

Biodiversity mainstreaming in South Africa's production landscapes: lessons and achievements

Aimee Ginsburg^B, Anthea Stephens^A, Mahlodi Tau^A, Emily Botts^B and Stephen Holness^C

^A South African National Biodiversity Institute, Private Bag X 101, Pretoria, 0001, South Africa

^B Benefits SE, PO Box 36762, Menlo Park, 0102, Pretoria, South Africa

^C Centre for African Conservation Ecology, Department of Zoology, Nelson Mandela Metropolitan University, Department of Botany, Nelson Mandela Metropolitan University, Port Elizabeth, South Africa

Contact email: a.stephens@sanbi.org.za

Abstract. South Africa's grasslands are critically threatened and many biodiversity priority areas lie in production landscapes. This is a challenge best addressed by an approach aimed at strengthening the enabling environment, and innovating, piloting and mainstreaming new models for biodiversity management into production sectors, namely agriculture, forestry, urban development and coal mining. The Grassland Programme (a 20-year partnership between government, conservation agencies, non-governmental organisations, and private sector) has implemented this approach to sustain and secure grassland biodiversity and ecosystem services for the benefit of current and future generations. In five years of implementation, notable achievements have been in shaping policies and regulations, improving existing institutional capacity, and implementing pilot projects demonstrating biodiversity gains across sectors. Particularly significant is experience from the mining sector, where deeper engagement is enabling the development of integrated tools and products that help to ensure: biodiversity issues are consistently incorporated into decision-making processes for mining projects; high priority wetlands (of global importance) are avoided; residual impacts are offset; and proactive stewardship secures landscapes of high importance for biodiversity, energy and water provisioning. The sector demand for these tools and the leveraged finance raised from industry bodies is evidence of achievements earned in the face of lessons learnt as regards policy engagement, market-based incentives, and communicating the value offering of biodiversity using sector appropriate language. Technically proficient, cross-disciplinary teams able to develop integrated, accessible decision-support tools and guidelines in partnership with sector stakeholders, has been critical to the gains made in this multi-million dollar mainstreaming programme.

Keywords: Grassland, conservation, mining, offsets, integrated planning.

Introduction

South Africa is one of the world's seventeen megadiverse countries, mainly due to its extensive plant diversity and endemism (Mittermeier *et al.* 1997). The South African Grassland Biome is similarly species rich, supporting 82 plant species per 1000 m² (O'Connor and Bredenkamp 1997). Nearly half of South Africa's endemic mammal species occur in the grasslands (Wilkinson and Ginsburg 2010). The biome is identified as an Endemic Bird Area and is host to 52 of the 122 Important Bird Areas in South Africa and contains 10 of the 14 globally threatened bird species found in South Africa (SANBI 2008a). Just over 20% of the reptiles endemic to South Africa occur in the grasslands (SANBI 2008a) and some of the most threatened butterfly species (Henning and Henning 1989). The biome also contains five important Ramsar designated wetlands (DEAT 1998) and its mountains are the source of water for most of the country's rivers. It boasts three natural and cultural World Heritage Sites and is visited by tourists for its unique landscapes, birds and plants. With only 2.34% of the biome under formal protection (Wilkinson and Ginsburg 2010), much of the Grassland Biome's rich

biodiversity resides outside formally protected areas, within the broader, economically productive landscape. Thus, the Grasslands Biome is in need of innovative conservation action. During its initial 5-year phase, the National Grasslands Biodiversity Programme (hereafter called the Grasslands Programme) has been pioneering approaches that incorporate biodiversity considerations directly into the policies and practices of production sectors. This paper will share the lessons and achievements of the Grasslands Programme, focusing specifically on progress made within the mining sector.

Global context for biodiversity mainstreaming

The responsibility for biodiversity conservation has traditionally been seen as a function of government and, particularly, of its environment departments and conservation agencies. Non-governmental organisations, local communities and other interest groups have supported this role by championing specific environmental issues. Conversely, business and industry are typically regarded as competitors to environmental causes, needing land and resources for production. Under this conventional

approach, balancing the protection of the environment with necessary economic development is difficult and divisive. Since the founding of the Convention for Biological Diversity (CBD) and its first conference in Rio de Janeiro in 1992, an alternative strategy is being supported that aims to incorporate biodiversity considerations directly into the policies and planning of business and industry (Article 6(b) of the CBD 1992). This strategy has become known as “biodiversity mainstreaming”.

The case for mainstreaming is enhanced with the recognition that protected areas need to be supported by an approach that directly addresses the underlying causes of biodiversity loss by internalising biodiversity considerations into all development actions (CBD 2002, Petersen and Huntley 2005). The Global Environmental Facility (GEF), the largest public funder of environmental projects, recognises that protected areas alone cannot deliver the biodiversity benefits and is investing significantly in biodiversity mainstreaming. A global workshop on biodiversity mainstreaming held in Cape Town in 2004 helped to define the GEF’s approach to mainstreaming as a core element of its biodiversity strategy. This workshop identified the primary objective of biodiversity mainstreaming is “to internalize the goals of biodiversity conservation and the sustainable use of biological resources into economic sectors and development models, policies and programmes, and therefore into all human behaviour” (Peterson and Huntley 2005).

Biodiversity mainstreaming has become a strategic objective of the GEF Biodiversity Focal Area since 2002, and subsequent GEF Biodiversity Strategies have built on this with refinements to strategy objectives based on advice from GEF’s Scientific and Technical Advisory Panel and guidance of the ninth meeting of the Conference of the Parties of the Convention on Biological Diversity (GEF 2010). Mainstreaming of biodiversity conservation into production landscapes is seen as increasingly important relative to Protected Areas as a suitable instrument for achieving the conservation and sustainable use of biodiversity and the maintenance of ecosystem goods and services (the goal of the biodiversity focal area) (GEF 2012). While the GEF is the largest funder of biodiversity mainstreaming, mainstreaming initiatives are explicitly or implicitly supported by numerous other organisations, agencies and donors working at different scales.

South Africa’s approach to biodiversity mainstreaming

South Africa is an emerging economy heavily reliant on natural resources and is under immense pressure to provide jobs and services to address high levels of poverty and inequity. The need to grow major economic sectors places increasing pressure on the natural environment and on its ability to deliver vital services such as clean water, clean air and fertile soils. Biodiversity mainstreaming ensures that addressing development needs and protecting the environment is not an either-or situation, but rather that development is supported by the sustainable use of its natural resources. South Africa has several attributes that make biodiversity mainstreaming an appropriate strategy for the conservation and sustainable use of its natural

environment.

South Africa’s progressive environmental laws developed since the change in government in 1994 are a good foundation for biodiversity mainstreaming. The National Environmental Management Act (Act 107 of 1998) and its subsidiaries, the Biodiversity Act (Act 10 of 2004) and the Protected Areas Act (Act 57 of 2003, and amended as Act 15 of 2009) provide the legal platform for many of the activities necessary for biodiversity mainstreaming.

South Africa also has a strong background in biodiversity science which is firmly integrated into its biodiversity policy and regulatory framework. South Africa employs systematic conservation planning to prioritise conservation. This involves setting targets to ensure the conservation of biodiversity pattern (ecosystems and species) and ecological processes in the most efficient space, whilst minimising conflict with competing land uses (Margules and Pressey 2000; Cadman *et al.* 2010). Several national spatial biodiversity assessments have been conducted based on the most comprehensive and current species and ecological data (such as riparian zones, wetlands, climate change sensitivity and ecosystem services) (e.g. the 2011 National Biodiversity Assessment by Driver *et al.* 2012). Using the scientific foundation of systematic biodiversity planning, South Africa has developed a robust biodiversity policy framework and effective land use planning and management tools to guide decisions about where and how development takes place.

South Africa therefore has the legal framework, the biodiversity science, and the policy background for successful biodiversity mainstreaming. Building on this foundation, South Africa has adopted a landscape approach to biodiversity conservation (Cadman *et al.* 2010). This approach recognises that all land users should contribute to sustainable use of biodiversity and the protection of ecosystem functioning. It enables biodiversity objectives to be met in the broader landscape outside of the boundaries of protected areas (Cadman *et al.* 2010). The landscape approach is thus highly compatible with biodiversity mainstreaming.

South Africa’s grasslands

The South African Grassland Biome forms part of the global temperate grasslands that occupy about 8% of the Earth’s surface and are one of the world’s most transformed ecosystems (TGCI 2010). The recent National Biodiversity Assessment recognises the Grassland Biome as highly threatened (Driver *et al.* 2012). The level of formal protection of temperate grasslands globally (only 5%; TGCI 2010) and in South Africa (only 2.34%; Wilkinson and Ginsburg 2010) is insufficient for adequate representation of grassland biodiversity in formally conserved areas (Driver *et al.* 2012).

The National Protected Area Expansion Strategy (NPAES) has recommended a further 12% of land in the Grassland Biome be protected to meet the 20 year protected area targets (Government of South Africa 2010). Protected area expansion following a model of state-owned protection involves prohibitively large upfront payments to purchase land from private owners to secure all 20-year

terrestrial protected area targets (Government of South Africa 2010). Another approach is to achieve formal protection through biodiversity stewardship. This is significantly cheaper for the state and allows voluntary but formal commitments of privately owned land to conservation through contractual agreements and title deed changes under biodiversity legislation. In spite of this, efforts to meet the protected area targets in the biome remain an ongoing challenge. There are high costs involved and significant rates of biodiversity loss and ecosystem degradation associated with competing land and resource uses. It is also necessary to make complex trade-offs between land uses and management to meet economic and development objectives within highly productive landscapes.

Much of the Grassland Biome has been used for livestock production, agriculture, afforestation, mining and converted into urban or industrial areas. Agriculture is responsible for the largest conversion of natural habitat (Wilkinson and Ginsburg 2010). Approximately 62% of South Africa's commercial croplands and 50% of the subsistence farms are found within the Grasslands Biome (DAFF 2011). In 2012, approximately 6 million cattle (44% of the country's total herd) and 8 million sheep (35%) grazed in the Grassland Biome (DAFF 2012). Grasslands support more than 90% of the country's extensive timber plantations (Wilkinson and Ginsburg 2010). The Grassland Biome is also home to the country's largest urban centre, the conurbation of Johannesburg and Pretoria (cities in Gauteng province) with a population of over 12 million (StatisticsSA 2011). Further, the Grassland Biome has extraordinary mineral wealth, in particular coal deposits. According to the most recent land-cover data, over 40% of South Africa's mining lands are found within the biome (SANBI 2008b).

These production activities make significant contributions to South Africa's economy and development, but they also impact significantly on grassland biodiversity and its functions, which are responsible for maintaining ecosystem processes that provide a suite of services, such as clean water, clean air, grazing, tourism, pollination services and soil formation for agriculture. These ecosystems can be thought of as *ecological infrastructure* – “the nature-based equivalent of built or hard infrastructure and are just as important for providing services and underpinning socio-economic development” (SANBI 2012). Tough decisions about optimal development futures in these highly productive grassland ecosystems are necessary. This is especially so in the strategic water source areas of the biome which contribute significantly to overall water supply of the country (Nel and Driver 2012). Nearly half of these areas nationally occur in the Grassland Biome and the impacts of production activities make the need for strategic environmental management and integrated development planning essential.

The cost of protected area expansion, the wide range of production sectors that are important to economic development but impact on biodiversity and ecosystems, and the inevitable trade-offs between competing land uses make plain the need for urgent, strategic and focused action that is supportive of sustainable development. Biodiversity mainstreaming is an important additional conservation strategy to protected areas in this highly productive

landscape.

The National Grasslands Biodiversity Programme

The Grasslands Programme is pursuing a 20-year conservation strategy and has successfully secured \$8.3 million from the Global Environment Facility (GEF) for a period of 5 years to implement a catalytic biodiversity mainstreaming strategy during the initial phase (SANBI 2008a; Steyn 2008). The launch of the Grasslands Program in 2008 represented the first major investment in the conservation of the country's Grassland Biome on a national scale (Fig. 1). The South African National Biodiversity Institute (SANBI) is the implementing agency of the Grasslands Program.

Following detailed research that identified where the priority biodiversity areas were in the grasslands, key sectors were identified with whom mainstreaming interventions could be designed and implemented. These sectors included the agriculture, mining, forestry and urban sectors.

The Grasslands Programme banked its success on partnerships and co-financing by working through a range of informal and formal partnerships involving government, conservation agencies, industry associations, private sector groups, civil society organizations and research organisations (Cadman *et al.* 2010). Once partnerships with production sectors were established, mainstreaming interventions were co-designed to ensure grasslands conservation is achieved by working with these sectors to incorporate biodiversity objectives into their operational plans, policies and decision-making. Over 16 institutions have signed a Memorandum of Understanding committing to the vision and objectives of the Grasslands Program.

The recommended suite of interventions include mitigating the impact of mining, forestry, agriculture and urban development through developing market-based mechanisms, improving management of unplanted areas and securing protection of priority areas through stewardship agreements. Central to the success of mainstreaming is improving capacity within the institutions that regulate production within the grasslands. One of the Grassland Programme's key strategies is to promote the concept that

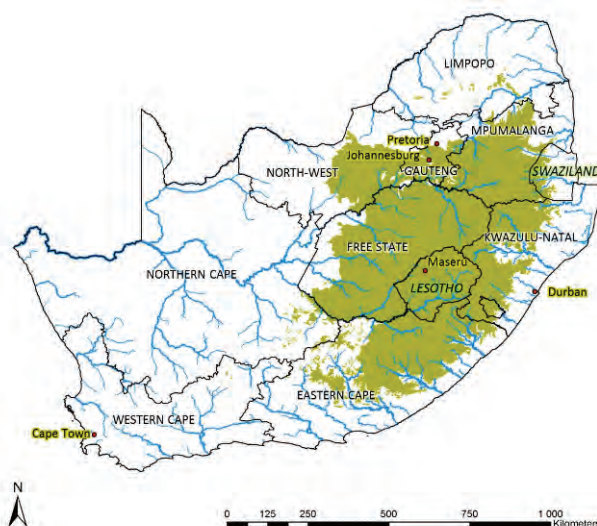


Figure 1. Grassland Biome in South Africa

grasslands and their associated ecosystem services have real monetary value (SANBI 2008a; Steyn 2008).

Mainstreaming biodiversity into production sectors: achievements and lessons

In 2013, the Grasslands Program is nearing the end of its initial 5-year phase to implement a catalytic biodiversity mainstreaming strategy. It has made significant achievements in increasing the extent of protected areas in production landscapes (nearly 70% of its target by year 4), increasing the area under better management in production sectors (more than 80% of the target by year 4), and in mainstreaming biodiversity into policies and plans of production sectors. This paper is able to reflect upon the broader programme strategies that have been key to achievements. Six aspects that are fundamental to achieving successful biodiversity mainstreaming are described below, using mainstreaming interventions in the mining sector as examples:

Provision of science-based leadership and expertise

The robust scientific foundation for biodiversity conservation in South Africa has generally been recognised by production sectors as credible – a key component of trust. However, mainstreaming biodiversity into different production sectors is cross-disciplinary work that also requires good leadership to successfully pilot innovative projects or develop high-quality science-based tools that enable the easy integration of biodiversity into decision-making. In the mining sector, real gains were made with the appointment of a mining-biodiversity sector specialist with the skills and expertise to facilitate, coordinate and guide biodiversity mainstreaming that is specific to the mining sector. Specialists with biodiversity and production sector expertise are able to identify sector needs, respond to emerging threats, and champion interventions to promote mainstreaming in partnership with other stakeholders. Science-based leadership and expertise supported the prioritisation of an area of the Upper Pongola catchment in Mpumalanga province of South Africa, which has high biodiversity importance and is a strategic water source area feeding economically important rivers. Emerging threats of numerous small mining projects, which have a large cumulative impact, called for a proactive approach to securing voluntary biodiversity stewardship of an area of 9258 ha, which has since been gazetted with the intent to declare as a Protected Environment (under national protected areas legislation). Biodiversity stewardship is a key tool in the biodiversity mainstreaming toolbox as it allows suitable, conservation-worthy land to remain under the ownership of private owners and be formally protected.

Delivering high-quality, demand-led tools for integrating biodiversity into planning processes and decision-making

The large range of existing biodiversity data products (*e.g.* conservation plans, threatened ecosystems data, areas earmarked for protection, sensitive wetlands, offset guidelines) that South Africa is fortunate to have is sometimes difficult for users to contend with. These multiple data sources can confuse users even if they have the best

intentions. The Grasslands Programme identified this as a constraint and prioritised the development of integrated tools and guidelines to provide decision support that is specific to sector needs. Integrated technical products for the mining sector included a national Mining and Biodiversity Guideline (Department of Environmental Affairs *et al.* 2013), which provides a single reference point for industry and regulators to ensure biodiversity issues are consistently incorporated into decision-making processes for mining projects. The associated spatial data of the biodiversity priority areas in South Africa and the interpretation of these data for mining projects will be available as an online mining land-use advisor. These tools focus on providing biodiversity information to users in a way that harmonises existing information systems and facilitates their access to and use of biodiversity information.

Making a case for investing in biodiversity and ecological infrastructure

A key characteristic of these integrated biodiversity tools is that they are demand-led, meaning that they are tied to market-based or business incentives in a way that helps to ‘make the case’ for the use of these tools in a way that is specific to the production sector in question. In this way, awareness is raised of the linkages between biodiversity and production activities, and the value or benefits of integrating biodiversity objectives into the policies and plans of the production sector becomes more understandable. For the mining sector, the commercial value of integrating biodiversity into decision-making throughout the mining life cycle is through the management of business risk. The effectiveness of the ‘case’ made for the mining sector is evidenced by the responsiveness of the mining industry to the integrated tools that are under development, through co-financing of some of the tools, active involvement in their development, and, in a few cases, voluntary implementation of guidelines. For example, mining companies required a better way to identify high priority wetlands within the Highveld grassland area of South Africa, an area with large coal deposits. In response to this need, CoalTech (a coal mining research association) co-financed the creation of a new fine-scale wetlands map for the area that is now being used by mining houses, consultants and regulators.

Building individual and institutional capacity to mainstream biodiversity

Capacity development is a critical element in successful mainstreaming and is of vital importance in the long-term to reduce institutional bottlenecks, strengthen multi-sectoral processes, and promote policies and plans that support good decision-making. Capacity building has taken place in several cross-cutting ways and influencing different levels of capacity (Matachi 2006). The development and/or piloting of biodiversity tools has increased capacity at an institutional level through growing the intellectual resources available for improved planning, management and decision-making. Institutions and stakeholders have received training on how to use tools, such as those mentioned above. Workshops have raised public awareness

that increases knowledge of biodiversity tools and changes attitudes about integrating biodiversity objectives into production. Institutional capacity has also been developed through increasing the staffing complement in provincial conservation agencies, forging stronger partnerships in support of shared learning, and the development of standards and guidelines that are adopted by production sectors. This has been enhanced through consultative processes such as the convening of focused discussion platforms.

Convening focused discussion platforms

Proactive and constructive engagement of stakeholders from different sectors is a crucial strategy for developing capacity, strengthening partnerships, sharing knowledge, and overcoming barriers in interventions to mainstream biodiversity. In the mining sector, deeper engagement on biodiversity and mining issues was enabled through the South African Mining and Biodiversity Forum (SAMBF). The SAMBF is a sector-based forum, under the auspices of the South African Chamber of Mines, through which focused engagement on particular issues takes place. The value of these platforms is that they have brought partners together around issues of joint interest at the interface of mining and biodiversity. Additionally, various task teams and working groups displayed demonstrable flexibility, an ability to learn and adapt strategies and actions, address barriers, and mitigate risks. This ability for adaptive management allowed the Grasslands Programme to deal with rapidly changing economic, institutional and political situations. Through the SAMBF, the mining industry has shown willingness and responsiveness to address biodiversity objectives aligned with their needs. However, government regulation must support this too. In this regard, it has been critical to have an implementing partner that has the ability to bring government departments together. The South African National Biodiversity Institute (SANBI) is this partner, with a strong history of scientific credibility and technical capacity, it is perceived as an organisation that is sufficiently independent that both government departments and private sector are comfortable interacting with it. It is predominantly through the open, collective and collaborative efforts of these cross-sectoral and cross-disciplinary groups that the Grasslands Programme remains resilient and manages shifting priorities.

Providing policy advice

SANBI also has a mandate to provide policy advice (Government of South Africa 2004). The combination of mandate, credibility, convening power and scientific capacity has enabled the provision of policy advice that is integrative and based on practice as well as theory. Practical testing of tools that are influencing policies in South Africa is accomplished through pilot projects, such as a wetland offsets project with a major mining house in wetlands of high biodiversity importance in the Mpumalanga province of South Africa. Biodiversity offsets are conservation activities that compensate for biodiversity losses in this case due to mining. The Grasslands Programme established the pilot to test methodologies for offset site selection, compensation ratios, hectare

equivalents used to determine the size and functionality of the offset, as well as options for securing offsets through conservation servitudes, and the required monitoring and evaluation systems. This allowed for the practical testing of broader concepts included in the wetland offset guidelines, which will be formally endorsed by South Africa's Department of Water Affairs and also influence the national policy on offsets (enabled by SANBI's involvement in both).

Concluding remarks: looking beyond South Africa's grasslands biome

The lessons and achievements of biodiversity mainstreaming conducted by the Grasslands Programme have wider relevance at many different scales. While the ultimate outcomes of this work in terms of improved biodiversity management and conservation will only be seen over time, a significant foundation has been set and early successes are pointing to opportunities for taking this experience to scale. Similarly, as a UNDP-GEF funded project, its experience will influence further GEF investments in biodiversity mainstreaming.

The lessons from the Grasslands Programme are already having broader application within South Africa. South Africa is richly endowed with biodiversity and other natural assets which play a significant role in supporting economic growth and poverty alleviation. The partnerships established by the Grasslands Programme can be expanded to include production sectors and government in other parts of the country. Further, these tools and lessons are being applied to shape and influence national development strategies as well as financial and fiscal mechanisms for ensuring greater investment – and returns from that investment – in natural resources. One example currently being explored is to ensure that the water price in South Africa properly reflects the importance and costs of good catchment management, and for that revenue to be invested in managing the ecosystems vital to the delivery of water. While these interventions at scale are in their early days, initial traction reflects the successes of catalytic pilot projects funded by the GEF.

Grasslands around the world have similar characteristics to those in South Africa. Temperate grasslands are often highly productive landscapes that require innovative biodiversity conservation actions as an alternative to the traditional protected areas approach. The similarity of grassland ecosystems means that some of the biodiversity science, products and tools developed for South Africa may be directly relevant to grasslands in other countries. Further, interventions of the Grasslands Programme demonstrate the contribution South Africa is making to the conservation of world temperate grasslands as committed by signing the 2008 global Hohhot Declaration in China.

Finally, the six aspects of successful biodiversity mainstreaming that the Grasslands Programme has identified are transferable to other biodiversity mainstreaming projects. The aspects can be used to direct mainstreaming efforts in other regions, for other biodiversity targets or other sectors. Biodiversity mainstreaming will be more successful if these six aspects

are followed. A competent *leadership* must help to identify and develop *high quality tools* in partnership with sector stakeholders. A *good business case* must be made for the conservation of biodiversity. Sector based *discussion groups* and training workshops help to *increase capacity* within both regulatory organisations and industry. Pilot projects test concepts that provide sound *policy advice*. Biodiversity mainstreaming will avoid ad hoc, site-specific decisions and enable more integrated planning and prioritisation.

References

- Cadman M, Petersen C, Driver A, Sekhran N, Maze K, Munzhedzi S (2010) Biodiversity for Development: South Africa's landscape approach to conserving biodiversity and promoting ecosystem resilience. (South African National Biodiversity Institute, Pretoria).
- CBD (1992) Convention of Biological Diversity. United Nations, Rio de Janeiro.
- CBD (2002) The Hague Ministerial Declaration of the Conference of Parties to the Convention on Biological Diversity. The Hague, Netherlands.
- DAFF (2012) Livestock statistics per province. Department of Agriculture, Fisheries and Forestry, Pretoria, South Africa.
- DAFF (2011) Crop boundaries data (spatial data). Department of Agriculture, Fisheries and Forestry, Pretoria, South Africa.
- DEAT (1998). RAMSAR sites of South Africa. Department of Environmental Affairs and Tourism, Pretoria
- Driver A, Sink KJ, Nel JN, Holness S, Van Niekerk L, Daniels F, Jonas Z, Majiedt PA, Harris L, Maze K (2012). National Biodiversity Assessment 2011: An assessment of South Africa's biodiversity and ecosystems. Synthesis Report. (South African National Biodiversity Institute and Department of Environmental Affairs, Pretoria).
- GEF (2010) Biodiversity Strategy for GEF 5. Published online http://www.thegef.org/gef/GEF5_Biodiversity_Strategy (accessed 30-03-2013)
- GEF (2012) GEF Thematic Evaluation: Focal Area Strategies. Unedited version of final report. October 2012.
- Government of South Africa (2004) National Environmental Management: Biodiversity Act, No. 10 of 2004, Government of South Africa, Pretoria, South Africa.
- Government of South Africa (2010) National Protected Area Expansion Strategy for South Africa 2008: Priorities for expanding the protected area network for ecological sustainability and climate change adaptation. Government of South Africa, Pretoria, South Africa.
- Department of Environmental Affairs, Department of Mineral Resources, Chamber of Mines, South African Mining and Biodiversity Forum, and South African National Biodiversity Institute. 2013. Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector. Pretoria. 100 pages.
- Henning SF, Henning GA (1989) South African Red Data Book - Butterflies. South African National Scientific Programmes Report No 158. (CSIR, Pretoria)
- Margules CR, Pressey RL (2000) Systematic conservation planning. *Nature* 405, 243-253.
- Matachi A (2006) Capacity building framework. UNESCO - International Institute for Capacity Building in Africa. United Nations Economic Commission for Africa, Ethiopia.
- Mittermeier RA, Mittermeier CG, Gil PR (1997) Megadiversity: Earths Biologically Wealthiest Nations. (Monterrey, Mexico: CEMEX)
- Nel JL, Driver A (2012) South African National Biodiversity Assessment 2011: Technical Report. Volume 2: Freshwater Component. CSIR Report Number CSIR/NRE/ ECO/IR /2012/0022/A, Council for Scientific and Industrial Research, Stellenbosch.
- O'Connor TG, Bredenkamp GJ (1997) Grassland Vegetation of Southern Africa (Eds RM Cowling, DM Richardson, SM Pierce) pp.215-257 (Cambridge University press, Cambridge, UK)
- Petersen C, Huntley B (2005) Mainstreaming Biodiversity in Production Landscapes. (Global Environmental Facility, Washington)
- SANBI (2008a) National Grasslands Biodiversity Programme, proposal prepared by the Republic of South Africa for the United Nations Development Programme and the Global Environment Facility, Proposal ID: 0045129, Project ID: 00053253, BU: ZAF10 (NGBP) PIMS 2929.
- SANBI (2008b) Mosaic landcover for South Africa. South African National Biodiversity Institute, Pretoria, South Africa.
- SANBI (2012) Ecological infrastructure: nature delivering services. South African National Biodiversity Institute Information sheet, November 2012. Available at www.grassland.org.za (accessed on 2013-02-28)
- StatisticsSA (2011) Census data per municipality, Census 2011. Statistics South Africa, Pretoria, South Africa.
- Steyn L (2008) The South African Grasslands Programme: A partnership for the future. (Eds P Hopkins) (South African National Biodiversity Institute, Pretoria, South Africa)
- TGCI (2010) Towards a conservation strategy for the worlds temperate grasslands. Temperate Grasslands Conservation Initiative, IUCN, Switzerland.
- Wilkinson M, Ginsburg A (2010) A Monitoring and Evaluation Framework for the Grasslands Programme. Grasslands Programme Report September 2010.