waterberg - Platinum belt area (specifically coal), and the iron ore and manganese operations in the Northern Cape. The government's legislative support for the sector focuses



on enabling diversification of the sector to accommodate new license holders, with Black Economic Empowerment (BEE) an imperative, as established in the Mining Charter¹⁸ (2010).

Mining activities tend to have long term and frequently irreversible impacts on the environment (soil structure, geological stability, water resources, aquatic and terrestrial biodiversity and air quality). Thus, with respect to mining expansion, land use and the question of terrestrial carbon stocks, a number of issues apply:

- **The extent of mineral resources:** South Africa is endowed with a wide range of mineral resources located throughout the country. Existing knowledge or reserves is based on conventional exploration, but the country still has significant potential for additional discoveries, using new exploration techniques. Thus the issues pertaining to mining and its relationship to other land uses including ecological infrastructure services and carbon stocks applies at a national scale.
- **The question of the right to mine, versus existing land use and other land use options:** Historically, the national and regional spatial and land use management systems did not have the ability to integrate mineral development, with the result that the question of mining rights versus other land use rights have tended to be arbitrated by the courts. This created a situation where legal precedence is frequently based on court verdicts relating to planning legislation.¹⁹ This is a process that is under continued under legal revision. The Constitutional Court ruling in 2012 on the matter of *Maccsand vs City of Cape Town* implies that land use zoning rights are required for land holdings for which mining rights have

been granted in terms of the MPRDA. The process of addressing this is now underway in national, provincial and local planning initiatives that fall under *The Spatial and Land Use Management Act, 2013* (SPLUMA).

- **The regional impacts of mining activity and its impacts on other land uses bioregional services:** This is an extensive topic beyond the scope of this analysis. Mining impacts are very often not limited to a single piece of land, but can also be carried by air or water. This issue is most clearly illustrated with respect to acid mine water²⁰ quality issues that affect both groundwater and surface water. This is particularly problematic in the Witwatersrand area, where acid water has been decanting into surrounding river catchments, with increasing impacts on river systems in Mpumalanga, Free State, Limpopo and the North West.
- **A regulatory environment in a state of flux and uncertainty:** The laws governing mining and petroleum exploration and production in South Africa are in a state of flux and have been for some time²¹. The laws changed fundamentally in 2004 with the entry into force of the *Mineral and Petroleum Resources Development Act, 2002 (Act no. 28 of 2002)*, which places all minerals under state custodianship, with the Minister of Mineral Resources authorized to grant rights to prospect and mine for mineral and petroleum in consultation with relevant departments. In a more recent development The Amendment Bill to the *MPRDA* was approved by the Parliamentary Minerals Portfolio Committee early in March 2014, again making changes to the underlying legal tenets pertaining to exploration and mining rights²¹. The Bill is likely to come under challenge in the Constitutional Court, with the result that the sector faces regulatory uncertainty in the near term.

18 The Mining Charter of 2010 aims to ensure black ownership of 26% of the country's mining assets by 2014, and introduces sustainable development principles, premised on the understanding that licence to operate includes environmental, health and safety performance.

19 The Constitutional Court ruled, in the matter of *Maccsand (Pty) Ltd and Others v City of Cape Town and Others* (2012) that the matter of granting a mining right or permit by DMR was unconstitutional, as the required land use authorization had not been granted in terms of the Land Use Planning Ordinance (LUPO). Thus the ruling determined that the granting of a mining right in terms of the MPRDA does not obviate the need to also obtain the relevant land use zoning. In arriving at its decision the Constitutional Court held that the issues in the appeal were not confined to the Western Cape Province, but to the provinces to which LUPPO applies, viz. parts of the Eastern Cape and parts of the North-West Province. However, as all other provinces have planning ordinances and, in some instances planning laws, this may also apply generally across the country.

20 Acid mine water is characterised by a low pH, and a high salt and heavy metal content. Acid mine water can be released anywhere on a mine where sulphides are exposed to air and water including waste rock piles, tailings, open pits, mine shafts. Acid mine drainage has severe impacts on aquatic life, animals and plants and renders water unsuitable for irrigation and human consumption.

21 In 2008 an Amendment Bill to the MPRDA was introduced into Parliament, which proposed a number of changes, including the requirement that mining operations be subject to provisions of the country's environmental legislation, viz. NEMA. This Bill was delayed in coming into force, but was followed by the 2012 Amendment Bill. Before this latter bill was enacted, certain components of the 2008 Amendment Bill came into force which led to a situation where many of the MPRDA provisions relating to the environment were actually been repealed, while NEMA provisions relating to mining have not come into force.

22 The 2013 Amendment Bill, makes substantial changes to the underlying legal tenets pertaining to exploration and mining rights. To facilitate diversification and new entrants into the sector, the amendment leaves more discretionary power to the Minister (for example the Minister has the power to refuse to grant a prospecting right if the grant of such a right will "result in the concentration of mineral resources under question under the control of the applicant and their associated companies with the possible limitation of equitable access to mineral resources"). Discretionary provisions for the Minister to decide on levels of minerals to be set aside for beneficiation, the preferred pricing regime for local beneficiation and to limit the export of certain "designated" minerals are also likely to be challenged. These provisions could also run contrary to international trade agreements to which South Africa is a party.

- **Remediation legacies:** Nationally there are currently more than 6000 closed mine sites requiring rehabilitation (Financial Mail, 2012). Priority is given to asbestos sites, which pose the greatest human risk, but there are currently more than 100 sites in the Northern Cape alone requiring remediation. If handled within strict health and safety norms, remediation efforts could offer the opportunity to employ a substantial number of local, rural residents.

Thus, there are significant land use related questions pertaining to the sector, both in terms of rights and in terms of long term impacts on the human and biophysical environment. There is also a level of uncertainty in the sector with a concern being that the longer term effects of the MPRDA Amendment Bill will be to dampen growth and investment in the sector, as the discretionary powers granted to the Minister leave some uncertainty for new investment.

Reinforcing Legislation

The *Mineral and Petroleum Resources Development Act* (Act no. 28 of 2002, the MPRDA Amendment Act of 2008, and MPRDA Amendment Bill of 2013) stipulate the environmental requirements, which must be approved by the Department of Mineral Resources prior to issuance of a mining permit. In addition, and according to MPRDA, all mining and prospecting must adhere to NEMA (section 37). Regulations listed below are some of those that govern environmental and land use aspects relevant to mining.²³

- *The National Water Act*, Act 36 of 1998 (both a Water Use License is required and compliance with the Regulations on Use of Water for Mining and Related Activities Aimed at the Protection of Water Resources - DWAF)
- *Atmospheric Pollution Prevention*, Act 45 of 1965 (an Air Quality Certificate is required) - DEAT: Air Pollution Control
- Clearance is required from the South African Heritage Resources Agency (SAHRA)
- The *Income Tax Act*, No 58 of 1962 (the Act regulates mining rehabilitation funds, requiring that the assets of rehabilitation funds be strictly utilized according to their objects) – South African Revenue Services
- *National Environmental Management Act* (including requirements for a waste permit in terms of Act 59 of 2008 (Waste Act) – DEAT.

Regulations promulgated under the MPRDA address requirements for Scoping and Environmental Assessment Reports required for consideration of application for a mining license. Thus an environmental assessment is required according to specific guidelines of the MPRDA and in addition all mining and prospecting must adhere to NEMA (Section 17). However, ancillary infrastructure, which may be “identified activities” (roads, water pipelines etc.) may require a separate Environmental Impact Assessment, which requires approval under NEMA. Thus a situation prevails of joint responsibility for environmental authorization for mining approvals, with DME and DEAT jointly responsible for the decision on the EIA. The 2008 Amendment to the MPRDA provided for the authority on EIA to rest entirely with the DME, but this did not come about.

While the Amendment Bill to the MPRDA has sought to address the streamlining of applications between departments, some of the proposed changes have come under criticism from civil society, as the bill provides for a separate environmental authorization regime for mining-related environmental impacts, with the DMR holding ultimate responsibility for authorization. This could present an inherent conflict of interest as the DMR is the designated agency responsible for promoting the interests of mining, albeit with sustainable development principles in mind.

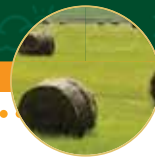
However the MPRDA grants the Minister discretionary powers that, if used, could favour decisions based on proactive environmental planning. According to the MPRDA, the Minister may by notice make regulations regarding the conservation of the environment at or in the vicinity of any mine works, management of the impact of mining operations on the environment in the vicinity of mining operations, rehabilitation of disturbances, and prevention of pollution of air, land, sea or other water (Section 107).

Environmental Management Programmes and post closure liability

Effective rehabilitation has scope to limit the net-negative impacts of mine expansion on local vegetation and soil carbon stocks.

While regulatory requirements for environmental management and post closure rehabilitation have been in place for several decades, the rehabilitation objectives

²³ Obtaining the relevant authorisations is not a streamlined process, and is managed by several departments. There are reportedly more than 100 operators who are working without or with outdated Water Licenses, and due to delays with DWA there is a practice for mining licenses to be issued ahead of water licenses (Reichardt, pers. com). The process of obtaining approvals can take up to three years (Reichardt, pers com).



and procedures and specific legal requirements of mining companies have changed considerably over the past 25 years. The introduction of the MPRDA brought improvements to the requirements for mine closure planning, requiring that a functional end land use be reinstated, which can positively contribute to the future biophysical and societal demands of people and animals living in proximity to the disturbed environment.

Section 38(1) (d) of the MRRDA and Government Notice of NEMA both state that mining operations should “as far as reasonably practicable, rehabilitate the environment affected by the prospecting and mining operations to its natural or predetermined state, or to a land use which conforms to the generally accepted principle of sustainable development.” Section 61 (b) of the MPRDA also requires that the environmental management planning needs to “... provide broad future land use objective(s) for a site” and the provision of a plan describing the final and future land use and arrangements for the site, in accordance with Section 62(i), as part of the mine’s closure planning.

The MPRDA sets out requirements for closure plans and establishment of a rehabilitation fund to ensure adherence to the “polluter pays” principle outlined in NEMA.

Broader policy frameworks:

Additional regulatory frameworks apply although their legal application to determine the outcomes of mining authorization is currently limited:

- Guidelines regarding the determination of Bioregions and the preparation and publication of bioregional plans
- The National Environmental Management: Biodiversity Act
- Disaster Management Act and Framework
- Spatial Planning and Land-Use Management Act
- The National Framework on Sustainable Development
- The Sustainable Development through Mining Programme (SDM).

The Sustainable Development through Mining Programme (SDM) falls under the NFSD umbrella and aims to promote the management of human, socio economic and environmental components affected by mining. Specifically the programme has a practical implementation component, and is engaged in identifying and prioritising abandoned mines for closure which still require rehabilitation. It is also developing a strategy to ensure that current mining

operations do not generate these liabilities. Reportedly one of the biggest challenges at closed mining sites stems from the soil erosion that tends to take place several years from closure.

Required suggested omissions / deletions to existing policy

It was not considered necessary to either omit or delete any content in the existing body of policies.

Suggested new inclusions to policy

There is a body of well thought out legislation with respect to the question of issuance of prospecting and mining licenses and the environmental requirements for consideration and management of mining related activities. However, there are many ambiguities around mining license applications, and lack of clarity as to the overriding regulations and responsible level of government that ultimately determine authorisation on mining applications. The result is that stakeholders frequently take disputed mining authorisations decisions to court for arbitration, notably in regards application of the *National Water Act*. This situation is not ideal for those who bear the legal costs and capacity required for court arbitration, including local and national government. It is also not ideal for a sector that is characterized by high environmental risks and potential for irreversible impacts on ecosystem service functioning, including water supply and the terrestrial carbon storage capacity of landscapes.

Policy recommendations are made for the development of more strategic frameworks related to the question of mining expansion, and for streamlining and clarifying processes for environmental authorisation.

Presidential Commitments: Outcome 10 Delivery Agreement

The Outcome 10 Delivery Agreement was launched in September 2010. This “negotiated charter” records the following key challenge with respect to mining: “*The inability of current spatial planning and land use management systems to integrate mineral development has resulted in the latter occupying areas where it permanently sterilized areas of high agricultural potential or impacted severely on sensitive and prioritised ecosystems. Mineral development priority areas should with equal standing “compete” in a spatial planning and land use management system with other policy imperatives such as biodiversity protection, food security, water security etc. The inclusion of mineral*

development in spatial planning and land use systems and identified agreed “mining restriction areas” is accordingly an important step in doing things differently towards achieving the desired outcome.”

The process of addressing this is now underway with the drafting of legislation for provincial acts that fall under *The Spatial and Land Use Management Act, 2013* (SPLUMA). SPLUMA lists mining amongst 14 other land use purposes (schedule 2) for zoning. This is an opportunity for mining to be effectively integrated with spatial planning. However there is an important need to develop comprehensive frameworks that address the principals that are addressed in the presidential outcome listed above.

Many of the national policies guiding future development recognise the importance of maintaining and enhancing ecosystem service infrastructure, including maintenance of water resources and terrestrial carbon storage functions. An integrated approach is advised, whereby provincial planning frameworks are developed taking cognizance of mining land use in relation to these priorities.

Developing an Environmental Management Framework to evaluate mining applications

The location of mining activities is obviously determined by the location of identified mineral resources. As the situation stands the DMR is obliged to accept all applications for prospecting, except for certain areas defined in the MPRDA, including residential areas, public roads and railways and cemeteries (Section. 48 (2)). Acceptance does not imply granting of the prospecting license – but the application must be considered according to established processes. If minerals are located through prospecting, the DMR is then obliged to consider and process all applications for mining –subject to the environmental management principles listed in Section 2 of NEMA. Thus, in consultation with other relevant departments, including the DEA, the DMR can refuse to grant a license.

Ideally, a first level screening should take place, so that certain no-go areas are identified proactively, and contained within a planning framework, so that applications for prospecting and associated mining targeted at certain areas will not be considered in the first place. Such a framework should hold statutory legal standing, which the MPRDA provides for. Section 49(1) gives specific discretion to the Minister to “*after inviting representatives from relevant stakeholders, from time to time by notice of in the Gazette, having regard for national interest and the need to promote sustainable development of the national mineral resources, prohibit or restrict the granting of any reconnaissance permission, prospecting right, mining right or mining permit in respect of such land identified by the Minister for such period and on such terms and conditions as the Minister may determine*”. Thus, for example, the destruction of the headwaters of a catchment

area has an opportunity cost for South Africa with national consequence. If it is agreed that certain strategic areas should be avoided on the basis of their supply of natural resources (such as potable water) the MPRDA provides the avenue for declaring the prohibition of prospecting and mining in within these strategic areas.

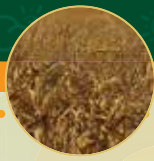
In addition NEMA sets out very clear spatial planning guidelines to all organs of the state and other authorities responsible for the implementation of legislation regulating the use and development of land through Environmental Management Frameworks for spatial planning (Section6. (1)). This includes the preparation, adoption and implementation of any spatial development framework, policy or by-law concerning spatial planning and the development or use of land.

Thus both NEMA and the MPRDA could be used to develop a statutory framework. This framework should ideally fall under SPLUMA and inform the provincial planning legislation, which is now under development. Such a framework would exclude all areas that have been identified within other relevant legislation as areas where no commercial prospecting and mining are allowed. These include the following:

- World Heritage Areas (World Heritage Convention Act, (Act 49 of 1999),
- Special Nature Reserves, National Parks or Nature Reserves declared in terms of the National Environmental Management: Protected Areas Act, 2003.
- Marine Protected Areas declared under The Marine Living Resources Act of 1998
- Specially protected forest areas declared in terms of the National Forests Act of 1998

The exclusion of these areas may seem unnecessary if they are protected by law, but there are instances where prospecting and mining rights have not only been considered in these areas, but granted. This places a burden on civil society, which invariably applies to court for the reversal of such decisions. This situation could be addressed through improved verification and screening, and spatial development frameworks.

- Mountain Catchment Areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act 63 of 1970)
- Ramsar Sites, or sites recognized under the Ramsar Convention on Wetlands 1971 (and this would include identifying key no-go areas within the Ramsar site catchment.)
- Recognized endangered and critically endangered ecosystems, and areas with high ecosystem services function, including provision of high-density terrestrial carbon stocks.
- Recognized important food production agricultural areas



- Areas where mining will have a negative impact on established settlements and human health

Ideally such a framework would evolve through consultation with a range of stakeholders, and not be limited to relevant government ministries. Input from the Department of Agriculture, Forestry and Fisheries is essential, as is that of established agricultural organizations and environmental agencies. Such frameworks should integrate ecosystem service infrastructure consideration, such as water resources and terrestrial carbon storage.

Rehabilitation, Post-closure planning and end use planning

This aspect of mining is adequately addressed in the MPRDA and NEMA. The Chamber of Mines has also developed clear guidelines according to international best practice and local environmental conditions. The DMR also considers mine closure very seriously owing to improved understanding of costs associated with the regional impacts of these long-term liabilities (such as the Witwatersrand AMD issue). This area is well regulated, and holders of the prospecting and mining license can be held criminally liable and remain so until the DMR has issued a closure certificate (Section 43 (1) MPRDA).

In spite of this supportive legislative environment, substantial issues regarding rehabilitation persist, with serious consequences for national resources, particularly water. In particular is the practice of selling mining assets that hold potential environmental liability²⁴. Subsequent insolvency of smaller mines that purchase marginal assets (with liability) becomes problematic: competing laws mean that, when a mine goes into liquidation, the *Insolvency Act* and the *Companies Act* take over and rehabilitation funds are theoretically left unprotected. In addition, the *Companies Act* allows a company to deregister without having to obtain a closure certificate.

Further issues in this area arise due to incompatibilities between the *Income Tax Act* (the Act that regulates trust funds for rehabilitation purposes), the *National Water Act*, NEMA and the MPRDA. An in depth review of the incompatibilities is not undertaken here, but for instance, there are differing applications of time periods for which responsibility is held. The *National Water Act* holds to a 30-year liability period, MPRDA holds to a 3 to 5 year period and the ITA can only provide for tangible liability, so the water pollution issues with longer time horizons are problematic. The ITA actively prevents funding for longer-term liability, as it requires all funding to be for specific known eventuality.

On the matter of closure certificates, the DMR is responsible agency. However given the complex and specialized nature of environmental rehabilitation, and range of issues at hand, the DMR may not in all instances have the necessary capacity to evaluate rehabilitation efforts and issue closure certificates. The issue is one of national importance; the DMR and therefore the taxpayer carry the cost of mine closure and regional remediation initiatives. In addition, the impacts result in issues of national consequence in the form of sterilized land, loss of ecosystem functioning, loss of water resources, threats to a healthy living environment and so on. Rural communities are the ones who bear the brunt of this situation, and many in these communities do not have access to municipal services and are more reliant on natural resources for their direct livelihood.

The following recommendations are made:

- Positive incentives be incorporated for mines that undertake rehabilitation concurrently with mining activities, and in such a way as to reinstate functional ecosystems, with attributes that deliver ecosystem services such as flood attenuation, carbon sequestration, and water filtration and purification,
- A review is undertaken on the way that financial provisions are estimated and regulated, ensuring that the relevant legislation is aligned with the purpose at hand and relevant to current costs and future inflation.
- That the DMR's guidelines for closure-related provisioning are reviewed in the following way:
- Consultation with mining stakeholders,
- Incorporation of other relevant resources such as the DWA2008 *Best Practice Guidelines Series for Water Resource Protection* and the 2007 Chamber of Mines & Coal's *Guidelines on Rehabilitation of Mines*
- Clarification of links between the EMP guidelines and the DMR financial provision calculation guidelines to enable better quantified rehabilitation plans

It is recommended that structures be established whereby the function of evaluating rehabilitation efforts and issuance of mine closure certificates is delegated to a multidisciplinary task force, including independent experts.

2.3 Agriculture – commercial, smallholder and subsistence

At present, there is a strong focus on the expansion and growth of the agricultural sector in South Africa. Considered an important driver of job creation and a means for reducing

²⁴ The sale of a mine requires approval from the Minister, and closure liabilities are required to be evaluated at this stage, but in practice this aspect is often not properly addressed. For example, Harmony Gold is currently seeking a Constitutional Court order declaring that a government directive in November 2005 became invalid when Harmony sold assets to which the order applied to Pamodzi Gold in 2007.

food insecurity, agriculture is an important component of both rural and urban economies.

Two prominent findings emerged following a review of the considerable body of policy governing the extent and nature of agriculture in South Africa. The first is that while the expansion of agriculture is strongly advocated for in a number of key policies, there is little reference to standards or technologies, such as reduced tillage, that may limit the impact of the roll-out on terrestrial carbon stocks and associated ecosystem services. Although there is some support for technologies such as reduced tillage in certain supporting policies, these activities are generally not referred to in leading policies directing growth within the sector.

The second finding is that while the potential impact of agricultural expansion is not explicitly included in policies driving expansion, there is a substantial body of “reinforcing legislation” (listed below), which provide a number of important tools to municipalities, provinces and national government to guide land use planning and decisions on the manner in which agriculture should be implemented. These include:

- The Conservation of Agricultural Resources Act
- National Environmental Management Act
- National Environmental Management: Biodiversity Act
- Guidelines regarding the determination of Bioregions and the preparation of and publication of Bioregional Plans
- Disaster Management Act and Framework
- Spatial Planning and Land-Use Management Act

Detailed accounts of each policy are provided in the “policy catalogue” located in the Section 3.1 Policy Review report

The majority of suggested policy considerations within the agricultural domain therefore focus on including clearer reference to the manner in which expansion may occur. The intention of this document is not to advocate for a reduction in the expansion of agriculture but rather to advocate for clearer guidelines about expansion that reduces potential negative impacts and assists in its own long-term sustainability.

Required suggested omissions/deletions to existing policy

It was not considered necessary to either omit or delete any content in the existing body of policies.

Suggested new inclusions to policy

Within existing policies that drive the expansion of agriculture
While the *National Development Plan* and the *Medium Term Strategic Framework* make reference to responsible natural resource use and conservation, the explicit link

to agricultural practices is not made. The *Integrated Growth and Development Plan* (DAFF) is the only ‘driver’ policy that makes reference to the need to ensure that the expansion of agricultural production be guided by a commitment to ensuring the integrity of natural ecosystems and biodiversity.

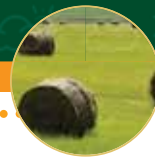
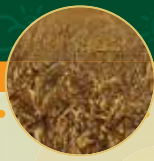
A number of these policies expire in 2014/2015, with the entry into a new election cycle.²⁵ This presents a good opportunity to revise and update these policies, taking into consideration the impacts on terrestrial carbon stocks as well as other ecosystem services. It is recommended that each of the policies that promote growth in the subsistence, smallholder and commercial agricultural sectors be reviewed and potentially updated, with a near-term emphasis on those policies that are set to expire and which will require updating. Proposed commitments include:

- That where possible, agricultural expansion will take place on previously ploughed or degraded lands, in an attempt to avoid the transformation of natural habitat.
- That expansion of agriculture – subsistence, smallholder and commercial – will only be undertaken once explicitly assessed against provisions in NEMA and CARA, in particular:
- The necessity to avoid disturbances and degradation to ecosystems, and where this is not feasible, to minimize and remedy disturbances (NEMA)
- The application of the precautionary principle, taking into consideration current limitations to knowledge
- The commitment to conservation of the country’s natural agricultural resources, including soils and vegetation cover
- That improved agricultural practices, which through scientific, peer-reviewed research are proven to increase soil carbon stocks, are promoted as part of the overall agricultural growth strategy
- That provisions are made for training and extension services, notably to vulnerable and low-income households, to ensure uptake of improved agricultural practices

Within existing policy: Legislation

The current body of legislation governing land-use and agriculture has been drafted in such a way as to allow for the development of regulations, frameworks and norms and standards over time, which will respond to new government objectives and visions, whilst retaining their core integrity and purpose. For this reason, it is not believed that changes should be made to existing legislation, but that rather from them, new regulations, frameworks, or norms and standards can be developed which address the impacts of agriculture on national terrestrial carbon stocks. These are described in the section below.

²⁵ The MTSF, IPAP, the Strategic Plan for the Department of Rural Affairs and Land Reform: 2011-2014.



Suggested new policies

The actors driving the expansion of agriculture are not comprised of a single, homogenous group but rather a range of subsistence and smallholder farmers, market-adept commercial farmers, large agricultural corporations and others. When formulating policy and associated legislation, the context of each of these actors needs to be carefully considered. This is particularly important when formulating legislative responses, which may include either punitive or incentive-based measures. As such, it is proposed that policy responses be adopted that take these differences into account.

Whilst punitive measures and controls at times are necessary and may be included within NEMA, the use of incentives to drive the adoption of improved practices and to reward both small-holder and commercial farmers for the avoidance of degradation of intact natural habitat, will be important means of realizing participation during agricultural expansion. The following incentive-based measures could be considered and integrated into both legislation and departmental level plans and strategies. It is advised, however, that substantive research into the soil carbon benefits of improved agricultural techniques and

associated planning be undertaken in advance of promoting and rolling out a national-scale incentive programme:

- Payments for the adoption of conservation tillage practices, or other types of practices that are deemed to be consistent with the preservation of soil carbon. This directly aligns with the proposed mitigation action 7 – conservation tillage – and the policy proposals discussed in Section 1 of this report.
- Consistent, sustainable technical and extension service support to vulnerable and low-income farmers, to guide the adoption of improved agricultural practices that conserve soil resources and provide for improved crop yields.
- Privileged access to agricultural financial packages for subsistence and smallholder farmers who adopt and consistently employ improved agricultural techniques
- Fiscal incentives for farmers who undertake expansion of agricultural holdings onto recently degraded or ploughed lands, essentially rewarding the avoided release of emissions from intact natural landscapes. Recently, for example, rooibos tea producers have undertaken successful cultivation of the crop on marginal lands in Elim.

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Appendix A (Section 1)

Technical procedure

The stocks and fluxes as defined in this project are schematically represented in Figure 1.

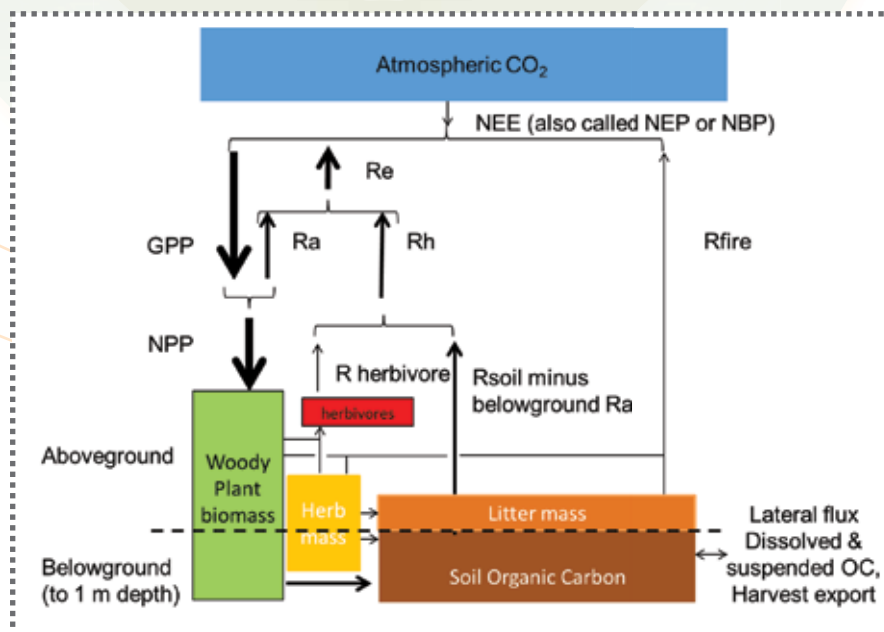


Figure 1. Components of a generalised terrestrial carbon cycle. The size of the boxes and the arrows, which represent stocks and fluxes respectively, is roughly indicative of their relative size. The herbivore stock is relatively small ($<10^{12}$ gC nationally), and neither it nor the corresponding herbivory flux is directly evaluated. Terminology: NEE – Net Ecosystem Exchange, NEP – Net Ecosystem Productivity, NBP – Net Biome Productivity, GPP – Gross Primary Production, NPP – Net Primary Production, R_a – autotrophic respiration (respiration by plants), R_h – heterotrophic respiration (herbivores, carnivores and microbes), R_e – ecosystem respiration (the combined respiration from all sources), R_{fire} – fire emissions.

Error propagation

The top-level products of this study are accompanied by error estimates, defined as the likely range for a given level of confidence (such as 80%). They take into account the error of estimation associated with uncertainty in the measurements and models. Since the whole country is measured there is no statistical sampling error. The inherent spatial and temporal variability of carbon stocks and fluxes is reflected separately in the tables, as the spatial standard deviation (SD). This should not be confused with sampling error that is usually reported in carbon stock assessments that have taken a stratification approach.

In order to estimate the top-level error, the underlying errors in each of the variables that went into the calculation must be known or estimated. Where possible, and especially for values that make a large contribution to the overall error, these are statistically-rigorous, data-based derivatives of the variance. For factors where the data are sparse ($n < 5$) or where the factor makes a small contributions to the overall error ($< 5\%$), an expert-based assessment of the variance (σ^2) has been made.

The propagation of error in the equations used in this study are mostly covered by the two rules outlined below, used alone or in combination.

For the sum (or subtraction) of statistically-independent, normally distributed variables with a variance denoted σ^2 , the overall error is given by:

$$\text{Error} = \sqrt{\sigma_1^2 + \sigma_2^2 + \sigma_3^2 + \dots + \sigma_n^2}$$

For the product of n statistically-independent, normally-distributed variables each with a variance denoted σ^2 and an expected value of q , where the overall expected value is Q , the overall error is given by

$$\text{Error}/|Q| = \sqrt{(\sigma_1/q_1)^2 + (\sigma_2/q_2)^2 + (\sigma_3/q_3)^2 + \dots + (\sigma_4/q_4)^2}$$

Basis for calculating stocks

The working units for stock estimates are gC/m^2 ($1 \text{ g}/\text{m}^2 = 0.01 \text{ t}/\text{ha}$, where t is a metric tonne = 10^6g , which is properly denoted Mg). For national sums we use TgC (10^{12}g), which is a million tonnes (teragrams).

Natural and semi-natural vegetation covers

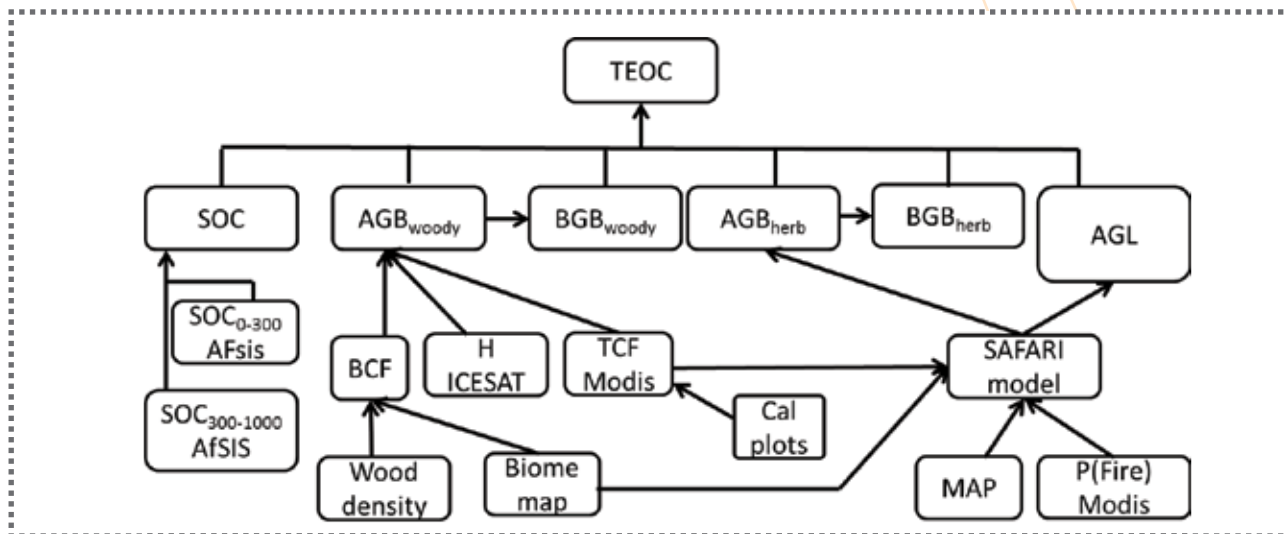


Figure 2 The workflow for calculating terrestrial carbon stocks.

- $TEOC = SOC + (AGB_{woody} + BGB_{woody} + AGB_{herb} + BGB_{herb} + AGL) * CF$
- TEOC= total ecosystem organic carbon
- SOC=Soil Organic carbon to a depth of 1 m
- AGB_{woody} =Aboveground biomass in woody plants (leaf+stem biomass of perennial, lignified plants, regardless of height – trees, bushes and shrubs)
- BGB_{woody} =Belowground biomass in woody plants (fine+coarse roots of perennial, lignified plants)
- AGB_{herb} =mean annual maximum aboveground biomass of herbaceous plants (predominantly grasses, but also forbs, restios, sedges etc)
- BGB_{herb} =mean annual maximum belowground biomass of herbaceous plants.
- AGL = Aboveground litter
- CF = carbon fraction ie $C = CF * DM$; = 0.42 (references: Safari 2000, Parton et al)

The error in TEOC is determined from the error in its parts, using a combination of additive and multiplicative rules. Note that BGB is in both cases derived from AGB, they are not independent.

Soil organic carbon (SOC) is derived from the AfSIS system (<http://www.africasoils.net/data/digital-soil-mapping> Markus Walsh). AfSIS uses a Bayesian prediction model, based on 12000 African pedons (about 3600 of which are from South Africa) driven by many covariates (among others, climate, soil texture, and topographic position) to estimate the SOC to any given depth (0-0.3 m is the standard for 'topsoil', while 0.3-0.7 m is used for subsoil) at a given location. These are integrated spatially at a ground resolution of 1 km to provide a national surface. The SOC surfaces are accompanied by a surface representing the estimation error, defined as the 10 to 90 percentile

confidence limits at each point. The lower and upper confidence ranges are assymetric – there is a long 'tail' of possible SOC values much higher than the best estimate. Since SOC dominates the TEOC, this uncertainty and its assymetry propagates through, and has forced us to adopt the 10-90 range for the uncertainty estimates of other components as well. The confidence range cannot be easily reduced by increased sampling effort, since it depends rather on the measurement and extrapolation technology. Note that the lower (more conservative) limit is much closer to the 'best estimate', and it is the one which matters more.

The SOC data comes in the form of %SOC, which is converted to absolute gC/m² using the following formulae for the topsoil and subsoil respectively.

$$SOC_{0-300mm} = \rho_{0-300mm} * 0.3 * \%SOC / 100 * 1\,000\,000$$

$$SOC_{300-1000mm} = \rho_{300-1000mm} * 0.7 * \%SOC / 100 * 1\,000\,000$$

$$SOC_{to\ 1\ m} = SOC_{0-300} + SOC_{300-1000}$$

ρ is the soil bulk density (Mg/m³). The AfSIS data does not currently include a correction for stone content, which will lead to overestimation of the profile SOC in stony soils. AGB_{woody} is estimated using the product of tree cover and height as a proxy for the volume of the tree or shrub, which is in turn linearly related (using the constant BCF_{biome}) to aboveground biomass:

$$AGB_{woody} = (H_{veg} * TCF) * BCF_{biome}$$

H_{veg} is the mean maximum height of the vegetation at a location (m) interpolated from ICESAT-GLAS point records, obtained from the NASA Jet Propulsion Lab (Simard et al 2011, Sassan Saatchi pers com) and from the Woods Hole



Institute (Buccini et al 2008). The ICESAT-GLAS data, which represents a laser 'spot' about 80 m in diameter, is unlikely to be reliable for small vegetation patches, or in steep topography. It may also be unreliable for closed canopy. The high-slope areas were masked out and then patched-in from the national vegetation map, with an estimate of their AGB based on adjacent level areas, or published studies. For fynbos a completely different approach was used, based on modelling the biomass accumulation since the last fire, given the rainfall.

TCF = tree cover fraction (dimensionless 0 to 1: the values are given as a percentage and are divided by 100 before use) from the MODIS satellite based sensor.

BCF is the Biomass Calibration Factor, which in principle varies by biome or sub-biome. For the savanna biome, where it varies between different savanna types from 1100 to 1900 gC/m³ (erroneously given as 29.6 to 44.4 MgDM/ha in original Colgan et al (2012) reference). Much of this variation can be accounted for by wood density and form factor which can be related to the VegMap savanna classes. We use 1100 gC/m³ since it corresponds to the combined savanna dataset, and has an error of about ±20%. For the thicket biome the BCF is calibrated against a reserved set of intact thicket data from (Powell 2009), and came to 2029 gC/m³. For karoo, the savanna relation was used, since the height multiplied by cover numbers are small, so any error will also be small. Grasslands also used the savanna number for BCF (1100 gC/m³), in the absence of any calibration data.

$$BGB_{\text{woody}} = \text{root:shoot}_{\text{woody}} * AGB_{\text{woody}}$$

Root:shoot_{woody} is a function of mean annual rainfall (MAP).
 For MAP>800 root:shoot_{woody}=0.25
 300< MAP<800 root:shoot = -0.0035MAP+3.05
 MAP<300 root:shoot=2.0

AGB_{herb} is a relatively small number, but is included for completeness. It is based on published relationships between rainfall and yearly grass production (Scholes 2003, whose units are in gDM/m²/y), reduced proportionately to take into account competition by trees. AGB_{herb} varies greatly through the year – reaching a peak near the end of the growing and declining to near zero by the beginning of spring, especially in the presence of fire and/or herbivory. An 'annual average' is about half the peak value. It also varies greatly from year to year, which we ignore by using the mean annual precipitation (MAP) as the driver.

$$AGB_{\text{herb}} = 0.5 * 0.42 * a * (MAP - c) * (1 - TCF / 0.65) \text{ for } TCF < 0.65;$$

$$AGB_{\text{herb}} = 0 \text{ if } TCF > 0.65$$

Constant a is often referred to as the 'Rain Use Efficiency', and c is the amount of rain needed to have production. Constants a and c are both related to the topsoil sand content.

$$a = -0.0376 * \text{sand\%} + 3.442; \quad a = 0.1 \text{ if } \text{Sand\%} > 92; \quad a = 1.1 \text{ if } \text{Sand\%} < 64$$

$$c = 328 - 142/a$$

In the absence of topsoil texture data, we assume a sandy loam (75% sand), with a=0.622 and b=99.7.

We assumed BGB_{herb} = AGB_{herb} in all biomes, ie a root:shoot for herbaceous plants of 1.

AGL consists of downed wood, leaves and dung on the soil surface. It is generally a relatively small number, included for completeness. AGL is calculated per biome (or sub-biome, where the biome covers a wide climate range) based on a simple model including litterfall and decay rates as a function of rainfall, and validated against fuel load datasets (Shea et al 1996, and Powell 2009).

AGL = 90 ± 22 gC/m² for grasslands (from Powell (2009), old lands)

AGL = 121 ± 49 gC/m² for savannas (from Shea et al 1996)

AGL = 900 ± 50 gC/m² for forests (Weider and Wright 1995)

AGL = 254 ± 52 gC/m² for thickets (Powell 2009, assuming the thicket landscape is 50% degraded)

AGL = 50 ± 10 gC/m² for karoo (no data source, expert judgement)

AGL = 1500 ± 150 gC/m² for fynbos (van Wilgen et al 1990)

AGL = 0 for desert (expert judgement)

Transformed land

Annually-cropped cultivated lands

For calculating soil organic carbon in croplands a simplified version of the EU recommended methodology is used (Box 1). In essence the management and input factors have been assumed to be one. This is appropriate since no data on these factors is available. However, including these factors in the future would enable calculations of the contributions that could occur by moving to different management techniques such as no-till agriculture, return of residuals to the soil, adding of manure or adding biochar. A value is assigned per crop type, regardless of where it occurs in the country, consisting of

$$SOC_{\text{cultivated}} = F_{\text{lu}} * SOC_{0-30} + SOC_{30-100}$$

Where F_{lu} is a Land use factor reflecting the proportion of soil carbon retained in a given land use.

F_{lu} = 0.5 for dryland crops

F_{lu} = 0.8 for irrigated crops

F_{lu} = 0.8 for Horticulture tree crops

F_{lu} = 0.6 for sugar cane

F_{lu} = 0.5 for dryland crops

EU methodology (EU 2010) for calculating soil organic carbon in agriculture

$$SOC = SOC_{ST} \times F_{LU} \times F_{MG} \times F_I$$

where:

SOC = soil organic carbon (measured as mass of carbon per hectare);

SOC_{ST} = standard soil organic carbon in the 0-30 centimetre topsoil layer (measured as mass of carbon per hectare);

F_{LU} = land use factor reflecting the difference in soil organic carbon associated with the type of land use compared to the standard soil organic carbon;

F_{MG} = management factor reflecting the difference in soil organic carbon associated with the principle management practice compared to the standard soil organic carbon;

F_I = input factor reflecting the difference in soil organic carbon associated with different levels of carbon input to soil compared to the standard soil organic carbon.

AGB_{crop} was computed as a function of the at-harvest aboveground biomass (AGB_{harvest}) and the year-round residue mass left in stalks (AGB_{residue}). Crop duration is the average period between planting and harvest for that crop, in days.

$$AGB_{crop} = AGB_{harvest} * 0.5 * \text{crop duration} / 365 + AGB_{residue}$$

The Harvest index (HI) was used to determine AGB_{harvest} per hectare

$$AGB_{harvest} = Y \text{ (t/ha)} / HI$$

Where:

$$Y = \text{yield} * (1 - \text{fraction moisture})$$

Yield (in gC/m²) was quantified at municipal level for each crop group and used the 2002 agricultural census data (STATS SA 2002) to determine the proportional distribution of crop types and local yields. The carbon fraction was assumed to be 0.47 (EU 2010) for all agricultural vegetation. We had no error information on this term so we had to assume no error. Fraction moisture was estimated for each crop type from the literature.

$$AGB_{residual} = (AGB_{harvest} - Y) * R_{AGB}$$

Where R_{AGB} is the residual aboveground biomass expressed as a proportion of the non-yield biomass

$$BGB_{crop} = 0.2 AGB_{crop}$$

except for root crops, where BGB_{crop} is the root dry matter (DM) yield.

Table 1. Calibration factors used for agricultural crops

Crop group	HI ¹	Moisture	Below ground fraction ²	Carbon fraction	Residual fraction AGB	Residual fraction BGB	Crop duration ³
					R _{AGB}	R _{BGB}	
Summer cereals ⁴	0.5	0.13	0.2	0.47	0.2 (dry)	0.8 (dry)	0.66
					0.1 (irr)	0.6 (irr)	
Winter cereals ⁵	0.4	0.11	0.2	0.47	0.2 (dry)	0.8 (dry)	0.5
					0.1 (irr)	0.6 (irr)	
Oil seeds	0.39	0.15	0.2	0.47	0.2 (dry)	0.8 (dry)	0.66
					0.1 (irr)	0.6 (irr)	
Legumes	0.85	0.15	0.2	0.47	0.2 (dry)	0.8 (dry)	0.5
					0.1 (irr)	0.6 (irr)	
Fodder crops	1	0.5	0.2	0.47	0.2 (dry)	0.2 (dry)	1
					0.0 (irr)	0.0 (irr)	

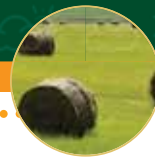
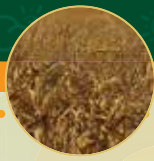
¹ HI = Harvest Index: the ratio of harvested yield to total aboveground biomass

² as proportion of AGB

³ as proportion of year

⁴ based on Maize which accounts for over 94% of this group

⁵ based on wheat which accounts for over 85% of this group



For tree crops two categories of trees were used. Grape vines and all other trees (see table 2). An area and tree category weighted average was derived per municipality. It was assumed that tree biomass is the same in all locations.

Below ground biomass was assumed as a proportion of above ground biomass. A non-tree biomass of 1 t/ha was assumed for other (non-tree) biomass in the orchard.

Table 2. Calibration factor for tree crops

	t/ha above ground (dry)	Belowground fraction	Residual biomass (non tree) t/ha
Vines	14	0.4	1
Other trees	38	0.4	1

An area and crop weighted average of carbon density of agriculture was calculated per municipality for the following categories of agricultural land use:

- Dryland agriculture (this includes fallow land)
- Horticulture (agricultural tree crops)
- Sugar cane

Plantation forests and tree crops

Estimates are provided per plantation type, based on biomass measures from the forestry industry (<http://www.forestry.co.za/statistical-data>). SOC is derived unchanged from the AFSIS product.

Urban areas

$AGB_{urban} = FAPAR_{annual\ mean} * 5000 \text{ [gC/m}^2\text{]}$ (Based on an IPCC 2006 value for closed urban forests. The multiplier can be adjusted to match estimates for the urban areas which have been surveyed, eg Johannesburg and eThikweni.)

$BGB_{urban} = 0.5 AGB_{urban}$ (assumes a mix of trees and herbaceous)

$SOC_{urban} = 0.8 SOC_{0-1000}$ (from AFSIS)

$AGL_{urban} = 0$. This could be used to reflect an estimate of carbon as timber in buildings and their furniture, plus the carbon in landfills from the National Communication.

Basis for calculating fluxes

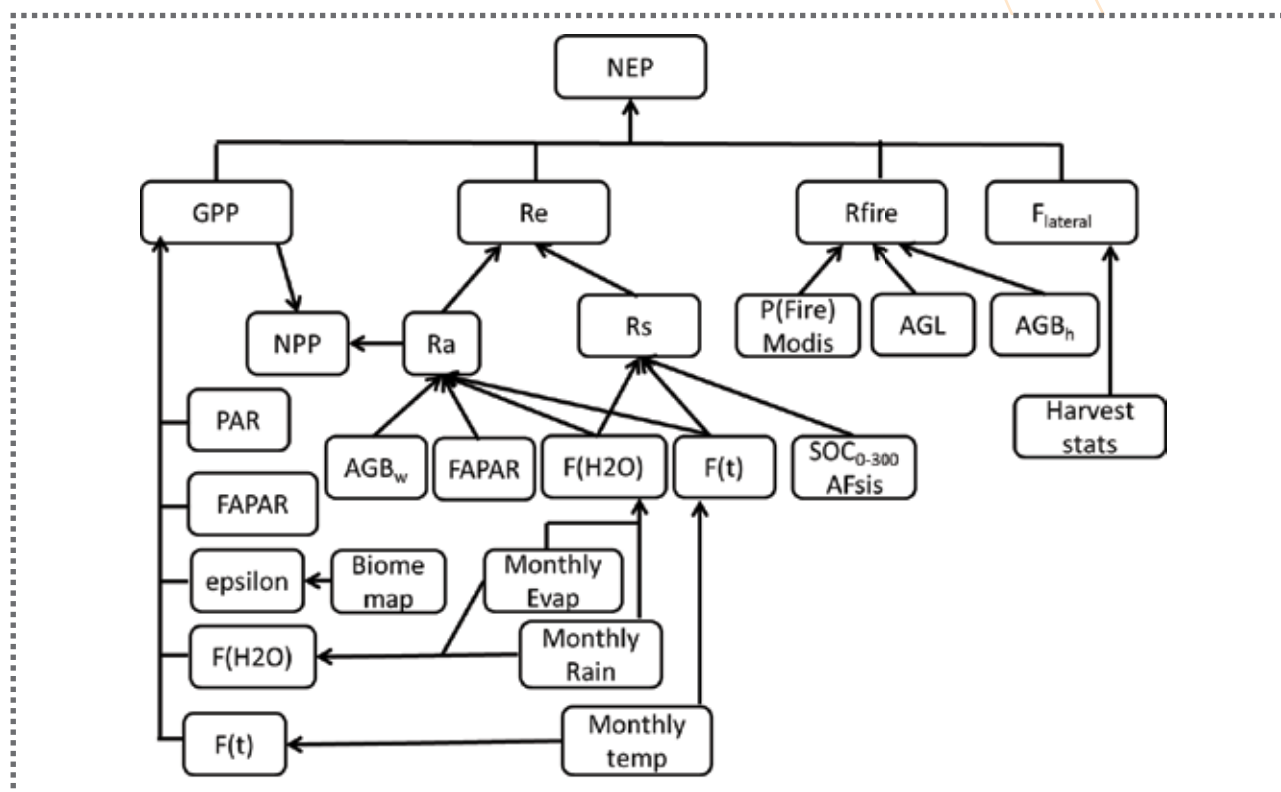


Figure 3: The workflow for calculating terrestrial carbon fluxes

Note that in the following the micrometeorology convention of downward fluxes (eg GPP) having negative signs and upward fluxes (eg R_{eco}) having positive signs has not been used. The equations are more intuitive when all values are expressed as positive numbers, which are then added or subtracted according to their direction. The units are $gC/m^2/y$. To get to $gCO_2/m^2/y$, used for instance in the National Communications, multiply by 44/12. To express the flux in dry matter terms per hectare (tDM/ha/y), divide $gC/m^2/y$ by 0.0045. National flux sums are expressed in TgC/y ($1 Tg = 10^{12}g$, or a million tonnes)

$$NEP = GPP - Re - Rf - Flateral$$

NEP = net ecosystem production (also called NEE, net ecosystem exchange, or if measured at large scale and over long times, as Net Biome Production)

GPP = Gross Primary Production

Re = Ecosystem respiration

Rf = fire flux

Flateral = export and import fluxes at the scale of the whole country. Particularly harvest and trade-related fluxes, but also water and wind transport. In principle these could be import fluxes (-ve) or export fluxes (+ve), but in practice are all export fluxes (except locally, in the case of accumulation of carbon in cities, which we do not calculate).

The gross primary production (GPP) is solved for periods of time corresponding to the input data, and summed to the year. In the absence of interpolated surfaces of daily weather, or month-by-month weather, we used a climatology of monthly weather for the period 1960 to 1990, and therefore match it to a climatology of mean monthly fraction of absorbed photosynthetically active radiation (FAPAR) and mean monthly photosynthetically active radiation (PAR). There are thus 12 input files for each term, corresponding to the twelve months. The climatology averaging periods for climate and satellite data are different. For FAPAR, the MERIS dataset covers the period 2000 to 2012, and the PAR dataset is also for this period. In the future it may be possible to do these calculations in near-real time, on a monthly or 8-daily basis. The current constraint is the availability of climate data, interpolated nationally, at this time resolution.

$$GPP = \epsilon_{biome} PAR * FAPAR * \int (H_2O) * \int (t) * \int (CO_2)$$

ϵ_{biome} is also known as the Light Use Efficiency (epsilon). It is taken as a constant per biome, and is calculated as the weighted sum of the ϵ for each of the main plant functional types in the biome, in proportion to their contribution to the time-integrated leaf area of the biome. Note that almost all of the literature reports ϵ in its constrained form – ie, as effective ϵ after the effects of temperature and water have been taken into account. We are using the potential ϵ , before it is constrained, since the constraints are then explicitly applied.



Table 3. The unconstrained light use efficiency, per plant functional type and per biome. Data sourced from Abel et al 1996, Gower et al 1999, Hunt et al 1994, Landsberg 1986, Landsberg and Waring 1997, Neilson et al 1992, Potter et al 1993, Turner et al 2003, Prince 1995, Running et al 1999, Raich et al 1991, Ruimy et al 1999, Verostaete et al 2002.

Plant functional type	ϵ unconstrained (\pm SD)
	gC/MJ
C3 (Trees, shrubs, temperate grasses)	1.8 (\pm 0.5)
C4 (Tropical grasses)	2.34 (\pm 0.6)
CAM	1.08 (\pm 0.4)

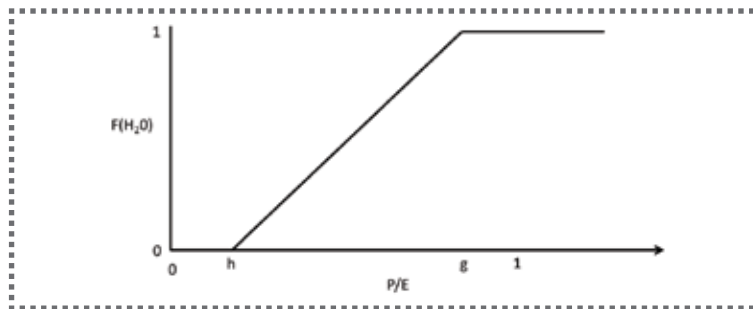
Biome	Fraction C3	Fraction C4	Fraction CAM	Weighted ϵ
				gC/MJ
Savanna	0.5	0.5	0.0	2.07
Grassland	0.1	0.9	0.0	2.29
Karoo	0.3	0.4	0.3	1.80
Desert	0.3	0.4	0.3	1.80
Fynbos	1.0	0.0	0.0	1.80
Forest	1.0	0.0	0.0	1.80
Thicket	0.4	0.1	0.5	1.49

$f(H_2O)$ is the fractional constraint applied due to the closure of stomata. At the monthly mean temporal scale we apply here, where P=mean monthly rainfall in millimeters and E is the monthly open-water potential evaporation (units?)

$$f(H_2O) = 1.0 \text{ if } P/E > g$$

$$f(H_2O) = (P/E-h)/(g-h) \text{ if } h < P/E < g$$

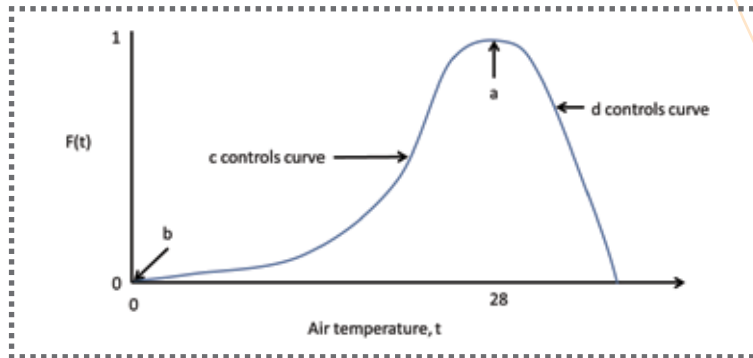
$$f(H_2O) = 0.0 \text{ if } P/E < h$$



The point on the P/E axis where $f(H_2O)$ reaches 1 (no water constraint) is given by g, which is in principle a biome-specific constant (based on the mix of functional types in the biome). Initially, g has been set to 1.0 for all biomes, and can be tuned to match known data. The point on the P/E axis at which $f(H_2O)$ reaches 0 is given by h. Initially it has been set to 0.

$f(t)$ is a hump-shaped function of temperature. The following empirical function has a temperature optimum (a) ~28 , no-growth temperature (b)=0.0; curvature below the optimum (c) =3 and curvature above the optimum (d)= 4.

$$f(t)_{\text{photosynthesis}} = \exp(c \cdot (1.0 - f^d) / d) \cdot f^c \text{ where } f := (b - t) / (b - a)$$



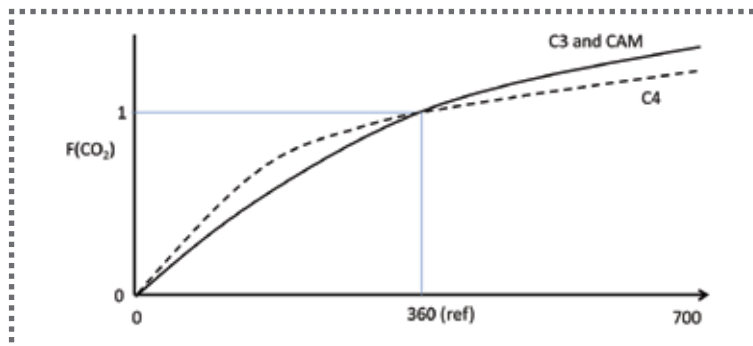
The temperature (t) used in the case of the temperature sensitivity of photosynthesis is the mean daytime temperature, approximated by

$$t_{\text{daytime}} = 0.75 \cdot (t_{\text{max}} - t_{\text{min}}) + t_{\text{min}}$$

$f(\text{CO}_2)$ is a saturating function of increasing atmospheric CO_2 concentration. It is included to allow future production to be calculated – the present effect of elevated CO_2 relative to the 1990's is very small and can be ignored. We use a Michaelis-Menten enzyme kinetics equation, normalised to equal 1.0 for a reference $[\text{CO}_2]$ of 360 ppm, which corresponds to the ~1990 era when the concern over rising CO_2 began, and adjusted to reflect the observed 11% increase in productivity for C4 plants and 15% increase for C3 plants from 'double CO_2 ' experiments (ie ~700 ppm).

$$f(\text{CO}_2) = ([\text{CO}_2] / ([\text{CO}_2] + 125)) / (360 / (360 + 125)) \text{ for C3 plants and CAM}$$

$$f(\text{CO}_2) = ([\text{CO}_2] / ([\text{CO}_2] + 87)) / (360 / (360 + 87)) \text{ for C4 plants}$$



The same proportions of C3 to C4 can be used per biome as described for the light use efficiency (epsilon) above.

The NPP is required by the project terms of reference, and is more intuitive for most users than the somewhat theoretical GPP. This requires disaggregating R_e into its autotrophic (R_a , by plants) and heterotrophic (R_h) parts ($R_h = R_e - R_a$). NPP will be solved on a grid-cell by grid-cell basis

$$\text{NPP} = \text{GPP} - R_a$$

A widely-used assumption is that $R_a \sim 0.5$ GPP. We calculate R_a as a function of temperature, AGB, BGB and FAPAR. The assumption is that the woody parts of the plant have one respiration rate and the more active tissues, indexed by FAPAR, have another.

$$R_a = f(t)_{\text{resp}} \cdot (k_1 \cdot (\text{AGB}_{\text{tree}} + \text{BGB}_{\text{tree}}) + k_2 \cdot (\text{FAPAR}))$$

$f(t)_{\text{resp}}$ follows the same empirical form as given above, with $a=28$ (Archibald et al 2009). The value for k_1 is about 0.01 and k_2 is about 8. The temperature used in the function is the mean daily temperature $t_{\text{mean}} = (t_{\text{max}} + t_{\text{min}}) / 2$

In order to calculate R_e ,



$$R_e = R_a + R_h$$

Where R_h is the soil respiration by microbes. The total soil respiration R_s , which includes $R_{a_{\text{roots}}}$, is given by Makhado and Scholes (2011) for Skukuza as

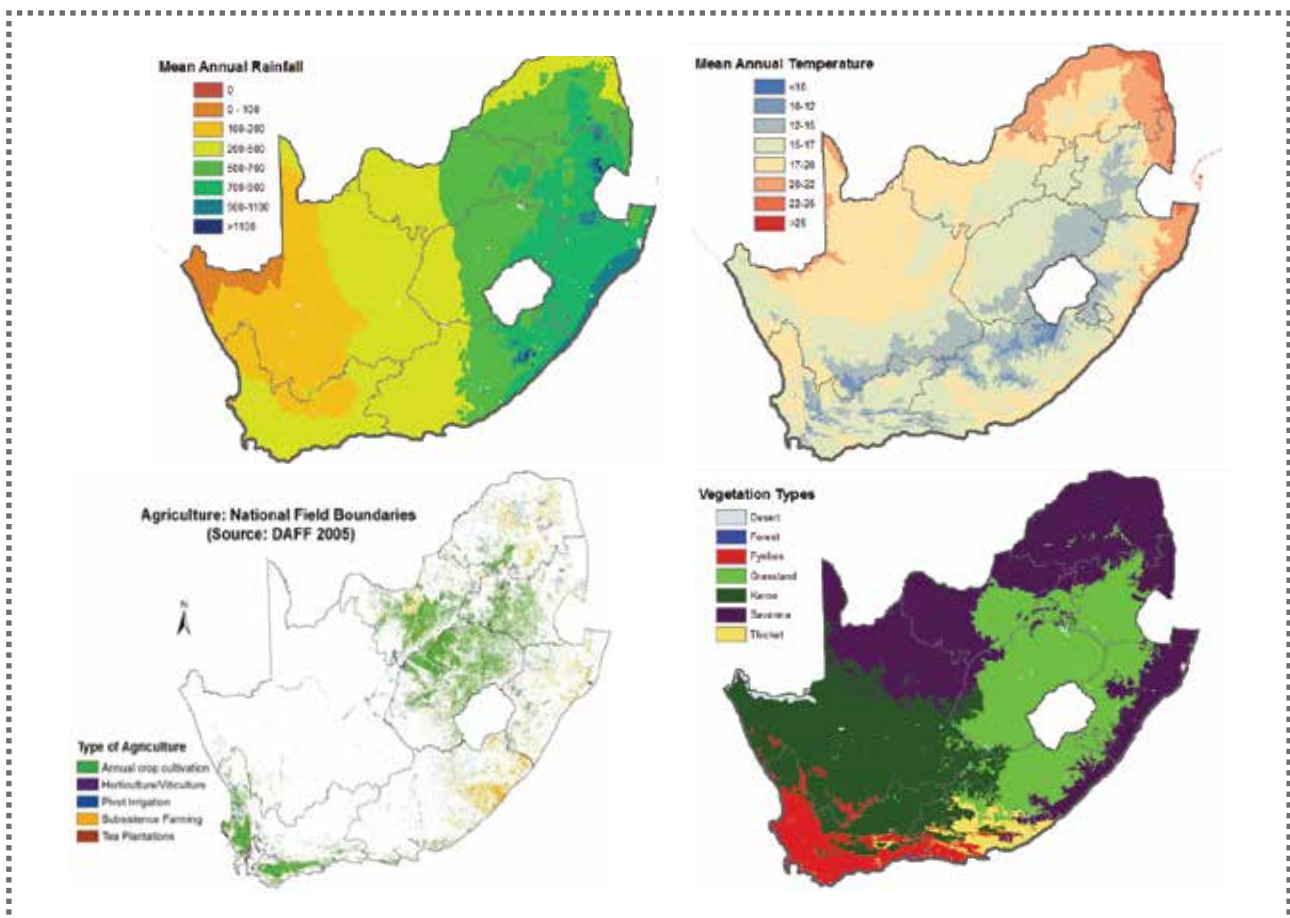
$$R_s = k_3 * (\text{SOC}_{0-300} + \text{AGL}) * f(\text{H}_2\text{O}) * f(t)_{\text{resp}}$$

where k_3 is a constant, tuned to reflect the measured R_s . From Makhado and Scholes (2011), for the Skukuza upland soils with 1.9% SOC to 300mm and a bulk density of 1.71 Mg/m³, apparent k_3 (including roots) is about 0.0005 day⁻¹. About half of this is due to roots, so for R_h rather than R_s , the real k_3 is about 0.00025 day⁻¹. The below-seepline soils have SOC ~4% and bulk density 1.68 Mg/m³ apparent k_3 is 0.0025 day⁻¹, a difference probably due to the smectitic nature of the clay in the latter. The k_3 for the part due to the soil microbes is about 0.000125 day⁻¹

The fire flux F is given by

$$F = p(\text{fire}) * \text{AGB}_{\text{herb}} + \text{AGL} * \text{combustion completeness}$$

Where $p(\text{fire})$ is the annual probability of a give point burning in a year, derived from the burned area fraction maps from MODIS. For areas of low burned area fraction (where there are many locations recording no fires in the 10-year observation period, but an expectation that fires could occur), an averaging window should be used. The size of this window should adjust to be larger when the fire probability is low, and smaller where it is high. Combustion completeness is taken as 0.8 (Safari 2000 data). Only a small part of this fire-emitted carbon is exported as a lateral flux from the territory of South Africa.



Map 1: a) climatic moisture, indexed by mean annual rainfall; b) the mean annual temperature c) National Field Boundaries d) the vegetation cover, as biomes.

Input datasets

The four main determinants of terrestrial carbon stocks in South Africa (and elsewhere in similar environments) are moisture, temperature, soil conditions and vegetation cover. The geographical distribution of these factors is shown in Map 1. There is a general increase in plant productivity with increasing moisture (west to east), and with it, increasing soil carbon stocks and biomass. Note that even the 'wet' parts of South Africa are comparatively arid by global standards. The highest soil carbon stacks are in flooded soils (wetlands), which are small in extent in South Africa, but will be explicitly considered in future

iterations of this study. There is a decrease in soil carbon with increasing temperature (south to north). Most of South Africa is warm-to-hot by global standards. There is an increase in soil carbon as the silt+clay content of the soil increases, and the carbon content of soils where the clay is of the smectitic type is higher than that of soils with kaolinitic clays. Overall the soils of South Africa tend to be sandy, but there are some important areas of clayey smectitic soils where the parent materials are basalts or dolerites. The biomass carbon varies greatly between vegetation types, in the order desert<karoo<grassland<fynbos < thicket<savanna<forest, and is largely controlled by the proportion of woody plants in the vegetation.

Table 4. Input datasets and their provenance

Input dataset	Source	Resolution	Error	Comments	Reference/ Custodian/ URL
Monthly mean of tmax,tmin	WRC Report 1489/1/06	1.7km	Assumed none	1950-1999	Schulze, R.E. (Ed). 2007. South African Atlas of Climatology and Agrohydrology. Water Research Commission, Pretoria, RSA, WRC Report 1489/1/06
Monthly mean rainfall	WRC Report 1489/1/06	1.7km	Assumed none	2004	Schulze, R.E. (Ed). 2007. South African Atlas of Climatology and Agrohydrology. Water Research Commission, Pretoria, RSA, WRC Report 1489/1/06
Monthly mean reference evaporation	WRC Report 1489/1/06	1.7km	Assumed none	1997	Schulze, R.E. (Ed). 2007. South African Atlas of Climatology and Agrohydrology. Water Research Commission, Pretoria, RSA, WRC Report 1489/1/06
Soil Organic Carbon (SOC)	Africa Soil Information Service (AFSIS)	1km	10th and 90th percentiles	2013	ISRIC – World Soil Information, 2013. Soil property maps of Africa at 1 km http://www.isric.org/data/soil-property-maps-africa-1-km
Canopy Height	NASA (JPL)	1 km	Error map provided	2011	Simard, M., N. Pinto, J. B. Fisher, and A. Baccini (2011), Mapping forest canopy height globally with spaceborne lidar, J. Geophys. Res., 116, G04021, doi:10.1029/2011JG001708 http://lidarradar.jpl.nasa.gov/
Percentage Tree cover	MODIS MOD44B	250m	Standard error by cover class provided	2010	USGS LPDAAC Vegetation Continuous Fields Yearly L3 Global 250m https://lpdaac.usgs.gov/products/modis_products_table/mod44b
SANBI 2009 Land Cover	SANBI	30m	Assumed none	2009	South African National Biodiversity Institute (SANBI), Pretoria, Report 13/10/2009 http://bgis.sanbi.org/mapsearch.asp
National Field Boundaries database	SPOT 5	2.5m	Assumed none	2007, 2011, 2012	Department of Agriculture, Forestry and Fisheries (DAFF)



Input dataset	Source	Resolution	Error	Comments	Reference/ Custodian/ URL
Agriculture statistics	Census of commercial agriculture	N/A	Assumed none	2002	Statistics South Africa (StatsSA)
PAR	MODIS and SeaWiifs JAXA	3km	Validated against flux tower	2000-2010	Earth Observation Research and application Center, Japan Aerospace Exploration Agency
FAPAR	MERIS (JRC-GEM)	1km	Estimated at 10%	10-daily composites 2000-2012	Gobron (2011)
Fire return period	MODIS MCD45A1	500m	5th and 95th quantiles provided		USGS LPDAAC Burn area product

Appendix B (Section 1)

Modelling data sources

The following organisations were contacted either telephonically, by email, internet and/or physical meetings to source potential information and spatial datasets in support of the future land-cover modelling:

- Department of Rural Development and Land Affairs (DRDLR), Chief Directorate National GeoSpatial Information (CDNGI),
- Department of Rural Development and Land Affairs (DRDLR), Spatial Planning and Information (SPI)
- Endangered Wildlife Trust (EWT)
- i@consult (commercial Town and Country Planners, Pretoria)
- CSIR Built Environment (CSIR-BE), (Pretoria)
- CSIR Natural Resources and Environment (CSIR-NRE), (Stellenbosch)
- SA National Biodiversity Institute (SANBI) (via BGIS website)
- Gauteng City-Region Observatory (GCRO)
- NW Provincial Government (NWPG), Dept of Economic Development, Environment, Conservation and Tourism (DEDECT)
- Department of Water Affairs (DWA), Directorate of Planning
- Department of Environmental Affairs (DEA), Directorate of Planning
- Department of Environmental Affairs (DEA), Atmospheric Carbon Mitigation
- Department of Environmental Affairs (DEA), EIM Systems and Tools
- Department of Agriculture, Forestry and Fisheries (DAFF), Directorate Land Use and Soil Management
- Department of Agriculture, Forestry and Fisheries (DAFF), Directorate: Forestry Regulation and Oversight
- MetroGIS (commercial GIS-Environmental Planning company)
- Council for GeoScience (CGS)
- STATS SA
- ESKOM (GIS Technology, Midrand).

Modelling data inputs

The following datasets were used as the inputs into the future SA land-cover modelling, based on minimising duplication of (comparable) information from different sources, suitability and relevance of data content, geographical coverage, (perceived) information reliability and age.

Land-cover change restrictor (i.e. “protectionist”) data:

- **DEA Formal Protected Areas:** Formally (i.e. legally) protected national and provincial conservation areas (vs 2013), (source: DEA)
- **SANBI Protected Areas:** Informal (i.e. no legal protection) conservation areas, (i.e. areas defined by formal administrative boundaries such as ownership, but not formally (i.e. legally) protected in terms of natural resource content, e.g. private game reserves, conservancies etc, but which could expect a significant level of developmental protection from EIA processes, public pressure etc (source: SANBI)
- **SANBI “National Protected Area Expansion Policy” 2008 (NPAES):** future national and regional areas likely to become legally protected (source: SANBI BGIS)
- **SANBI Threatened Ecosystems** dataset: areas not defined by biodiversity / natural resources rather than administrative boundaries, which could expect a significant level of developmental protection from EIA processes, public pressure etc (source: SANBI BGIS)
- **Water Research Commission’s (WRC) “National Freshwater Ecosystem Priority Areas for South Africa” (NFEPA)** Atlas, sub-quaternary River FEPA dataset (source WRC Atlas of Freshwater Ecosystem Priority Areas data CD); which could expect a significant level of developmental protection from EIA processes, public pressure etc (source: WRC Atlas data CD).

Land-cover change driver (i.e. “transformer”) data:

- **Agricultural Research Council (ARC) national (agricultural) Land-Capability Dataset**, which defines 8 x agricultural potential land-capability classes, based primarily on climate (rainfall), terrain and soils. A digital (vector) version of this was sourced from DAFF.
- **DAFF Potential Forestry Expansion Datasets**, based on climate, terrain and soil suitability. The data for the E Cape was originally supplied to DAFF as part of a Strategic Environmental Assessment (SEA) for the Zone of Afforestation Potential in the E. Cape (Coastal and Environmental Services (CES) May, 2006). The data for Kwa-Zulu Natal was sourced from a DWA commissioned report by the Institute of Natural Resources (INR): Afforestation Potential Study in KZN and Mpumalanga: Environmental Assessment Report (March 2009).
- **DWA New Dams:** Location of planned and/or proposed new major water storage dams, as described by DWA. In the majority of cases the geographical extent of the proposed new dam (maximum water level) was manually interpreted from pdf (or equivalent)



engineering map diagrams onto relevant base (satellite) imagery before inclusion in the future land-cover modelling. The following dams were included: De Hoop (Olifants, Mpumalanga), Foxwood (Adelaide, E.Cape), Springrove (Durban), Nwamita (Levhuvhu, Letaba), and Zalu (Lusikisiki, E Cape).

- **CGS Coal Reserves & Mining Rights:** Approximate boundary of all major coal reserves, and associated exploration and current and future extraction licences, based on farm and sub-farm units (as granted by Department of Minerals and Energy up to 2012), as sourced from the Council for GeoScience.
- **CGS Iron / Manganese Reserves & Mining Rights:** Approximate boundary of all major iron and manganese reserves, and associated exploration and current and future extraction licences, based on farm and sub-farm units (as granted by Department of Minerals and Energy up to 2012), and sourced from Council for GeoScience.
- **ESKOM Future Power Stations:** Point coordinate data for future planned and/or proposed ESKOM power stations (all fuel types), major regional sub-stations, wind and solar farms. These datasets were sourced independently from DEA and ESKOM. Any duplication of information (based on coinciding locations) was eliminated before modelling commenced.
- **CDNGI CRDP's:** Geographic boundaries of administrative districts / municipalities defined as

priority development regions within the DRDLR's Comprehensive Rural Development Programme. These were sourced from the CDNGI.

- **NDP/SIP Mega Build Projects:** significant urban-build and / or construction projects as defined in the National Development Plan (NDP) / Strategic Infrastructure Plan (SIP), excluding those already defined separately (i.e. ESKOM capital expansion projects). These were sourced from CSIR Built-Environment as a (point-based approximate location only) digital GIS dataset.
- **SKA:** Approximate geographic footprint of the Square Kilometer Array (SKA) telescope project. This was sourced from information available on the internet (www.ska, www.wikipedia)

Data modelling

The following section describes the actual modelling rules used to create the "2020" SA future land-cover:

Protected areas

Protected areas were defined on 5 levels, based on the level of existing legal protection, possible future legal protection, and likely protection from processes such as EIA's etc, especially if found in a pre-defined environmentally sensitive or threatened area.

Level	Protection		Dataset
0	least	All other undefined areas in S.A	n/a
1		All "Level 1" FEPA threatened sub-quaternary river catchments (defined on catchment boundaries).	SANBI / WRC
2		All "critically" threatened ecosystems (not defined on any formal administrative and/or ownership boundaries.	SANBI
3		All future Protected Areas Expansion Plan sites	SANBI
4		All existing informal conservation areas, i.e. no legal status, other than defined within formal administrative and/or ownership boundary, e.g. private game parks, conservancies etc)	SANBI
5	maximum	All existing formal conservation areas protected by legal status.	DEA

Agricultural expansion

According to DAFF, there is a need to develop ± 1 M ha of compensatory new agricultural land to replace cultivated land expected to be lost to mining in the near future. The regional priorities for this replacement land are likely to be E.Cape., KZN, NW and then Limpopo. Very little expansion is expected within the Free State since this already at near maximum cultivation capacity. Note that modelled future cultivation *expansion* was limited to only the commercial cultivation class, and did not include any changes to

subsistence, orchard, viticulture or sugarcane classes, since these are not considered as primary food security classes, and (b) no national-level data was identified to support future modelling of these specific crop-types. Potential new cultivated expansion areas were modelled thus:

- high agricultural potential land (as defined by ARC land capability classes 1- 4), re-weighted according to provincial location:

		DAFF land capability rating			
Provincial weights		1	2	3	4
E.Cape	1	1	1	2	3
KZN	2	1	1	2	3
NW	3	1	2	3	4
LPP	4	1	2	3	4

where 1 = most likely to be new cultivation

- that is currently classified as natural vegetation (excluding indigenous forests) in 2010, or
- classified as coal mines in 2010, and thus rehabilitation of high potential agricultural land could be possible by 2020, and
- on slopes <20° (as defined using the SRTM terrain dataset, re-scaled to the same cell resolution as the SA modelling exercise), which is the CARA (Conservation of Agricultural Resources, Act 4 / 1983) defined threshold for conventional cultivation, and
- with priority weightings applied to targeted provinces (EC = 1st, KZN = 2nd, NW = 3rd and Limpopo = 4th, or lowest weighting), and
- not identified as future 2020 mining sites, and
- not identified as future 2020 major dam / reservoir inundation sites, and
- not within protected areas (classes 4 and 5).

OR

- as above, but inclusive of forestry potential classes 2 if the potential land falls within a CRDP defined district boundary (to allow for expanded rural development).

Forestry expansion

According to DAFF, future expansion of commercial forestry is most likely to occur in either E.Cape or KZN, since Mpumalanga is at near maximum capacity. Potential new cultivated expansion areas were modelled thus:

- high forestry potential land (classes 1 for both E.Cape and KZN data),
- that is currently classified as natural vegetation (excluding indigenous forests) in 2010, and
- that is not targeted for future cultivation expansion, and
- not within protected areas (levels 3, 4 or 5), and

- not identified as future 2020 mining sites, and
- not identified as future 2020 major dam / reservoir inundation sites, and
- on 2010 existing coal mines that could be re-habilitated

OR

- as above, but inclusive of forestry potential classes 2 if the potential land falls within a CRDP defined district boundary (to allow for expanded rural development).

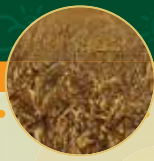
Dam expansion

All major DWA defined future dam developments were incorporated into the 2020 SA land-cover based on the best available interpretation of maximum flood level. All existing 2010 land-covers were over-written with the new dam extent, except for settlement-classified data cells, regardless of any future planned land-cover, use or protection status. Note this possibility of new dam extent overlapping existing urban codes is possible due to the single majority cover-code allocation to each pixel and the coarse resolution of the data modelling.

Future coal mines

Potential 2020 coal mines were defined as all land-cover pixels:

- located within a 500 km buffer (i.e. 1 km diameter) radius of the centroid point of each farm portion within which a future coal exploration and/or extraction licence has been granted, and
- which are located within defined national coal reserve areas; and
- which had not been previously identified as mining in either 2000, 2005 and/or 2010 land-cover datasets, or settlements, and



- were not within level 4 or 5 protected areas, or a 40km buffer exclusion zone around the SKA telescope development.
- Future coal mines were given priority over future cultivation and forestry expansion areas.

Future iron/manganese (non-coal) mines

Potential 2020 iron and manganese mines (i.e. minerals with large open-cast mining footprints) mines were defined as all land-cover pixels:

- located within a 500 km buffer (i.e. 1 km diameter) radius of the centroid point of each farm portion within which a future iron / manganese exploration and/or extraction licence has been granted, and
- which are located within defined national iron and manganese reserve areas; and
- which had not been previously identified as mining in either 2000, 2005 and/or 2010 land-cover datasets, or settlements, and
- were not within level 4 or 5 protected areas, or a 40km buffer exclusion zone around the SKA telescope development.
- Future coal mines were given priority over future cultivation and forestry expansion areas.

Future infrastructure build

Transformation foot-prints from potential future large infrastructure build projects were all incorporated into the “settlements” class, regardless of the type of infrastructure development. The potential expansion areas were defined as a 1km buffer (i.e. 2 km radius) around the defined central location point for all Eskom future power stations (regardless of fuel type), and the NDA/SIP defined Durban Bridge Development project. Future Eskom power substations and DEA/Eskom defined potential wind and solar power farms were allocated a single 500x500m pixel footprint. Solar and wind farm locations were defined as were the Eskom sourced SEA phase 1 (solar/wind) potential areas intersected with the centroid points (of each farm unit) for which there was an associated DEA sourced EIA application for a wind or solar park. The SKA telescope development footprint was defined as a 10km buffer around the core location of the SKA development.

It is however acknowledged that the SKA development is a low impact development (within a large area) and this modelling approach may have created an over-emphasis of actual land-cover change.

Future urban expansion

Future urban expansion areas were modelled using a 3x3 moving window majority filter over all existing 2010 “settlement” pixels, and re-coding all adjacent non-urban pixels to “settlements” if the majority of surrounding pixels were classified as “settlements” in 2010, and the targeted new “settlement” cell was:

- Within 10km of any of the 2020 defined new infrastructure build cells (based on Eskom and other mega projects), or
- Within a 2010 defined metropolitan or (selected) municipalities deemed to have development / expansion potential (i.e. Ekurhuleni, eThekweni, City of JHB, Buffalo City, City of Cape Town, Mangaung, Emalaheni, Mbombela, The Msunduzi, uMhlathuze, Nelson Mandela Bay, City of Tshwane, Rustenberg and Mafikeng), or

But *not*:

- Within a protected area of level 4 or 5, or
- Within potential agricultural lands defined by land-capability classes 1 and 2, or
- On 2010 cells as cultivated land (except for sugarcane, which was allowed, as a non-food security crop to be “lost”), or
- On 2020 or 2010 cells containing mines, plantations, wetlands, or water; or
- On slopes > 20°;
- Within the 40km SKA exclusion area buffer.

Note that no settlement expansion was modelled within CDRP’s, unless as a result of other influencing factors as defined above, since the aim of the CDRP’s is to stabilise existing populations with employment opportunities rather than attract new migration.

Appendix A (Section 3)

Policy creation and development in South Africa

One of the deliverables set out in the terms of reference for the National Carbon Sinks Assessment is a *mapping* exercise of existing policies and measures that directly and indirectly affect GHG emissions and removals from the AFOLU sector. To this end, we have analysed a broad range of policy and measurement documents including Green and White Papers, Acts, Regulations, Bills, Strategies, Plans, Frameworks, Assessments and Others that may have a direct or indirect impact on GHG emissions and removals from the AFOLU sector.

In this module, we describe how policies in South Africa are developed, with specific focus on environmental and climate policy. We also explore the legal processes policies undergo in order to come into effect in South Africa.

Policy: working definitions

There is no universally agreed definition of what constitutes 'policy'. Policy could encompass the set of decisions taken by government, but it could also include the influences that determine both the way in which these decisions are interpreted and which decisions end up being implemented. Further, it may include the initial context that determines the types of issues considered for decision and the kinds of contestation that accompany specific policies. Harvey Brooks (1989), for instance, defined public policy as "the broad framework of ideas and values within which decisions are taken and actions, or inaction, are pursued by governments in relation to some issue or problem." An analysis of policy could thus comprise a range of written policy documents (white papers and regulations), statements by policymakers, intentions and directions as included in green papers and strategic documents, institutional capacity and orientation, and actualised policy (Tyler, 2009).

For the purposes of this analysis, however, we only reviewed written policy documents. Beyond the realm of legislated acts, regulations and official government policy laid out in White Papers, we have also included departmental, ministerial and presidential strategies and frameworks as laid out in various green papers, plans, strategies and visions. This inclusion contributes to a better understanding of the country's policy priorities and general policy environment.

Additional definitions referred to in this module include the following:

- The difference between a **policy** and a **law** can be defined as follows:
- A **policy** outlines what a government ministry or department hopes to achieve and the methods and principles it will use to achieve them. It's a public statement of intent, principles and goals. A policy document is not law, but it will often identify new laws needed to achieve goals.
- **Laws** set out standards, procedures and principles that must be followed. If a law is not followed, those responsible for breaking them can be prosecuted in court.
- The term **measures** can be thought of as referring to legislative, administrative or other means through which a predetermined course of action may be implemented. For the purposes of this study, Cirrus has included the following measures into its catalogue: Acts, Bills, Regulations, ministerial listings, guidelines and standards.

Mapping is understood to be a graphical representation depicting arrangement and relationships among different policies and its different components, tracing any synergies or conflicts where possible. Cirrus has used a catalogue as the initial mapping tool. This is supported by textual analysis, simplified tables and charts.

How is policy created in South Africa?

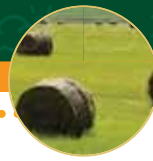
In South Africa, the process of formulating policy can be elaborate, taking time for policies to be, gazetted and implemented. The process of finalising official government policy or laws generally involves five stages during which key issues are debated and negotiated. It can thus take years before the impact of new laws or policies are felt on the ground. This section briefly outlines the policy development stages and processes in the country.

Stage One: Ruling Party Conference

The first stage involves the discussion and debate of particular issues at a major conference of the ruling party. At this stage, the ruling party decides its overall vision, goals and direction on a specific issue (Education and Training Unit, 2013).

Stage Two: Executive Ministry Draws up a Policy on an Issue

The second stage takes place at a national level where the ruling party will attempt to convert all its policy decisions



into official government policy or law, prescribed by the Constitution. The Executive Ministry, who may draw up the policy, is vested in the Presidency while all national, provincial and local levels of government have legislative and executive authorities within their spheres.

National Government is composed of three inter-connected branches:

- Legislative: Parliament, consisting of the National Assembly and the National Council of Provinces
- Executive: The President, who is the Head of State
- Judicial: The Constitutional Court, the Supreme Court of Appeal and the High Court

It is the responsibility of Parliament to approve policies and pass new laws in order to give legal standing to new policies. This process may take time as policies and laws are debated and negotiated with various stakeholders, such as opposition parties, the public and non-government organisations.

The government will draft discussion documents, called **Green and White Papers** on the policy or law to allow for debate or comment. Stakeholders can use different opportunities for input, such as attending parliamentary committee hearings, setting up meetings with department heads or the Minister, or using the media to persuade government (Education and Training Unit, 2013). Examples of policies such as these used in our analysis includes the *National Development Plan 2030*, *Medium-Term Strategic Framework 2009-2014* and the *National Growth Path: The Framework 2010*. Green and White Papers identify possible courses of action in terms of policy and legislation on specific issues that need to be addressed. These policies are therefore particularly important and form the foundation of future laws to be passed.

Stage Three: Finalise a Policy

Once a policy has undergone full scrutiny and it had been debated, the relevant Department and Ministry draw up a final policy which is published as a **White Paper**. The White Paper is a statement of intent and a detailed policy plan which often forms the basis of legislation. It is debated and adopted by Parliament and approved by Cabinet (Education and Training Unit, 2013).

Stage Four: Passing a Law

If the Ministry decides that a new law is necessary to achieve the White Paper's objectives and to implement its policy, the relevant Department will draft a new law. In its early stages before a new law has been tabled in Parliament, it is called a **draft Bill**. Once tabled in Parliament, it is called a **Bill**.

Before the draft Bill is tabled, the Bill goes to Cabinet for approval. It is then released for public comment. Once

comments have been received, relevant changes are made. Cabinet then undertakes an assessment to ensure the draft Bill does not contradict any other policies or the Constitution. It is then sent to legal advisors for legal approval, and then is tabled by the Minister in Parliament.

Once a bill has been tabled, it will be issued with a number and released as a Bill and go through the process of becoming a law. The process is summarised as follows:

- The Bill is sent to National Assembly who refer it to a Portfolio Committee
- The Portfolio Committee reviews the Bill and requests public comment. Whilst the Portfolio Committee reviews the Bill, it is considered the best time to lobby for changes or protest the principles of the Bill. Once the Committee has made changes and requested clarity on any issues, a report of the findings is sent to the National Assembly.
- The National Assembly then considers the Bill and votes on the changes the Portfolio Committee may have recommended.
- The Bill then goes to the National Council of Provinces where the appropriate Select Committee considers the Bill. The Bill then goes through a different process depending on whether the Bill contains issues affecting the provinces or not.

Once both houses of Parliament have agreed to a final version of the Bill, it will be sent to the President. The President then signs the Bill and it becomes an **Act** and law in South Africa (Education and Training Unit, 2013).

There are two other types of Bills which have not been discussed in as much detail; these are the **Money Bills** (Section 77 of the Constitution) and **Constitutional Amendments** (Section 74 of the Constitution). These follow a slightly different process and are briefly described as follows:

- Money Bills allocate public money for a particular purpose or impose taxes, levies or duties. They can only be introduced by the Minister of Finance and they must be introduced in the National Assembly. They follow the same procedure as Bills that do not affect the provinces (Section 75) (Parliamentary Monitoring Group, 2013).
- There are special requirements and procedures in order to amend the Constitution, especially since the Constitution is the highest law in the land. Special requirements include, for example, requiring special majorities of votes of the National Assembly so that changes cannot be made by a minority (Parliamentary Monitoring Group, 2013). For the purposes of this briefing, the details of constitutional amendments will not be discussed in further detail.

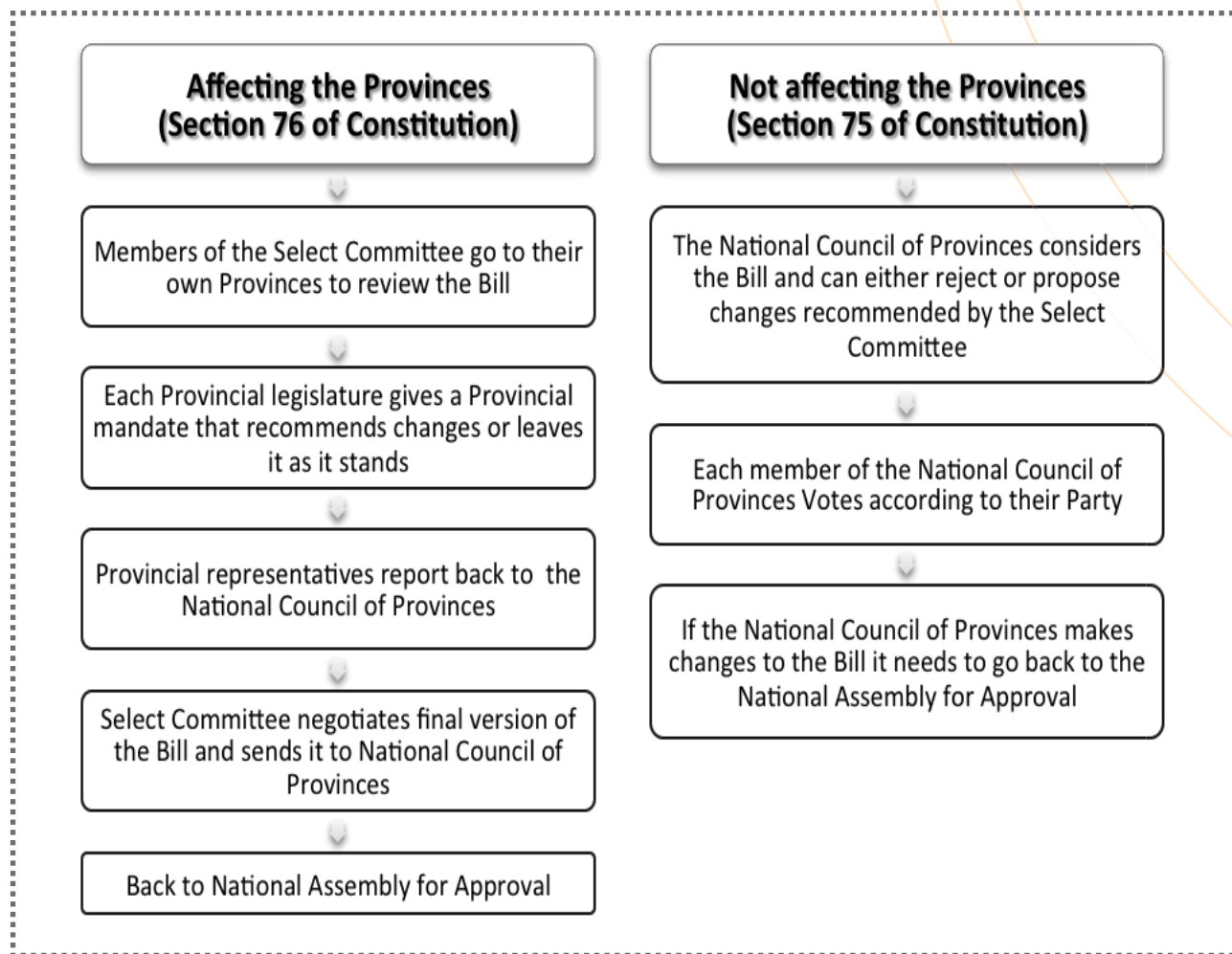


Figure 5. Approval Process for Different Types of Bills (adapted from Education Training Unit)

Stage Five: Subordinate legislation and implementation of Law and Policy

Once National Parliament has passed a law or a policy has been published, it is up to national and provincial ministries and departments to implement it. Provincial legislature can also make its own laws on areas defined in the Constitution. These laws will only apply to the province in which it was made. Apart from national and provincial laws, local governments can also pass ordinances that have the same legal force as national and provincial parliaments.

While some laws merely require enforcement, others need to be promoted. Frameworks and Strategic Plans, for example, generally originate from passed laws. In order to achieve the objectives prepared in an act, the legislation may require that a national department or committee (usually created as a requirement of the Act) develop a framework or strategic plans which set out the institutional frameworks, mechanisms for implementation of the act, as well as assigning key roles and responsibilities to responsible authorities. In some instances frameworks and strategic plans may include targets and timeframes within which the targeted interventions need to be implemented. Therefore, frameworks and strategic plans are often an interpretation and implementation of legislation.

National Environmental Policy Framework in South Africa

The following section aims to describe the overall context of the national environmental legal framework for South Africa.

South Africa’s constitutional structure divides the powers and functions of government into three parts – national, provincial and local. The national government usually formulates broad policy parameters for the country as a whole, while provincial and local governments are mandated to formulate their own specific policies and programmes and to implement them within national policy parameters.

The area of environmental policy falls within the group ‘concurrent functions’ allocated by the Constitution to be shared between national and provincial spheres of government. The overall framework is outlined below.

- The Constitution is the supreme law of the country and enshrines a Bill of Rights which in turn introduces an “environmental right”. Section 7(2) of the Constitution provides that the state must respect, protect and fulfil the Bill of Rights. Section 24 (b) has been interpreted



as mandating government to enact legislation which must achieve goals of environmental protection, the prevention of pollution and ecological degradation and the promotion of conservation and sustainable development (Warburton et. al., 2007).

- In order to comply with Section 24, the South African Government recently initiated an environmental law reform process overhauling important general environmental legislation and introducing new environmental legislation and policy documents concerning important aspects relevant to environmental management (Warburton et. al., 2007).
- The most important environmental statute to emerge is the *National Environmental Management Act No 107 of 1998* (NEMA), which came into operation in 1999. NEMA contains a multi-faceted definition of “sustainable development” and provides an overarching framework for integrating sound environmental management into all development activities, including those that might result in greenhouse gas emissions, and for promoting co-operative environmental governance (Warburton et. al., 2007).

- Recent legislative activity has seen the promulgation of a number of statutes under NEMA’s support. The names of these “new” environmental statutes typically include the prefix “National Environmental Management”. Thus the *National Environmental Management: Protected Areas Act No. 31 of 2004* and the *National Environmental Management: Biodiversity Act No. 10 of 2004*, have been promulgated to deal with a very broad range of conservation and biodiversity issues. The most recent addition to the list of NEMA-derived legislation is the *National Environmental Management: Air Quality Act No. 39 of 2004* (*the Air Quality Act*) (Warburton et. al., 2007).

The figure below provides a list of some of the key sectoral, national, and global policy instruments and other regulatory frameworks underpinning environmental protection and climate change governance processes in South Africa. Although the list is not exhaustive, it does represent an ensemble of various instruments that are critical for government and other key role players in South Africa to use to address the key challenges posed by climate change.

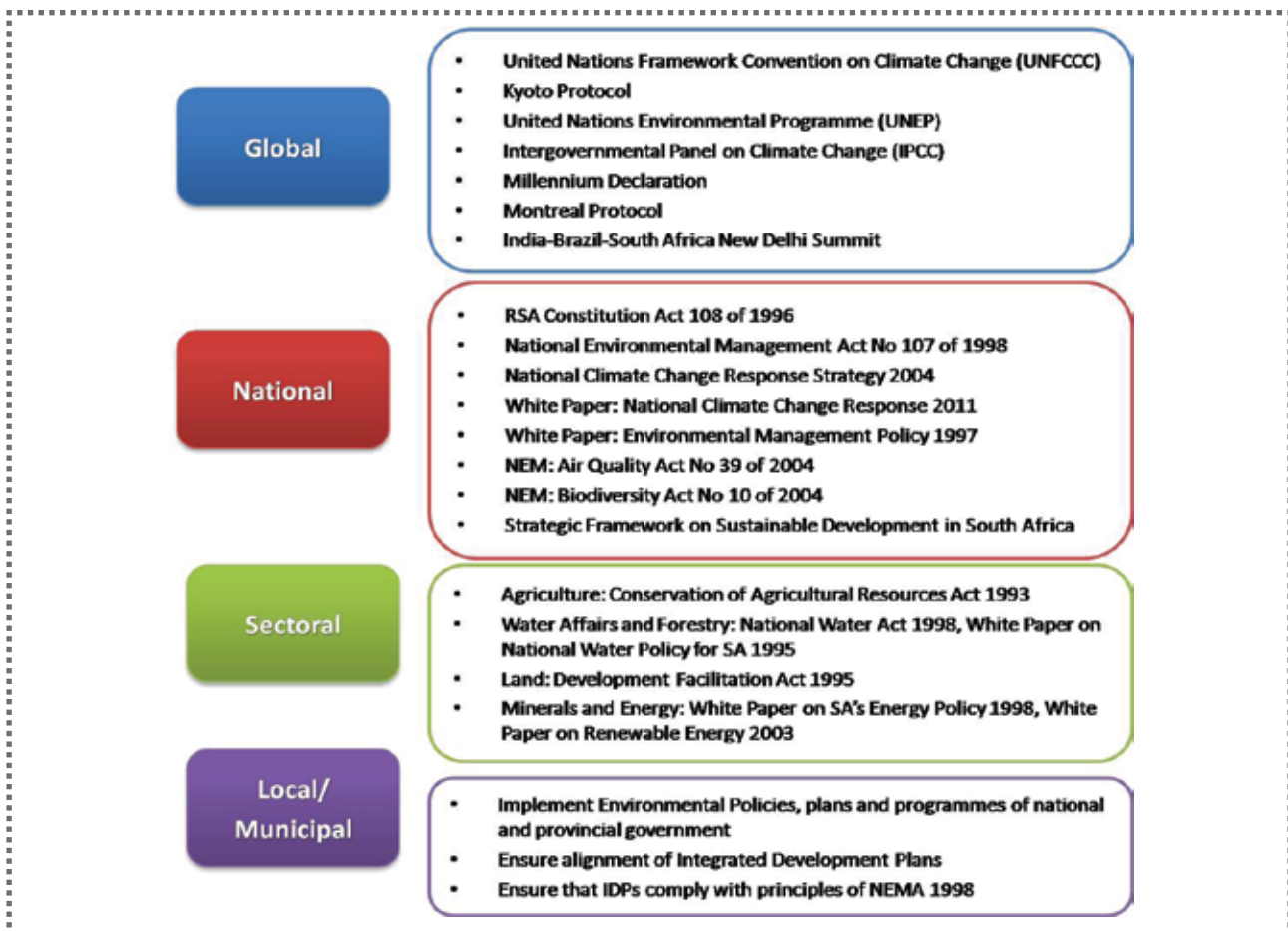


Figure 6. Revision of existing environmental and climate policy (adaptation from Mokwena, 2009)

National Climate Change Policy Development Process in South Africa

South Africa formed the **National Climate Change Committee** (NCCC) in 1994 which is a multi-stakeholder platform aligning government, business, industry, academia, non-governmental organisations and organised labour. By 2001, climate change had become an area of research in South Africa and became more prominent on the political agenda in 2002 when Heads of State of over 180 countries met for a world summit on Sustainable Development in Johannesburg. In 2002 and 2005, South Africa ratified the Kyoto Protocol and by June 2005 the Departments of Environment and Science started organising a unique climate change conference consisting of two components; a science conference attended by top regional scientists preceded by a policy conference. The policy discussion was focussed by input from scientists.

Two commitments were outlined at the 2005 conference; the first was the agreement to initiate a detailed scenario-building process to map how South Africa could meet its commitment to greenhouse gas stabilisation. This process was called the **Long Term Mitigation Scenarios** (LTMS). The second commitment was to initiate a participatory climate change policy development process.

The LTMS process began in March 2006 and concluded that a great deal could be done to reduce South Africa's GHG emissions. The process was run by a multi-stakeholder scenario-building team and included many representatives from government, business and civil society. In October 2007, three documents on the various scenarios were produced.

Following a long process of round table discussions to coordinate the diverse stakeholder and Departmental inputs, a Draft **Green Paper** was published in November 2010. Workshops were held in every province and a website was set up to create a forum for contributions. After further focus workshops and further research, Parliament hosted public hearings. After Committee reviews, the **White Paper** was approved by Cabinet on 12 October 2011 and published in the Government Gazette on 19 October 2011.

In terms of strategic priorities, the White Paper sets out South Africa's climate change response strategy to achieve the National Climate Change Response Objective. Other climate policy documents which are currently under development include the:

- Carbon Tax Policy Document
- Suite of Near Term Priority Flagship Programmes



Appendix B (Section 3)

Policy clusters

The second module of this policy review describes the policy development process. Briefly summarized, this process includes the following steps:

- Green and White policy papers are created to table an emerging policy issue in a structured manner for further discussion and debate. The objective of the initial policy papers is to communicate government’s objectives and vision on the issue as well as strategic objectives.
- This set of initial papers typically undergoes a series of revisions following input from stakeholders.
- Thereafter, a bill may be drafted that may undergo further revisions based on feedback from stakeholders.
- Finally, a law is enacted based on the bill and approved by Parliament.

When drafting an Act, government is required to make the necessary provisions for the Act to be successfully implemented. An Act cannot adequately address specific issues unless the necessary institutional capacity has been established to fulfil the objectives of the Act. An Act may therefore lead to the establishment of a responsible authority that is required to co-ordinate all matters relating to the Act and may lead to the development of further

supporting policy documents in the form of frameworks, strategies, action plans, regulations and guidelines (that may not necessarily be legally binding).

The creation and adoption of an overarching White Paper may therefore lead to a number of Acts and associated policy documents. To convey the potential relationship between policy documents, we have grouped documents that relate to a similar issue in “clusters”. The purpose of this module is to illustrate the clusters of policies encountered in our analysis and to describe the links or cross-overs between clusters. In addition, we note key policies that may fall outside clusters or the hierarchy of policy and how this may affect their level of influence.

Summary of clusters

Policies Originating from Presidency

The following policies originating from Presidency were included in the policy analysis:

- Medium-Term Strategic Framework 2009-2014 and Industrial Policy Action Plan II
- New Growth Path: The Framework 2010
- White Paper: National Planning Commission
- The National Development Plan 2030
- Industrial Policy Action Plan which is integral to the New Growth Path

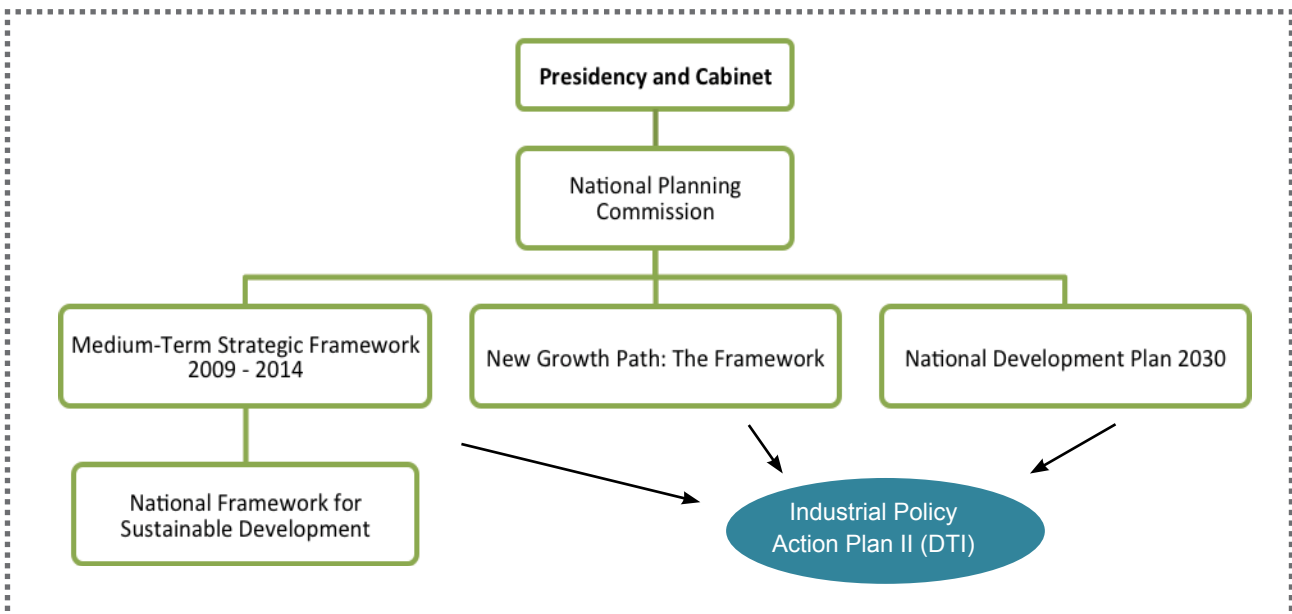


Figure 7. Policies originating from Presidency

The National Environmental Management Act Cluster

The family of National Environmental Management Act policies (NEMA) include:

- The National Environmental Management Act 1998
- The NEM: Environmental Impact Assessment Regulations (NEMA:EIA)
- The NEM: Environmental Management Framework Regulations
- The NEM: Protected Areas Act (Act 57 of 2003) and the National Protected Area Expansion Strategy (NPAES) (2008)
- The NEM: Biodiversity Act (Act 10 of 2004) and the SANBI Strategic Plan 2011-2015, the National Biodiversity Framework (NBF) (2008) and the Guidelines Regarding the Determination of Bioregions and the Preparation of Bioregional Plans (Guidelines, mandated by NEMA: BA).
- The National Environmental Management Air Quality Act (NEMA:AQA) and the Air Quality Management Framework

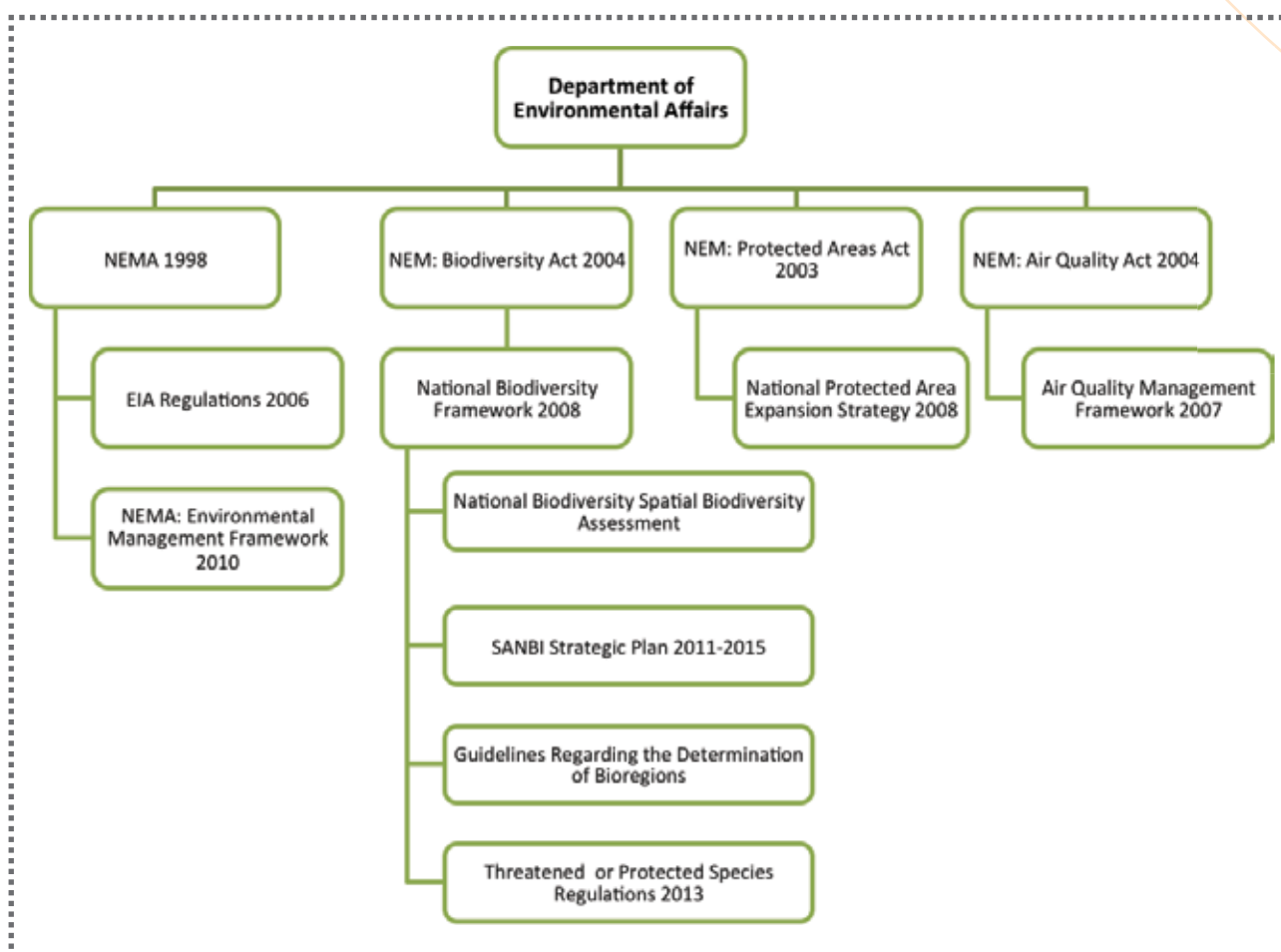


Figure 11. The National Environmental Management Act Cluster

Department of Agriculture, Forestry and Fisheries: Legislative Policies

Legislative policies originating from the Department of Agriculture, Forestry and Fisheries that may affect land-use and associated terrestrial carbon stocks include:

- Conservation for Agriculture Resources Act 1983
- Fertiliser, Farm Feeds, Agricultural Remedies and Stock Remedies 1947
- Forest Sector Transformation Charter
- National Forests Act 1998
- National Parks Act 1976
- National Forest and Veld Fire Act 1998
- Policy and Framework for Smallholder Development

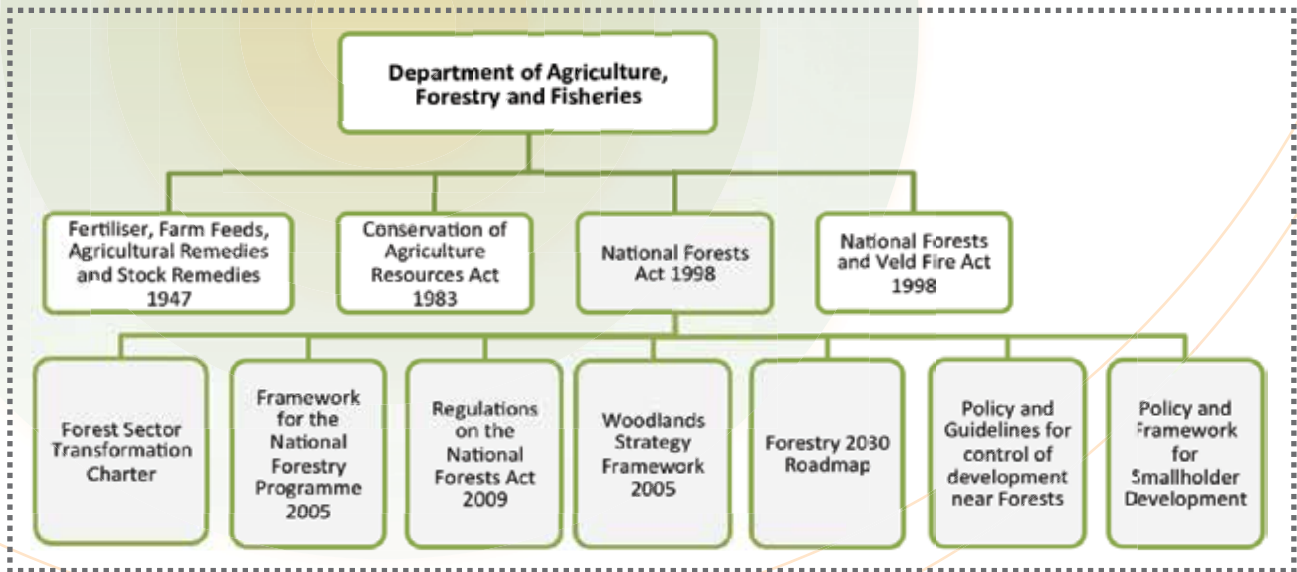


Figure 12. Pertinent policies within the Department of Agriculture, Forestry and Fisheries

Department of Agriculture, Forestry and Fisheries: Planning documents

Integrated and strategic plans developed by the Department of Agriculture, Forestry and Fisheries include:

- The Integrated Growth and Development Plan: Agriculture, Forestry and Fisheries ,
- The Strategic Plan 2012/13-2016/17 for the Department of Agriculture, Forestry and Fisheries
- The Strategic Plan for Smallholder Support
- The Climate Change Sector Plan for Agriculture, Forestry and Fisheries

It should be noted that all of these policies are closely linked to the *Medium-Term Strategic Framework, New Growth Path* and *National Development Plan*.

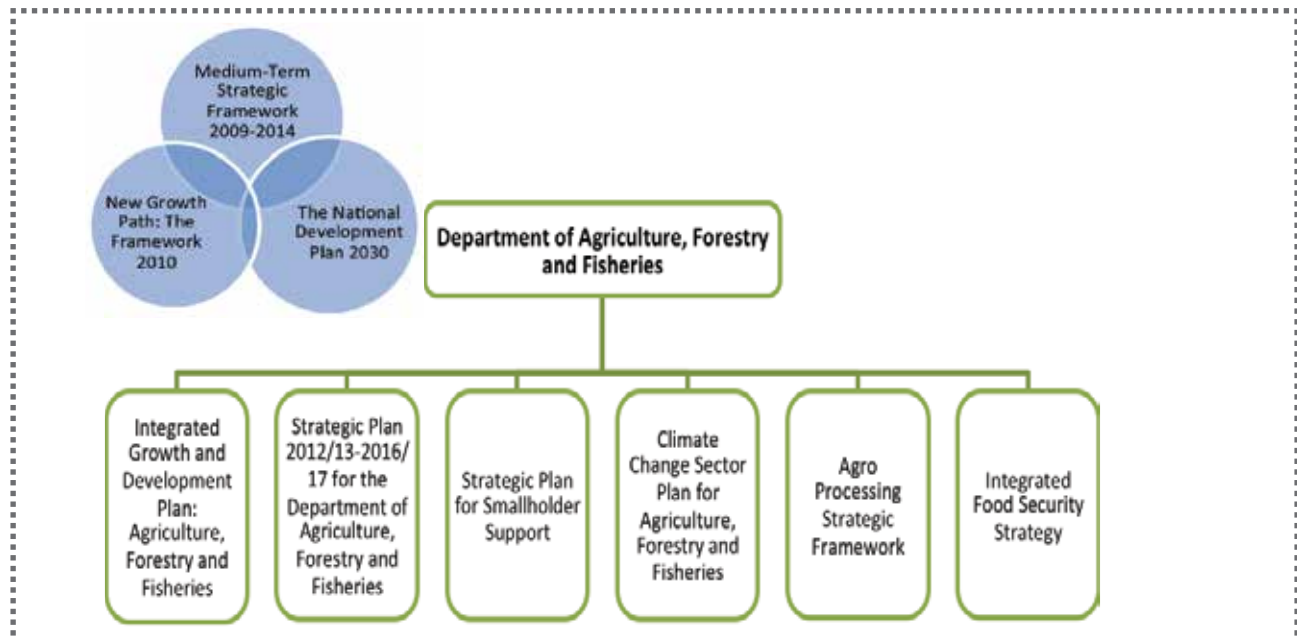


Figure 13. Integrated and strategic plans within DAFF that may have a direct effect on land-use and associated carbon stocks and emissions.

Land Reform Policy

Land Reform policies include the following:

- Green Paper on Land Reform 2011
- Department of Rural Development and Land Reform Strategic Plan 2011-2014
- Land Reform: Provision of Land and Assistance Act 1993
- The recent passing of the restitution of land rights amendment bill, which sets a new deadline for land claims to 31 December 2018, will also have an impact on terrestrial carbon stocks.

The hierarchy of these policies are illustrated in the diagram below:



Figure 14. Hierarchy of Land Reform Policies

Energy Legislation Cluster

Reviewed energy sector policies that may have an effect on terrestrial carbon stocks and associated GHG emissions:

- Mineral and Petroleum Resources Act 2002
- White Paper on Energy Policy 1998
- White Paper on Renewable Energy 2003
- Integrated Resource Plan 2010
- Green Economy Accord

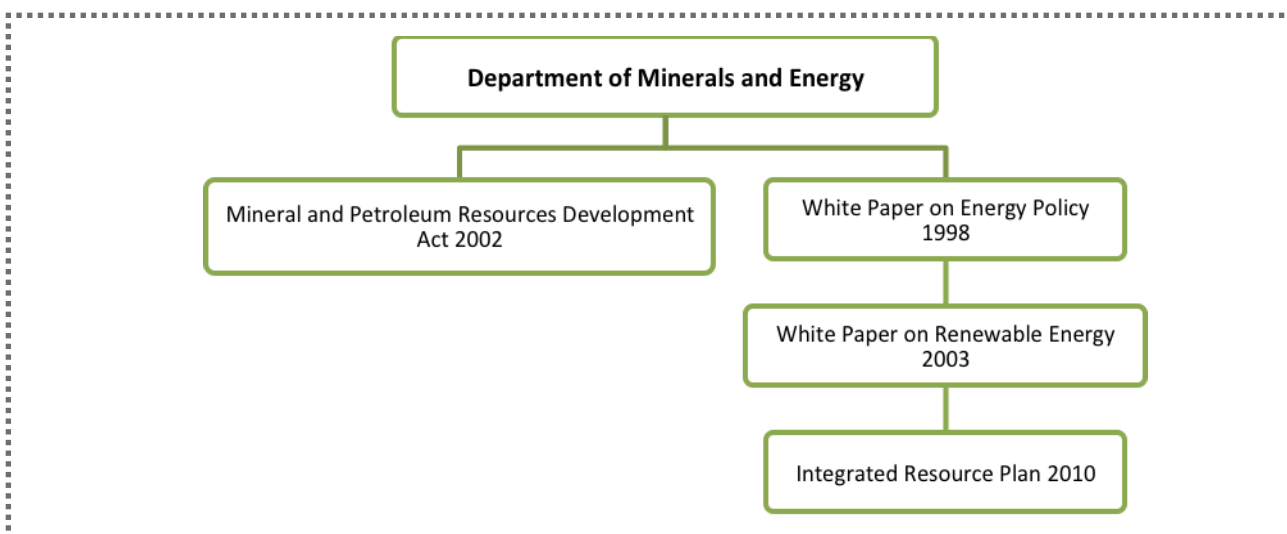


Figure 15. Pertinent energy policies to land-use and associated carbon stocks in South Africa



Water Legislation

Water Legislation considered in the policy review includes the following:

- White Paper on Water Policy 1997
- National Water Act 1998
- Water Services Act 1997

The hierarchy of these policies are illustrated in the diagram below:

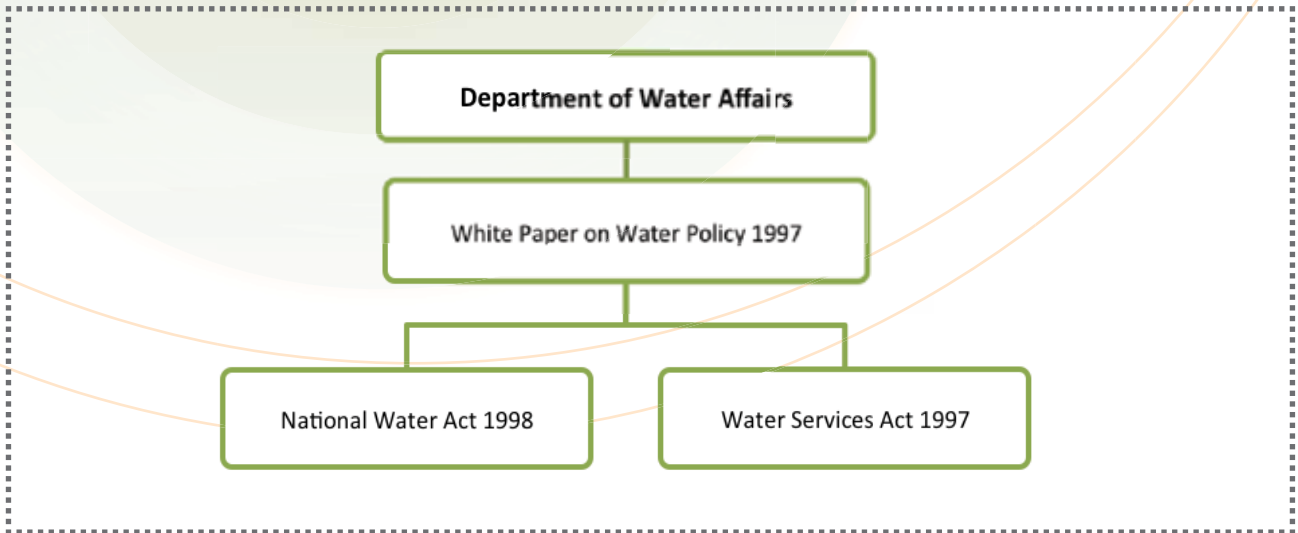


Figure 16. Water legislation that is relevant to land-use change and associated carbon stocks and GHG emissions.

Appendix A (Section 4)

Policies providing broad support for Top 8 mitigation opportunities

Table A.1. Evidence of broad support for reforestation of forests and thicket biomes in national-level policy

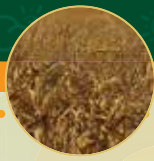
Policy	Evidence of broad support
National Climate Change Response Policy	<ul style="list-style-type: none"> Recognizes the need to enhance the national terrestrial carbon sinks, including in biomass and forest resources Affirms that ecosystems play a critical role in the country's adaptation response to climate change Notes the importance of rehabilitation and restoration of ecosystem services as part of the country's management response to climate change Notes the value that the Expanded Public Works Programme has delivered in regards to ecosystem restoration
National Forests Act (1998)	<ul style="list-style-type: none"> The Act has a broad commitment to the "Promotion and enforcement of sustainable forest management," which could be interpreted as including reforestation of degraded forests
National Environmental Management Act	<ul style="list-style-type: none"> As part of its core principles, recognizes the need to minimise impacts on the use and development of natural resources where and when feasible, and to not overexploit natural resources and the ecosystems on which they depend to the extent that their integrity is jeopardized That a risk-averse approach be used in regards to exploitation of the environment, taking into consideration the current potential limitations to our knowledge of how our actions impact the environment Sensitive, vulnerable, highly dynamic or stressed ecosystems are to receive privileged management attention, notably in instances where degradation and exploitation present threats to ecosystem integrity
NEM: Biodiversity Act	<ul style="list-style-type: none"> Provides for the management and conservation of biological diversity in South Africa and is guided by the core principles outlined in NEMA Authorizes the Minister to develop norms and standards to achieve the objectives of management and conservation of biological resources, as well as develop restrictions limiting certain activities that threaten biodiversity integrity Requires that the Minister draft a Biodiversity Framework, which details, amongst other requirements, the location of conservation priority areas The Minister or MEC of environmental affairs may declare and establish bioregions, with attendant management plans and which seek to manage a bioregion's biodiversity Any person, organization, or organ of state can develop biodiversity management plans, which require approval from the Minister and can cover the management of an ecosystem The Minister can enter into a biodiversity management agreement with the person, organization or organ of state that is authorized to implement a biodiversity management plan SANBI may undertake programmes for the restoration of ecosystems The Minister must promote research undertaken by SANBI, including into the conservation status of various ecosystems The Minister may publish a list of threatened ecosystems and which require preservation (critically endangered, endangered, vulnerable, protected) and identify processes or activities that threaten that biodiversity. The protection of these ecosystems must be taken into account by organs of state responsible for developing environmental implementation or environmental management plan; relevant municipalities must also take account of these threats in their IDPs



Policy	Evidence of broad support
Disaster Management White Paper, Act and Framework	<ul style="list-style-type: none"> • The White Paper affirms the government’s commitment to protecting the environment • The Act considers damage to the environment a disaster • The Act calls for the development of a national disaster management framework, which will include measures for reducing vulnerability to disasters • The Act requires the development of a National Centre, which will oversee the development of disaster management plans and strategies by relevant organs of states and other institutional role players and provide support in the prevention and mitigation of disasters • The Framework requires that priority be provided to protect “fragile natural ecosystems and environmental assets that offer protective environmental services and which, if damaged or destroyed in a disaster event, would result in serious natural and economic loss.” • The Framework calls for the rehabilitation of areas affected by a disaster event
National Development Plan	<ul style="list-style-type: none"> • Notes that agriculture, forestry and land-use can make a significant contribution to the national carbon sinks • Views regional sequestration initiatives as a means for delivering carbon sink enhancements • Affirms its “Vision 2030” commitment to ecosystem and biodiversity asset rehabilitation • Notes that Treasury should introduce incentives to promote rehabilitation of ecosystems
Carbon Tax Guidelines regarding the determination of Bioregions and the preparation of and publication of Bioregional Plans	<ul style="list-style-type: none"> • Notes that carbon offsets can be developed from projects that restore landscapes • Recommends that Bioregional Plans identify priority areas for ecological restoration in identified bioregions
Environmental Sector Plan	<ul style="list-style-type: none"> • Notes the need to restore landscapes to ensure provision of key ecosystem services • Recognizes the role that sustainable land-use management plays in reducing the country’s “carbon balance.” • Promotes the planting of indigenous plant species to enhance terrestrial carbon stocks • Affirms the role that ecosystems play in climate change adaptation
National Strategy for Sustainable Development	<ul style="list-style-type: none"> • Notes that a strategic goal is to restore “scarce and degraded natural resources.” • Commits to restoration of 3.2 million hectares of degraded lands by 2014
Woodlands Strategy	<ul style="list-style-type: none"> • Recognizes the extent of woodland degradation in the country and hence supports the introduction of incentives to promote rehabilitation • States that rehabilitation could take place through a national forest rehabilitation plan, perhaps linked to the EPWP in some way • Recommends the identification of “hotspots” for rehabilitation • Notes the numerous benefits that rehabilitation would provide,
Strategic Plan 2012/13-2016/17 for DAFF	<ul style="list-style-type: none"> • States that natural forest and woodland rehabilitation is an opportunity to respond to the challenges of degradation and exploitation the forestry sector faces • Commits to rehabilitating 50,000 hectares of degraded indigenous forests, agricultural lands and woodlands. • See page 28 and page 56 for 50,000 rehabilitation figure and page 89

Table A.2. Broad support for restoration and management of grasslands biomes in national-level policy

Policy	Evidence of broad support
National Climate Change Response Policy	<ul style="list-style-type: none"> • Recognizes the need to enhance the national terrestrial carbon sinks • Affirms that ecosystems play a critical role in the country’s adaptation response to climate change • Notes the importance of rehabilitation and restoration of ecosystem services as part of the country’s management response to climate change • Notes the value that the Expanded Public Works Programme has delivered in regards to ecosystem restoration
Presidential Delivery Agreement: Outcome 10 (1998)	<ul style="list-style-type: none"> • The Presidential Delivery Agreement Outcome 10 aims to ensure that environmental assets and natural resources are well protected and continually enhanced • Various outputs are identified to protect and restore ecosystem services viz. • Output no 1 is to enhance the quality and quantity of water resources, which includes water resource protection (by inference a reference to the grassland biome where key wetlands and catchment headwater lie) • Output no 2 is to reduce greenhouse gas emissions though inter alia, restoration and rehabilitation of degraded ecosystems and sustainable land use management • Output no 4 commits to protecting biodiversity through the following • Expansion of the conservation estate from 12% to 14% of total • Developing climate change adaption frameworks for major biomes and aquatic systems (including grasslands) • Protection of agricultural land – setting a target to protect 81% of high potential agricultural land
National Environmental Management Act	<ul style="list-style-type: none"> • As part of its core principles, recognizes the need to minimise impacts on the use and development of natural resources where and when feasible, and to not overexploit natural resources and the ecosystems on which they depend to the extent that their integrity is jeopardized • That a risk-averse approach be used in regards to exploitation of the environment, taking into consideration the current potential limitations to our knowledge of how our actions impact the environment • Sensitive, vulnerable, highly dynamic or stressed ecosystems are to receive privileged management attention, notably in instances where degradation and exploitation present threats to ecosystem integrity

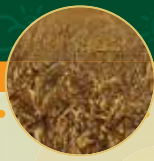


Policy	Evidence of broad support
NEM: Biodiversity Act	<ul style="list-style-type: none"> • Provides for the management and conservation of biological diversity in South Africa and is guided by the core principles outlined in NEMA • Authorizes the Minister to develop norms and standards to achieve the objectives of management and conservation of biological resources, as well as develop restrictions limiting certain activities that threaten biodiversity integrity • Requires that the Minister draft a Biodiversity Framework, which details, amongst other requirements, the location of conservation priority areas • The Minister or MEC of environmental affairs may declare and establish bioregions, with attendant management plans and which seek to manage a bioregion's biodiversity • Any person, organization, or organ of state can develop biodiversity management plans, which require approval from the Minister and can cover the management of an ecosystem • The Minister can enter into a biodiversity management agreement with the person, organization or organ of state that is authorized to implement a biodiversity management plan • SANBI may undertake programmes for the restoration of ecosystems • The Minister must promote research undertaken by SANBI, including into the conservation status of various ecosystems • The Minister may publish a list of threatened ecosystems and which require preservation (critically endangered, endangered, vulnerable, protected) and identify processes or activities that threaten that biodiversity. The protection of these ecosystems must be taken into account by organs of state responsible for developing environmental implementation or environmental management plan; relevant municipalities must also take account of these threats in their IDPs
Disaster Management White Paper, Act and Framework	<ul style="list-style-type: none"> • The White Paper affirms the government's commitment to protecting the environment • The Act considers damage to the environment a disaster • The Act calls for the development of a national disaster management framework, which will include measures for reducing vulnerability to disasters • The Act requires the development of a National Centre, which will oversee the development of disaster management plans and strategies by relevant organs of states and other institutional role players and provide support in the prevention and mitigation of disasters • The Framework requires that priority be provided to protect "fragile natural ecosystems and environmental assets that offer protective environmental services and which, if damaged or destroyed in a disaster event, would result in serious natural and economic loss." • The Framework calls for the rehabilitation of areas affected by a disaster event
National Development Plan	<ul style="list-style-type: none"> • Notes that agriculture, forestry and land-use can make a significant contribution to the national carbon sinks • Views regional sequestration initiatives as a means for delivering carbon sink enhancements • Affirms its "Vision 2030" commitment to ecosystem and biodiversity asset rehabilitation • Notes that Treasury should introduce incentives to promote rehabilitation of ecosystems
Carbon Tax Guidelines regarding the determination of Bioregions and the preparation of and publication of Bioregional Plans	<ul style="list-style-type: none"> • Notes that carbon offsets can be developed from projects that restore landscapes • Recommends that Bioregional Plans identify priority areas for ecological restoration in identified bioregions
Environmental Sector Plan	<ul style="list-style-type: none"> • Notes the need to restore landscapes to ensure provision of key ecosystem services • Recognizes the role that sustainable land-use management plays in reducing the country's "carbon balance." • Promotes the planting of indigenous plant species to enhance terrestrial carbon stocks • Affirms the role that ecosystems play in climate change adaptation

Policy	Evidence of broad support
National Strategy for Sustainable Development	<ul style="list-style-type: none"> Notes that a strategic goal is to restore “scarce and degraded natural resources.” Commits to restoration of 3.2 million hectares of degraded lands by 2014
Conservation of Agricultural Resources Act	<ul style="list-style-type: none"> Supports efforts to conserve agricultural resources, including the prevention of soil erosion (gully erosion is particularly problematic in the grassland biome) and allows the Minister to develop controls for the cultivation and use of agricultural lands as well as for the rehabilitation of denuded or eroded lands
Strategic Plan 2012/13-2016/17 for DAFF	<ul style="list-style-type: none"> Commits to rehabilitating 50,000 hectares of degraded indigenous forests, agricultural lands and woodlands.
The Grasslands Programme (SANBI, 2008)	<ul style="list-style-type: none"> Although this Programme is led by an agency outside of government, it enjoys of interdepartmental support at national and provincial levels The programme seeks to sustain and secure the biodiversity and associated ecosystem services of the grassland biome by working on a practical level with the sectors whose activities affect the grassland biome

Table A.3. Evidence of broad support for commercial small-scale afforestation in national-level policy

Policy	Evidence of support
National Climate Change Response Policy	<ul style="list-style-type: none"> Recognizes that commercial afforestation can lead to net increases in the country’s terrestrial carbon stocks Stresses concern over the potential impacts that commercial forestry can have on water flows and biodiversity and notes the need to ensure that economic development is weighed against water resource use required to support poverty alleviation (namely ensuring that all households have access to clean, consistent water supplies) Notes the need to promote the activity within the broader climate change agenda, with a focus on rural development, notably local job creation, and building climate resilience Recognizes the synergies between adaptation and mitigation in commercial forestry States the need to ensure that spatially-appropriate monitoring of climate change impacts is undertaken, to ensure that potentially negative impacts on the commercial forestry sector, amongst others, are flagged and mitigated (fires, pest outbreaks, etc.)
National Forests Act	<ul style="list-style-type: none"> Highlights the contribution that plantation forestry makes to the economy Acknowledges the need to manage the impacts that commercial forestry can have on the environment Recognizes the need to provide targeted support to community forestry initiatives, and allows the Minister to provide technical training and extension assistance, nursery development with privileged access to seedlings granted to community members, as well as the provision of financial or material assistance Provides for the development and agreement of community forestry agreements, but exclusively with respect to State forests
IPAP	<ul style="list-style-type: none"> Supports growth in the forestry sector, and notes that many of the new planting opportunities are on communal land, where small grower participation can grow Estimates that planting 100,00 new hectares of commercial plantation forest could generate 15,600 jobs, and believes that further expansion onto an additional 45,000 hectares could be planted in Mpumalanga, Limpopo, KwaZulu-Natal Highlights some of the key issues facing the sector, including: the slow afforestation license process, low skill development amongst rural communities, financial barriers to entry as it’s difficult to raise funds for a long-term business model, suitable lands may still be undergoing land claim court processes, demand for raw supply exceeds supply
Carbon Tax Paper	<ul style="list-style-type: none"> Notes that carbon offsets can be developed from projects that promote rural development



Policy	Evidence of support
<p>Integrated Growth and Development Plan</p> <p>Strategic Plan 2012/13-2016/17 for DAFF</p>	<ul style="list-style-type: none"> • Commits to growing the commercial forestry sector • Describes plantation forest ownership, total area under production, contribution to the economy and growing supply shortfalls • Notes that the Forestry Enterprise Development Programme has received limited support, and that DAFF provides no extension service to small growers • Recognizes the impacts that plantation forestry can have on stream flow, biodiversity and the spread of alien invasive species • Commits to developing a spatial commodity production plan to promote local economic growth and assist in infrastructure planning and market linkage developments • Commits to incentivizing the development of public-private partnerships which would support smallholder access to markets, through training, capacity building, improving access to information and establishing mentor programmes • Notes intention to develop Agriculture, Forestry and Fisheries Development Services Centres, so as to reach rural producers and provide support services locally • Notes intention to improve agricultural schools and colleges • Promotes skills development and training across the forestry value chain • Describes the forestry sector in South Africa • Provides a list of major challenges in the sector, including lack of funding to invest in the development of forestry, skills shortage and a difficult regulatory environment • Seeks to establish 12,000 new jobs through rehabilitation of category B&C plantations • Recognizes the opportunity to expand plantations in the Eastern Cape and KwaZulu-Natal • Commits to helping transfer MMM plantations to communities
<p>Framework for the National Forestry Programme</p>	<ul style="list-style-type: none"> • Supports community forestry activities, including transfer of forests to communities • Supports BEEE in the forestry sector • Is committed to expanding afforestation efforts in the Eastern Cape
<p>Forest Sector Transformation Charter</p>	<ul style="list-style-type: none"> • Commits to promoting BEEE in the forestry sector • Commits to increasing the skills of previously disadvantaged persons in the sector, improving access to funds and financial services for emerging black entrepreneurs, including seeking ways to develop a funding mechanism to fund or subsidize the interest burden for emerging farmers • Commits to providing capacity building to emerging farmers, either through private sector support or the signature of service delivery agreements with enterprise development agencies • Seeks to expedite the afforestation licensing process, to ensure that every year for 10 years, 10,000 ha of new plantation forest can be planted, for a total increase of 100,000 ha • Commits to working with all relevant departments to securing community tenure rights for 50% of afforestation projects in the Eastern Cape; it is also seeks to facilitate the resolution of restitution claims on areas currently under forestry production • Promotes the use of certification schemes for smallholder farmers to promote market access • Commits to working with the appropriate government agencies and private sector actors to identify required transport corridors to promote the forestry sector • Seeks to reduce property rate taxes on forested areas to promote growth in the sector
<p>Forestry 2030 Roadmap</p>	<ul style="list-style-type: none"> • Notes the growth in community-led plantation forestry programmes, namely supported by Mondi, Sappi and the SA Wattle Growers Union • Stresses the need to provide extension services to emerging forestry participants, notably along the entire value chain • Recognizes the challenges of land reform in the forestry industry, both for existing private commercial enterprises, and the communities that may come into ownership of those plantations • Seeks to support community-private sector partnerships

Table A.4. Evidence of support for development of anaerobic biogas digesters and biomass energy generation

Policy	Evidence of broad support
National Climate Change Response Policy	<ul style="list-style-type: none"> The Waste Management Flagship Programme gives the commitment to investigate and implement waste-to-energy opportunities available within solid-, semi-solid and liquid-waste management sectors, especially the generation, capture, conversion and/or use of methane gas. This has been initiated with the intention of rolling out programmatic approach for waste-to-energy at municipal waste sites
Renewable Energy White Paper (2003)	<ul style="list-style-type: none"> The White Paper on Renewable Energy (2003) commits the country to a developing a practical implementation strategy on renewable energy. The paper sets clear targets to achieve a diversified energy mix, with a specific target commitment of 10 000 GWh of South Africa's energy requirement to be delivered through renewable energy sources (biomass, wind, solar and small scale hydro) by 2013.
The Renewable Energy Independent Power Producer Procurement Programme (REIPPPP, 2012)	<ul style="list-style-type: none"> Renewable Energy Independent Power Producer Procurement Programme ("REIPPPP" or colloquially, "REBID") that was released in 2011 with the first REIPPPP procurement round reached financial close in the latter part of 2012. REIPPPP is a competitive bidding system for renewable energy providers, which includes significant requirement for local socio economic development component, specifically localised production facilities and job creation. It is a well-structured programme that has successfully facilitated 2 rounds of competitive bids.
Presidential Strategic Infrastructure Plan No 8 (SIP8)	<ul style="list-style-type: none"> SIP 8 aims to support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan
Integrated Resource Plan (IRP, 2010 & updated 2013)	<ul style="list-style-type: none"> The IRP determines South Africa's long-term electricity demands and details how this demand should be met in terms of generating capacity, type and cost The IRP is a living plan, and will be updated on an ongoing basis to reflect the changing needs of South Africa In terms of determinations, the Minister has allocated 12.5 MW for biomass, 12.5 MW for biogas and 12.5 for Landfill Gas
National Development Plan	<ul style="list-style-type: none"> The National Growth Plan makes broad references to renewable energy, and speaks in broad terms about the need for increased competition in the sector, better regulation of price and supply as well as increasing diversity of power sources. The objectives of the IRP are reiterated in the National Development Plan The NGP emphasizes the need for more integrated energy planning
Energy Act (2008)	<ul style="list-style-type: none"> The Energy Act governs the transformation of the South African energy economy and seeks to ensure that diverse energy resources are available in sustainable quantities and at affordable prices to the South African economy in support of economic growth and poverty alleviation
Industry's Manufacturing Competitiveness Enhancement Programme (DTI)	<ul style="list-style-type: none"> This programme of the Department of Trade and Industry includes grants and incentives for green technology and resource efficiency improvement
Green Energy Efficiency Fund (DTI)	<ul style="list-style-type: none"> The Green Energy Efficiency Fund aims to promote sustainable energy solutions to business – through assisting with technical and financial feasibility assessments to industry and provision of capital assistance



Table A.5 Evidence of broad support for biochar amendment in South African national-level policy

Policy	Evidence of Broad Support
Conservation of Agricultural Resources Act	<ul style="list-style-type: none"> • Supports efforts to conserve agricultural resources, including the prevention of soil erosion and allows the Minister to develop controls for the cultivation and use of agricultural lands as well as for the rehabilitation of denuded or eroded lands • Calls for the control of weed and invader plants • Authorizes the Minister to develop “schemes”, which would distribute subsidies to farmers to combat weeds and invader plants • Allows the officials of the department to destroy and remove invader plants and weeds on farms that they have inspected
National Climate Change Response Policy	<ul style="list-style-type: none"> • Recognizes agriculture’s contribution to GHG emissions globally • Notes that commercial, intensive agriculture is associated with a number of negative social and economic externalities • Climate-resilient agriculture should provide a multitude of social and environmental benefits beyond food production • Notes the need to invest in research to improve understanding of soil conservation practices and technology • Recognizes need for financial models that support “climate-smart” agriculture, which lowers agricultural emissions • Commits to educating subsistence and smallholder farmers on the practice of conservation agriculture • Notes that reducing GHG emissions from non-energy emissions in agriculture represents a viable climate change mitigation opportunity
National Development Plan	<ul style="list-style-type: none"> • Recognizes the need to refocus research in the agricultural sector on ways to improve sustainable agriculture outcomes, notably in the commercial sector • Notes its commitment to rolling out new technologies that align with sustainable agricultural strategies, notably those that benefit subsistence and small-scale farmers. • Seeks to ensure that agricultural policies support sustainable development • By 2020, will have ensured that agricultural development policies are aligned with the objective of delivering “environmentally sustainable rural regeneration.”
National Strategy for Sustainable Development	<ul style="list-style-type: none"> • Recognizes that food security is threatened by soil degradation trends in agricultural lands • Promotes conservation farming, permaculture and organic farming methods. • Ensuring that principles of sustainable land-use are integrated into the practices of land-claim beneficiaries • Supports changes to agricultural policy so as to better integrate principles of sustainable development • Notes the need to strengthen agricultural programmes that support conservation farming
Biodiversity Act and Framework	<ul style="list-style-type: none"> • The Act allows the Minister to identify and publish lists of invasive species • The Act controls and places restrictions on the use of invasive species • The Act requires that the control and eradication of invasive species be undertaken, and that efforts to eradicate seedlings and means of regeneration of the plant species • The Act requires that all organ of states, in their environmental management plans, detail how they will control and eradicate alien invasives on land over which they have control • The Framework recognizes the threat to biodiversity that alien invasive plants present and that it is difficult to control them • The Framework notes that it intends to publish regulations for alien and invasive species to address the challenges they present and for their prevention, containment and eradication, and to begin to implement them • The Framework that sustainable development is consistent with limiting the spread and further introduction of alien invasives • The Framework presents several mechanisms for managing alien invasives, including integration of alien invasive species removal and control with other local plans, notably those for natural resource management

Policy	Evidence of Broad Support
Environmental Sector Plan	<ul style="list-style-type: none"> Notes agriculture’s global contribution to GHGs Supports the use of compost as a means for locking soil in carbon Support organic food production through the use of agro-ecological models
Integrated Growth and Development Plan	<ul style="list-style-type: none"> Recognizes the need to sustainably manage landscapes so they provide optimal ecosystem services to the agricultural sector Notes the need to adopt conservation agriculture, in particular in sensitive areas Commits to improving production efficiency in alignment with conservation agriculture principles
Strategic Plan 2012/13-2016/17 for DAFF	<ul style="list-style-type: none"> A strategic goal is to “ensure the sustainable management and efficient use of natural resources.” Commits to reducing the carbon footprint of the agricultural industry Commits to developing policies that support agro-ecological practices Notes the need to adopt climate-smart agriculture, through the practice of introducing conservation methods into farming systems
Strategic Plan for South African Agriculture	<ul style="list-style-type: none"> Commits to helping new farming entrants undertake soil conservation works Seeks to implement soil conservation programmes All interventions will be supported by an overarching commitment to sustainable management of natural resources

Table A.6. Evidence of broad support for conservation agriculture in South African national-level policy

Policy	Evidence of Broad Support
Conservation of Agricultural Resources Act	<ul style="list-style-type: none"> Provides the Minister with the authority to provide control measures that must be adhered to by landowners. A non-exhaustive list is provided, and includes controls such as: mandates over use of virgin land, grazing capacity of veld, the protection and use of cultivated land, and the restitution or restoration of degraded, cultivated land Notes that the Minister may devise funded “schemes” which provide finance (subsidies) to farmers who undertake activities deemed to enhance soil fertility and reduce erosion or reduce grazing intensity (amongst other types of viable activities) The Minister may establish a Conservation Committee to oversee a certain area, and which is to provide support in regards to the conservation of natural agricultural resources in the area(s) in question
National Climate Change Response Policy	<ul style="list-style-type: none"> Recognizes agriculture’s contribution to GHG emissions globally Notes that commercial, intensive agriculture is associated with a number of negative social and economic externalities Climate-resilient agriculture should provide a multitude of social and environmental benefits beyond food production Notes the need to invest in research to improve understanding of soil conservation practices and technology Recognizes need for financial models that support “climate-smart” agriculture, which lowers agricultural emissions Commits to educating subsistence and smallholder farmers on the practice of conservation agriculture Notes that reducing GHG emissions from non-energy emissions in agriculture represents a viable climate change mitigation opportunity
National Environmental Management Act	<ul style="list-style-type: none"> As part of its core principles, recognizes the need to minimise impacts on the use and development of natural resources where and when feasible, and to not overexploit natural resources and the ecosystems on which they depend to the extent that their integrity is jeopardized

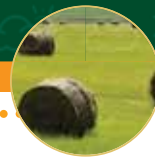
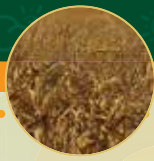


Policy	Evidence of Broad Support
Disaster Management White Paper, Act and Framework	<ul style="list-style-type: none"> • The White Paper affirms the government’s commitment to protecting the environment • The Act considers damage to the environment a disaster • The Act calls for the development of a national disaster management framework, which will include measures for reducing vulnerability to disasters • The Act requires the development of a National Centre, which will oversee the development of disaster management plans and strategies by relevant organs of states and other institutional role players and provide support in the prevention and mitigation of disasters • The Framework requires that priority be provided to protect “fragile natural ecosystems and environmental assets that offer protective environmental services and which, if damaged or destroyed in a disaster event, would result in serious natural and economic loss.” • The Framework calls for the rehabilitation of areas affected by a disaster event
National Development Plan	<ul style="list-style-type: none"> • Recognizes the need to refocus research in the agricultural sector on ways to improve sustainable agriculture outcomes, notably in the commercial sector • Notes its commitment to rolling out new technologies that align with sustainable agricultural strategies, notably those that benefit subsistence and small-scale farmers. • Seeks to ensure that agricultural policies support sustainable development • By 2020, will have ensured that agricultural development policies are aligned with the objective of delivering “environmentally sustainable rural regeneration.”
Carbon Tax	<ul style="list-style-type: none"> • Promotes the use of offsets that reduce land degradation
Guidance on Bioregional Plans	<ul style="list-style-type: none"> • Confirms that the National Department of Agriculture must take Bioregional Plans into consideration when any authorizations may impact on biodiversity (such as plowing of virgin lands) • Confirms that the Provincial Department of Agriculture must reference Bioregional Plans when developing farm or area planning
Environmental Sector Plan	<ul style="list-style-type: none"> • Notes agriculture’s global contribution to GHGs • Supports the use of compost as a means for locking soil in carbon • Support organic food production through the use of agro-ecological models
National Strategy for Sustainable Development	<ul style="list-style-type: none"> • Recognizes that food security is threatened by soil degradation trends in agricultural lands • Promotes conservation farming, permaculture and organic farming methods. • Ensuring that principles of sustainable land-use are integrated into the practices of land-claim beneficiaries • Supports changes to agricultural policy so as to better integrate principles of sustainable development • Notes the need to strengthen agricultural programmes that support conservation farming
Integrated Growth and Development Plan	<ul style="list-style-type: none"> • Recognizes the need to sustainably manage landscapes so they provide optimal ecosystem services to the agricultural sector • Notes the need to adopt conservation agriculture, in particular in sensitive areas • Commits to improving production efficiency in alignment with conservation agriculture principles
Strategic Plan 2012/13-2016/17 for DAFF	<ul style="list-style-type: none"> • A strategic goal is to “ensure the sustainable management and efficient use of natural resources.” • Commits to reducing the carbon footprint of the agricultural industry • Commits to developing policies that support agro-ecological practices • Notes the need to adopt climate-smart agriculture, through the practice of introducing conservation methods into farming systems

Policy	Evidence of Broad Support
Strategic Plan for Smallholder Support	<ul style="list-style-type: none"> • Commits to supporting the adoption of conservation and agro-ecological agricultural practices • Notes that the CASP National Mechanization Programme may not align with conservation agriculture objectives • Seeks to improve smallholder access to finance, extension services, training, research and development
National Biodiversity Framework	<ul style="list-style-type: none"> • Recognizes the role that intact ecosystems play in carbon storage • Commits to working with the agricultural sector to fast-track adoption of best practices to minimize habitat loss and land degradation in critical areas
Strategic Plan for South African Agriculture	<ul style="list-style-type: none"> • Commits to helping new farming entrants undertake soil conservation works • Seeks to implement soil conservation programmes • Commits to developing a infrastructure and services that support sustainable land-use, and promoting organic and environmentally friendly production • All interventions will be supported by an overarching commitment to sustainable management of natural resources

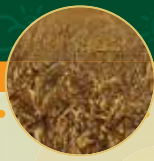
Table A.7. Evidence of broad support for Reducing Emissions from Deforestation and Forest Degradation (REDD+) in South African national-level policy

Policy	Evidence of Broad Support
National Climate Change Response Policy	<ul style="list-style-type: none"> • Deforestation increases GHG emissions and reduces the Earth’s capacity to store carbon • Seeks to conserve forests as they play an important role in carbon storage • Aligns with the objectives of the Protected Areas Expansion Strategy, notably in areas that are critical for stemming extinction of species and which will build resilience against climate change impacts • Supports conservation efforts and seeks to support these through the use of carbon offsets
National Forestry Act (1998)	<ul style="list-style-type: none"> • Has the specific purpose of sustainably managing forests and providing special measures for protecting certain forests and trees • Amongst its guiding principles for sustainable forest management, includes the provision that natural forests may not be destroyed save under exceptional circumstances, a minimum area of woodland must be designated for protection, • Amongst other sustainable management objectives, forests must be managed so as to ensure their health and vitality, and to conserve biological diversity • The Minister is to identify criteria and standards by which it can be judged the extent to which forests are managed sustainably, according to the core principles • Monitoring of and research into forest management must be undertaken, with results presented to Parliament every 3 years • The destruction of indigenous trees in a natural forest can only be done with a license • The Minister may declare certain forests as protected forest areas • The Minister may urgently intervene to prevent deforestation and undertake rehabilitation activities by declaring an area a controlled forest area • Penalties and offenses apply to controlled forest areas



Policy	Evidence of Broad Support
Disaster Management White Paper, Act and Framework	<ul style="list-style-type: none"> • The White Paper affirms the government’s commitment to protecting the environment • The Act considers damage to the environment a disaster • The Act calls for the development of a national disaster management framework, which will include measures for reducing vulnerability to disasters • The Act requires the development of a National Centre, which will oversee the development of disaster management plans and strategies by relevant organs of states and other institutional role players and provide support in the prevention and mitigation of disasters • The Framework requires that priority be provided to protect “fragile natural ecosystems and environmental assets that offer protective environmental services and which, if damaged or destroyed in a disaster event, would result in serious natural and economic loss.” • The Framework calls for the rehabilitation of areas affected by a disaster event
National Environmental Management Act	<ul style="list-style-type: none"> • As part of its core principles, recognizes the need to minimize impacts on the use and development of natural resources where and when feasible, and to not overexploit natural resources and the ecosystems on which they depend to the extent that their integrity is jeopardized

Policy	Evidence of Broad Support
<p>NEMA: Biodiversity Act and Framework</p>	<ul style="list-style-type: none"> • The Act is guided by NEMA • Seeks to ensure the conservation of ecosystems that warrant national protection • Seeks to ensure the sustainable use of indigenous biological resources • The Minister may publish norms and standards which restrict activities that may impact on biological diversity and which ensure the conservation and management of these resources • SANBI is to coordinate and implement rehabilitation programmes, including with civil society • SANBI to advise on the conservation of biological resources and the sustainable use of indigenous biological resources • SANBI to assist in identifying the location of bioregions, which must be declared by the Minister or the MEC for environmental affairs in a province • Any individual or entity, for approval by the Minister, and which are tailored to a particular ecosystem and which seeks to ensure its long-term survival, may create Biodiversity Management Plans. • Biodiversity Management Agreements may be entered into by individuals or entities wishing to preserve ecosystems under their control • The Act promotes research and monitoring of biodiversity • The Act calls for the publication of a national list detailing which ecosystems are threatened and in need of protection and also publish a list of activities which threaten that ecosystem • The Minister has the authority to create regulations that support the principles and objectives of the Act • The Act provides for offences and penalties • The Framework recognizes that ecosystems are threatened by both climate change and the loss and degradation of natural habitats and warns of the habitat fragmentation • Amongst its five strategic objectives, the Framework seeks to ensure the sustainable use of biological resources and promote the conservation of a representative sample of biodiversity. • The Framework support implementation of the Protected Areas Expansion Strategy • The Framework seeks to highlight the role of biodiversity in achieving sustainable development • The Framework seeks to integrate biodiversity considerations into the country's fiscal framework and through environmental fiscal reform • The Framework is committed to developing strategies to enhance ecosystem adaptation to climate change • Has identified 9 broad areas of conservation concern in SA • The Framework commits to better understanding what levels of resource extraction in terrestrial landscapes qualifies as sustainable • The Framework aligns with the Protected Areas Act support for the designation and management of formal protected areas on any land, including communal or private lands and seeks to integrate this tool into Provincial Stewardship Agreements • The Framework commits to expanding the information conservation network
<p>Carbon Tax</p>	<ul style="list-style-type: none"> • Carbon offsets are promoted as a means for reducing land degradation and protecting biodiversity



Policy	Evidence of Broad Support
Guidelines regarding the determination of Bioregions and the preparation of and publication of Bioregional Plans	<ul style="list-style-type: none"> • Supports conservation of biodiversity outside of protected areas • Provides a means for effectively managing biodiversity in a designated area • Provides for the identification of critical biodiversity areas in a bioregion and the provision of guidelines on how to avoid the degradation of those areas • Requires the use of land-use guidelines, which will ensure the long-term ecological functioning of the bioregion • Requires an explicit description of management needs in the bioregion
NEMA: Protected Areas Act	<ul style="list-style-type: none"> • Seeks to conserve “ecologically viable” areas in South Africa which are representative of the country’s biodiversity and its natural landscapes • Describes the means by which protected areas are established, the ways in which these areas can be used sustainably, and how they may be managed by communities • Notes that protected areas include specially protected forest areas, forest nature reserves and forest wilderness areas as declared in the National Forests Act
Protected Areas Expansion Strategy	<ul style="list-style-type: none"> • Recognizes the role that protected areas can play in ecological sustainability, local socio-economic development and climate change adaptation • Provides concrete targets for the protection of forests and savannah over a 20-year period (2008-2028) • Supports the use of contract agreements to encourage the participation of private landowners • Asserts that the use of innovative fiscal instruments should incentivize the participation of private landowners • Stresses the urgency with which expansion of the protected areas network should take place • Notes the vital role that protected areas play in the country’s ecological infrastructure
Environmental Sector Plan	<ul style="list-style-type: none"> • Affirms the role that ecosystems play in climate change adaptation • Supports the efforts of NEMA: BA and NEMA:PAA • Supports sustainable land-use management • Recognizes how biologically diverse South Africa is • Acknowledges the threat to biodiversity due to climate change and natural habitat degradation • Aligns with the conservation goals of the Protected Areas Expansion Strategy

Policy	Evidence of Broad Support
Woodlands Strategy	<ul style="list-style-type: none"> • Recognizes the Department of Forestry’s role and mandate in conserving woodlands and ensuring sustainable resource use • Notes that the Minister is responsible for determining what percentage of woodlands should be conserved • Seeks to support community forest management in communal areas • Proposes the development of a Woodlands Extension Service • Supports the use of incentives to promote woodland management • Recommends the development of woodlands certification, to provide a transparent chain of custody for woodland-derived products • Proposes the use of “energy grants” in rural areas, which would serve to reduce local reliance on unsustainable fuel wood consumption • Notes that the overexploitation of woodlands is leading to widespread degradation, soil erosion, and sedimentation of water sources and loss of biodiversity. • Woodlands can provide climate change adaptation benefits and are an important terrestrial carbon sink • Notes that tenure reform is required to ensure more responsible use of woodlands in communal lands • Recognizes the importance of woodlands to rural communities • Acknowledges the need to have a budget specifically focused on woodlands research • Proposes the development of an Advisory Support Programme, to work with local communities on woodland management • Notes that further investigation is required to better understand sustainable forest use systems
National Development Plan	<ul style="list-style-type: none"> • Recognizes the contribution of forests to GHG emissions, and the role they can play in acting as a carbon sink • Recognizes the role that long-term planning plays in realizing an effective conservation programme • Supports the Protected Areas Expansion Strategy’s conservation targets • Supports SANBI’s use of Biodiversity Stewardship Programme to establish conservation partnerships
Integrated Growth and Development Plan	<ul style="list-style-type: none"> • Recognizes that forests, woodlands in particular, have been subject to degradation over an extended period of years • Acknowledges the important ecosystem service benefits that forests provide, in particular its rich biodiversity environment • Notes that forest (including woodlands) resource management requires, amongst other strategies, a focus on conservation but can also extend to other management interventions • Describes the reliance of rural households on woodland resources • Affirms the need to undertake a national-scale mapping of woodlands to facilitate the development of conservation and other targets • Commits to conserving woodland and forest resources
Strategic Plan 2012/13-2016/17 for DAFF	<ul style="list-style-type: none"> • Notes that the management of indigenous forests and woodlands does not necessarily solely focus on conservation, but also on sustainable resource use, management, and the processing of non-timber forest products • Notes that forest degradation is a challenge, as well as lack of budget and in-depth research and development • States that conservation and rehabilitation of forests as well as development of a Working for Forests Programme are all important opportunities in the sector • Committed to improving the licensing process in indigenous forests to ensure sustainable resource extraction





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