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Please cite this paper as:

Manuel, J. *et al.* (2016), "Key Ingredients, Challenges and Lessons from Biodiversity Mainstreaming in South Africa: People, Products, Process", *OECD Environment Working Papers*, No. 107, OECD Publishing, Paris.
http://dx.doi.org/10.1787/5jlzgj1s4h5h-en

OECD Environment Working Papers
No. 107

Key Ingredients, Challenges and Lessons from Biodiversity Mainstreaming in South Africa

PEOPLE, PRODUCTS, PROCESS

Jeff Manuel, Kristal Maze, Mandy Driver, Anthea Stephens, Emily Botts, Azisa Parker, Mahlodi Tau, John Dini, Stephen Holness, Jeanne Nel

JEL Classification: F3, Q1, Q56, Q57

Unclassified **ENV/WKP(2016)9**

Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development **29-Apr-2016**

English - Or. English

ENVIRONMENT DIRECTORATE

ENV/WKP(2016)9
Unclassified

KEY INGREDIENTS, CHALLENGES AND LESSONS FROM BIODIVERSITY MAINSTREAMING IN SOUTH AFRICA: PEOPLE, PRODUCTS, PROCESS - ENVIRONMENT WORKING PAPER No. 107

by Jeff Manuel, Kristal Maze, Mandy Driver, Anthea Stephens, Emily Botts, Azisa Parker, Mahlodi Tau, John Dini, Stephen Holness, Jeanne Nel - South African National Biodiversity Institute (SANBI)

Authorised for publication by Simon Upton, Director, Environment Directorate.

JEL Classification: Q57, Q56, Q01, F3

Keywords: ecological economics, ecosystem services, biodiversity conservation, environment and development, sustainability, sustainable development, international finance

OECD Environment Working Papers are available at www.oecd.org/env/workingpapers.htm

JT03395068

Complete document available on OLIS in its original format

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ACKNOWLEDGEMENTS

This paper was commissioned by the OECD from the South African National Biodiversity Institute (SANBI) to contribute to the joint EPOC/DAC project on Biodiversity, Development and Development Co-operation. Preliminary findings of this report were vetted at the OECD *Workshop on Biodiversity and Development - Mainstreaming and Managing for Results* in February 2015 and the paper has benefited from discussion with participants there. Comments from the OECD Secretariat, Katia Karousakis, Christina Van Winkle, Anna Drutschinin, and Jan Corfee-Morlot as well as from delegates of the Working Party on Biodiversity, Water and Ecosystems were also gratefully received and have been incorporated into the report. The paper has been written under the oversight of Katia Karousakis (ENV/CBW).

The Global Environmental Facility (GEF), and the Critical Ecosystems Partnership Fund (CEPF), provided much of the funding that made biodiversity mainstreaming possible in South Africa. Without this funding, South Africa would not have been able to develop its biodiversity mainstreaming practice to the successful level it has reached today.

ABSTRACT

This paper provides an in-depth review of experiences and insights from mainstreaming biodiversity and development in South Africa. More specifically, it describes how biodiversity considerations have been mainstreamed in five key sectors/areas, namely: land use planning, mining, water, infrastructure, and the agricultural sector. It discusses the types of barriers and challenges that have been encountered, the key ingredients and lessons learned to help ensure more effective biodiversity mainstreaming, and the role of development co-operation in supporting in mainstreaming in South Africa. Examples of the key elements of success include good science, the ability to harness windows of opportunity, and ensuring genuine links to development objectives.

JEL Codes: Q57, Q56, Q01, F3

Keywords: ecological economics, ecosystem services, biodiversity conservation, environment and development, sustainability, sustainable development, international finance

RÉSUMÉ

Ce document présente un tour d'horizon détaillé des expériences et des éclairages apportés par l'intégration transversale de la biodiversité et du développement en Afrique du Sud. Plus précisément, il décrit la façon dont les considérations de biodiversité ont été systématiquement prises en compte dans cinq secteurs ou domaines clés, à savoir : l'aménagement de l'espace, l'exploitation minière, l'eau, les infrastructures et le secteur agricole. Il examine les types d'obstacles rencontrés et de défis relevés, les principaux ingrédients et enseignements susceptibles de favoriser une transversalisation plus efficace de la biodiversité, ainsi que l'appui pouvant être apporté par la coopération pour le développement à l'intégration transversale en Afrique du Sud. Parmi les principaux facteurs de réussite cités en exemple figurent une bonne base scientifique, l'aptitude à tirer parti des occasions propices et l'instauration de liens véritables avec les objectifs de développement.

Classification JEL : Q57, Q56, Q01, F3

Mots-clés : économie écologique, services écosystémiques, conservation de la biodiversité, environnement et développement, durabilité, développement durable, finances internationales

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ACRONYMS

BCSD	Biodiversity Conservation and Sustainable Development
CAPE	Cape Action for People and the Environment
CARA	Conservation of Agricultural Resources Act
CBD	Convention on Biological Diversity
CEPF	Critical Ecosystems Partnership Fund
CoM	Chamber of Mines
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DEA&DP	Department of Environmental Affairs and Development Planning (Western Cape)
DMR	Department of Mineral Resources
DWA	Department of Water Affairs, now Department of Water and Sanitation
EIA	Environmental Impact Assessment
GCIS	Government Communication and Information System
GDP	Gross Domestic Product
GEF STAP	Global Environmental Facility Scientific and Technical Advisory Panel
GEF	Global Environmental Facility
GIS	Geographic Information Systems
ICMM	International Council on Mining and Metals
NFEPA	National Freshwater Ecosystem Priority Areas
NWRS	National Water Resource Strategy
OECD	Organisation for Economic Co-operation and Development
PES	Payment for Ecosystem Services
SAMBF	South African Mining and Biodiversity Forum
SANBI	South African National Biodiversity Institute
UEIP	uMngeni Ecological Infrastructure Partnership
WWF-SA	World Wide Fund for Nature – South Africa

1. Introduction

Biodiversity mainstreaming has emerged over the last several decades as a viable complement to traditional protected-areas-based conservation. With an ever increasing use of natural resources, biodiversity conservation must increasingly be integrated into production sectors and working landscapes to simultaneously achieve the goals of conservation, economic growth and sustainable development. The idea of biodiversity mainstreaming originates from the 1992 Convention on Biological Diversity (CBD), of which 196 countries are Parties. Article 6(b) of the Convention states that parties shall:

> *"Integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programmes and policies."*
>
> (CBD, 1992)

A series of Global Environmental Facility, Scientific and Technical Advisory Panel (GEF STAP) workshops have developed the following definition of biodiversity mainstreaming, which is used in this paper:

> *"Biodiversity mainstreaming is the process of embedding biodiversity considerations into policies, strategies and practices of key public and private actors that impact or rely on biodiversity, so that biodiversity is conserved, and sustainably used, both locally and globally."*
>
> (Huntley & Redford, 2014)

Since the emergence of democracy and the subsequent wide-ranging constitutional changes in 1994, South Africa has made progress in improving living standards, but there remain structural and social challenges that must still be overcome (OECD, 2013). Unemployment and inequality are high, with over 40% of the working age population in long-term unemployment. Life expectancy is two-thirds the OECD average (OECD, 2013). South Africa is also one of the most carbon-intensive economies in the world (OECD, 2013). However, South Africa is also one of the world's 17 megabiodiverse nations. Since 1994, South Africa has taken the lead in a number of international environmental initiatives. The country has developed a range of progressive environmental legislation and policies that establish a sound basis for biodiversity mainstreaming (OECD, 2013; Huntley, 2014). The global financial crisis prompted a reappraisal of South Africa's carbon and resource intensive growth model, with a renewed focus on expanding the Green Economy (OECD, 2013).

Management of South African biodiversity is the responsibility of the Department of Environmental Affairs, whose mandate includes "ensuring the protection of the environment and conservation of natural resources, balanced with sustainable development and the equitable distribution of the benefits derived from natural resources" (DEA, 2015). Although other national departments may have a small number of environmental staff in advisory roles, environmental issues generally fall outside of their primary mandate. At provincial scale, biodiversity planning and management devolves to provincial departments, which often share a focus with agriculture, rural development or tourism. Provincial departments conduct environmental planning and impact assessment, management of natural resources and conservation at a provincial scale. Similarly, each municipality conducts environmental management at a municipal scale, with reference to provincial biodiversity plans.

South Africa has been involved in biodiversity mainstreaming conceptualisation and practice for many years. The overall focus of biodiversity mainstreaming interventions in South Africa has been to embed biodiversity into institutional systems. Biodiversity objectives are integrated into a range of planning processes, policies, standards and regulations, but also into general awareness and even informal office culture and processes.

The primary agents responsible for implementing biodiversity mainstreaming in South Africa are government departments and institutions mandated with the protection of biodiversity, for example the Department of Environmental Affairs (DEA) and the South African National Biodiversity Institute (SANBI). SANBI is a government agency mandated by legislation to monitor, report and provide policy advice on biodiversity within the country. These main role-players receive much support from environmental non-governmental organisations (NGOs) and research institutions. This broad group, often termed the 'biodiversity sector', is responsible for many aspects of formal conservation, environmental advocacy and biodiversity planning. Other partners that are particularly important for biodiversity mainstreaming include the production sectors, development planners and regulatory government departments whose core mandates are not directly related to biodiversity conservation. The close involvement these critical partners often determines the success of a biodiversity mainstreaming initiative, as the objective of biodiversity mainstreaming is to embed biodiversity considerations directly into the planning and operations of such production sectors.

A primary biodiversity sector activity in South Africa, that has been core to the country's biodiversity mainstreaming approach, has been the development of spatially explicit biodiversity maps resulting from systematic biodiversity planning (also known as conservation planning). Through a strong community of practice in biodiversity planning, a number of biodiversity priority areas have been identified for terrestrial, freshwater and marine ecosystems at various scales. Spatial biodiversity planning is conducted at national, provincial and municipal scale, and is based on best available biodiversity science including species distributions, climate change adaptation, ecosystem services and more.

The envisaged outcomes of biodiversity mainstreaming in South Africa include (Driver et al., 2012):

1. Avoided loss/degradation: By ensuring that biodiversity is properly considered during development planning and decision-making, loss of biodiversity priority areas can be prevented. Habitat loss from necessary development can be directed away from highest value biodiversity areas and into areas of lower value where loss is less critical.

2. Protection: Establishment of formal protected areas is sometimes necessary and mainstreaming can facilitate this through the identification of biodiversity priority areas, regulatory processes or agreements with production sectors, provincial and municipal authorities, non-governmental organisations (NGOs) and private land owners. A core strategy in for biodiversity mainstreaming is the protection of priority biodiversity areas on privately owned land in production landscapes through biodiversity stewardship.

3. Restoration: By creating awareness of the ecosystem services that are generated and delivered by natural areas, government and the private sector can be encouraged to invest in the restoration of ecological infrastructure that delivers ecosystem services in priority areas.

South Africa's biodiversity mainstreaming interventions over the past 10 years have focussed mainly on organs of state, including national, provincial and municipal government. The rationale for this focus is that the regulatory framework is foundational to successful mainstreaming, and regulation is the responsibility of government. In support of this, there have been several biodiversity mainstreaming interventions that have targeted the private sector, including production sectors such as agriculture, forestry and mining, which have resulted in significant biodiversity gains. Even these private sector mainstreaming interventions require strong support from the relevant government departments to be successful.

This paper examines the evolving approach that South Africa has implemented in its biodiversity mainstreaming interventions. Through a series of case studies (on land-use planning, mining, agriculture, and water policy and infrastructure), this paper illustrates how the practice of biodiversity mainstreaming

has developed within the country. Some of the key ingredients that have proven to be effective biodiversity mainstreaming strategies countrywide are assessed. The lessons that have been learnt and barriers that remain are also discussed. The intent is to provide a broad analysis of biodiversity mainstreaming that may be valuable to others intending to implement similar interventions.

2. Case studies from South Africa

2.1 Land-use planning in the Western Cape Province

The Fynbos is a small area of Mediterranean vegetation occurring largely in the Western Cape and Eastern Cape Provinces. It boasts the very high levels of diversity and endemism that make up the Cape Floristic Region. Many of the most threatened Fynbos ecosystems are found in the Western Cape Province (Driver et al., 2011). The provincial government and municipalities are jointly responsible for land use planning in terms of the National Environmental Management Act (Act 107 of 1998), which should consider the unique and threatened biodiversity of the region. Pioneering early work on systematic conservation planning was conducted in the Western Cape as part of the Cape Peninsula Biodiversity Conservation project, a Global Environmental Facility (GEF) funded project that ran from 2001 – 2010. Lessons from this work laid the foundation for systematic conservation planning in South Africa, and highlighted the need for fine-scale plans. The Botanical Society of South Africa (a local non-governmental organisation focussed on priority plant conservation) then initiated a project known as "Putting biodiversity plans to work". The aim of this project was to support the relevant municipal and provincial government planning departments to become familiar with existing, scientific biodiversity plans.

At the same time, the South African National Biodiversity Institute (SANBI) worked with the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) to include biodiversity plans into its provincial Spatial Development Framework (initial, DEA&DP, 2005; draft currently under review, DEA&DP, 2013). A Spatial Development Framework is legally required at both provincial and municipal scale as part of integrated development planning to indicate where appropriate land-use and development is permissible. These two projects were effective in initiating discussions about integrating biodiversity plans into developmental planning. The interactions in these ***early projects helped to build relationships***, including cross-scale relationships at both municipal and provincial level that would sustain later, more substantial involvement. However, several lessons were learnt through these interactions, most importantly that the highly scientific plans developed by the academic community where often not easily integrated into municipal planning processes without considerable adaptation and 'translation' into the language used by municipal planners. This meant that once outside support from the biodiversity sector ceased, often at the end of the projects, the spatial planners reverted to the status quo without taking full advantage of the biodiversity plans that were available.

Building on the lessons from the "Putting biodiversity plans to work" project, the majority of the fine-scale plans were developed as part of the Biodiversity Conservation and Sustainable Development (BCSD) project, implemented under the Cape Action for People and the Environment (CAPE) partnership programme, which was funded from the GEF's third funding cycle (Tortell, 2010). Essentially a biodiversity mainstreaming project, the outcomes of the BCSD project included requirements to embed biodiversity objectives into land-use management in the Western Cape. It was apparent during project design that this would require biodiversity plans at a corresponding spatial scale to that of land-use planning and environmental assessment and decision-making, in other words at the site-scale. The project therefore invested resources in working with biodiversity planners and ecologists to develop the required fine-scale biodiversity plans. However, as the intended target audience for the plans was known, the ***potential users of the products could be actively involved in their development***. The associated guidelines for land-use were developed to meet the requirements of the planning department, in terms of categories used and the land use descriptions and terminology. Thus, development of the plans overlapped with their

implementation, with the municipal and provincial planners providing practical feedback and input. In this way, the plans were structured to meet the objectives and requirements of both the biodiversity sector and the target municipal planning departments and provincial environmental affairs and planning department.

A SANBI biodiversity planning expert had been seconded to the Western Cape provincial DEA&DP in 2008 to help lead the biodiversity planning revisions. This proved to be an essential role for building trust and familiarity with the people involved and the contents of the work. Through a willingness to listen and understand their priorities and processes, this relationship helped to ***determine how best to achieve the objectives of both parties***, for example, by sourcing co-financing to help fund projects suffering from budget cuts during the recession. The secondment also provided significant opportunities for input into the department's own guidelines that were currently being produced, such as the guideline on urban densification and guideline on rural development. This was a valuable bridging opportunity, which allowed the fine-scale plans that were being finalised to be tailored to integrate directly into the department's own guideline documents. This was achieved by standardising the terminology and language used between the two products. The ultimate result is that the fine-scale plans are so thoroughly embedded into the department's own guideline documents and processes that it is able to take full ownership of the plans for future use and revision. Through the CAPE Partnership, this work continues, with the provincial conservation agency (CapeNature) responsible for providing updated fine-scale plans for the Western Cape. CapeNature and the provincial Department of Environmental Affairs and Development Planning work together to maintain the capacity of municipal planners to continue to utilise these products in their decision making.

The biodiversity mainstreaming interventions under the CAPE programme primarily took the form of targeted integration of biodiversity information into specific spatial planning products. Known as 'short-hook' biodiversity mainstreaming, this approach demonstrates a close link between a targeted intervention and its direct result. Short-hook is effective for achieving on-the-ground results that have a localised spatial extent. However, after the successes of the CAPE programme, the South African biodiversity mainstreaming approach was broadened to include policy reform and the integration of biodiversity considerations along entire supply chains within the relevant production sectors. These so-called 'long-hook' approaches are designed to change the trajectory of development, and thus operate over larger areas and longer time-scales. Inclusion of the long-hook approach to biodiversity mainstreaming was a significant consideration in the development of the Grasslands Programme. The Grasslands Programme was also a GEF-funded programme, co-ordinated by SANBI, which ran from 2008 to 2014 and focussed on biodiversity mainstreaming in the Grasslands biome.

2.2 Mining and Biodiversity Guideline

The mining sector is a mainstay of the South African economy, contributing as much as 18% to the Gross Domestic Product (GDP) if related industries are included (GCIS, 2013). In 2012, the mining sector was directly responsible for 514 760 jobs and another 838 623 jobs in related industries (GCIS, 2013). In response to the international movement towards environmentally responsible mining and national legislation, the South African mining sector had begun to take measures to consider the environment in its operations. In 2005, the Chamber of Mines established the South African Mining and Biodiversity Forum (SAMBF), a discussion platform that would provide guidance and information on best environmental practice to its members. One of the SAMBF's first aims was to provide a local counterpart to the global *Good Practice Guidance for Mining and Biodiversity* (ICMM, 2010) developed by the International Council on Mining and Metals. This was supported by the Department of Environmental Affairs (DEA), whose Presidential delivery agreement (Outcome 10; DEA, 2010) called for maps of sensitive areas for mining. Therefore, through this process it was possible to ***align biodiversity mainstreaming with development objectives***. Lack of clarity on environmental planning issues was a key constraint for the mining sector, which was recognised in the sector as a business risk. The sector was therefore interested in

achieving clear, transparent, predictable outcomes from regulatory processes. This provided an opportunity to align biodiversity outcomes with an important business outcome: the reduction of risk from improved regulatory predictability. The development of guidelines for biodiversity mainstreaming in the mining industry was, therefore, a strongly user-driven project, in response to a specific sector need.

Since coal mining is a significant threat to grasslands in South Africa, the Grasslands Programme had established a dedicated coal-mining intervention. This provided a ***synergistic window of opportunity*** when the DEA and SAMBF approached SANBI to be involved in a mining and biodiversity guideline. SANBI was able to use the resources and funding for the coal-mining component of the Grassland Programme to provide input in the development of a South African focussed mining and biodiversity guideline.

The initial intention of the guideline was to focus on mitigation of biodiversity concerns during mining operations. Through the partnership, the guideline was broadened to include avoided loss of biodiversity priority areas. This was enabled by ***a strong foundation of biodiversity science in the country***, particularly from the spatial biodiversity plans that had been developed over the years. There was a wide range of biodiversity information available, such as biodiversity priority areas, (including priority rivers and wetlands), threatened species and more. All had potential relevance for the mining sector, but were not available in relevant, user-friendly and accessible format. The guideline development therefore presented an opportunity to integrate all of the available information into a single spatial product tailored to the mining sector. The envisioned map would provide not only integrated spatial information, but also standardised interpretation relevant to the mining sector.

The preparation of the *Mining and Biodiversity Guideline* (DEA, DMR, CoM, SAMBF & SANBI, 2013) required a significant amount of co-ordination between various stakeholders. SANBI was able to support this engagement, having ***established relationships with a number of relevant stakeholders*** through a history of dialogue around biodiversity issues. After an initial draft had been developed, ***sequential iterations were revised based on input*** from the private sector, government, environmental organisations and other stakeholders. This required co-ordination, negotiation and a certain amount of compromise on all sides. The final endorsement and co-publication of the guideline by the Department of Environmental Affairs, Department of Mineral Resources and the industry body, the Chamber of Mines, was a significant achievement that lends much credibility to the guideline.

The *Mining and Biodiversity Guideline* consists of a 114-page document, accompanied by a spatial map of areas sensitive to mining and the necessary spatial data. An important feature of the guideline is the focus on the mitigation hierarchy, which directs decision-makers to first avoid, then minimise, rehabilitate and finally offset biodiversity impacts from mining. The accompanying map simplifies a range of biodiversity information into four categories of decreasing sensitivity to mining: 'Legally protected', 'Highest biodiversity importance', 'High biodiversity importance' and 'Moderate biodiversity importance'. The guideline, map and spatial data are freely available online through SANBI's Biodiversity GIS website (http://bgis.sanbi.org). A large number training sessions have been held since the guideline was published, well attended by representatives of the private sector, government, academic institutions and non-governmental organisations. The training sessions aim to increase awareness of the guideline, provide a channel for dissemination and to familiarise potential users with the content and application of the guideline. Early evidence suggests that 97% of survey respondents had used the guideline to varying extents in the process of their work and that 56% believe the guideline has been useful to some extent to influence outcomes (Survey, 2014). There are tentative plans to make the use of the guideline mandatory through the National Environmental Management Act (Act 107 of 1998) by requiring it to be used in the environmental impact assessment (EIA) process. However, this would require significant additional stakeholder involvement and legislative processes, as the current version was negotiated as a guideline.

2.3 National Water Resource Strategy

South Africa is a water scarce country and its freshwater ecosystems are amongst the most threatened of the country's ecosystems (Driver et al., 2012). Water scarcity can be a significant limitation to economic development. Water use and its regulation are therefore important targets for biodiversity mainstreaming. Sectors that are experiencing either environmental regulatory issues or real environmental limits are likely to be more open to the potential outcomes of biodiversity mainstreaming. Biodiversity mainstreaming into the National Water Resource Strategy version 2 (NWRS2) (DWA, 2014) proved to be a long and convoluted process. It began in 2008, when the Department of Water Affairs (DWA, now the Department of Water and Sanitation) announced the revision of the existing NWRS. The NWRS is a strategy document mandated by the National Water Act 36 of 1998 to "provide the framework for the protection, use, development, conservation, management and control of water resources for the country". An early meeting was held to determine the possibility of providing inputs into the strategy from the National Freshwater Ecosystem Priority Areas (NFEPA) project, which was underway at the time (Nel et al., 2011). The NFEPA project was a collaborative effort between the water and environmental sectors to identify a national network of freshwater ecosystem priorities. The project therefore had direct relevance to the water resource protection component of the NWRS2. The Department of Water Affairs appointed a set of consultants to develop a first draft of the revised strategy.

The community of freshwater ecologists working within South Africa is relatively small. Key individuals based at different institutions are well known to each other and ***maintain strong connections through consistent working relationships***. The consultants appointed to develop the revised NWRS were known within this community, and were open to receiving appropriate inputs into the strategy. Consequently, contributions were made to the early drafting of the strategy in the form of maps and other information emerging from the NFEPA project. The first draft of the strategy was much delayed, but fortuitously provided time for the finalisation of the NFEPA project. The initial feedback from DWA on the freshwater ecosystem inputs into the draft strategy helped the NFEPA project respond in an adaptive manner by ***clarifying the core messaging.*** This helped to provide better guidance on how the NFEPA products could be used in specific water policy processes, by translating the information into policy tools used by sector officials in DWA.

The NWRS process was restarted when it was re-assigned to an individual within the department. This individual was dedicated to finalising the NWRS and encouraged sectoral inputs outside of the DWA. The DWA held stakeholder meetings as part of the process, which served to establish contact between the project leaders and the relevant freshwater experts. These experts were then requested to make additional contributions towards the chapters of the strategy that deal with the protection of water resources (as legislated within the National Water Act to include rivers and wetlands). This was an ***important opportunity for biodiversity mainstreaming***. An informal working group was set up, consisting of representatives from SANBI, South African National Parks (SANParks), the Council for Scientific and Industrial Research (CSIR) and WWF-SA. This core group was able to provide the necessary inputs promptly because of their existing relationships and the easily available scientific information resulting from the NFEPA project. The inputs were accepted into the draft, which was gazetted for public comment in September 2012.

After the public comments, the draft was revised multiple times, including several major revisions. Throughout these revisions, it was necessary for the informal working group to remain involved with the project, and motivate to the DWA for important inputs to be accepted, included or retained. This required patient persistence, as well as continued relationship building as staff turnover occurred during the process. Ultimately, the final National Water Resource Strategy 2 was published in June 2013 (DWA, 2013). The significant effort made by the biodiversity sector in ***continuing to remain involved throughout the long process*** was rewarded in the final version. The final version includes many of the contributions made by

the biodiversity sector, including direct references to the Freshwater Ecosystem Priority Areas, Strategic Water Source Areas (areas that supply significant water to downstream economies), ecological infrastructure and ecosystem rehabilitation. These provide an excellent opportunity for embedding a focus on freshwater ecosystems in the development of the NWRS Implementation Plan, underway in 2015.

2.4 uMngeni Ecological Infrastructure Partnership

The uMngeni Ecological Infrastructure Partnership (UEIP) is a partnership between government, civil society organisations, academia and the private sector to foster better collaboration and coordination of ecological infrastructure investments aimed at improving water security in the greater uMngeni catchment. The UEIP resulted from a long and unplanned progression of other projects. It finds its origins in the concept of Payment for Ecosystem Services (PES). PES had proven to be an effective mechanism to raise finance for ecosystem restoration in other developing countries (e.g. Costa Rica; Gómez-Baggethun et al., 2010), and through its biodiversity mainstreaming projects, SANBI set up a number of pilot projects to test its effectiveness in South Africa. These PES projects focussed most often on water resources, as these have the most direct link between ecosystem health and ecosystem services. However, the pilot projects encountered a number of difficulties including buyers unwilling to enter into complex agreements to pay for services, regulatory issues, complicated supply chains and poor communication. Ultimately, the potential buyers of services were unwilling to enter into long-term payment contracts with an uncertain return on investment. In parallel, SANBI embarked on a series of dialogues aimed at improving the communication of the essential PES messages. The concept of 'ecological infrastructure' was developed. Ecological infrastructure "refers to naturally functioning ecosystems that deliver valuable services to people, such as fresh water, climate regulation, soil formation and disaster risk reduction" (SANBI, 2013). This concept resonated with the country's current intention of encouraging sustainable economic development through large infrastructure projects. It also helped to encourage the public sector to invest in ecological infrastructure, as it does with many forms of social and economic infrastructure.

The eThekwini metropolitan municipality, including the city of Durban, is one of the most populous in South Africa, home to 3.5 million people. The uMngeni River catchment is the primary water supply for urban and industrial use in the metropolitan area. However, with increased water requirements, the municipality is predicting extreme shortages over the next few years. In addition to which, large amounts of money are spent on chemicals to clean the highly polluted water. In response to this water crisis, the municipality began investigating possible solutions, although it soon became apparent that engineering solutions alone, including the construction of additional dams and trans-catchment transfer schemes, would not be sufficient to solve the problem. The ***biodiversity sector was ready to provide a possible solution*** to the municipality to supplement engineering solutions: the emerging concept of ecological infrastructure. After much engagement and discussion, the Head of Water and Sanitation in the eThekwini Municipality, an engineer by training, became a significant champion for the concept, and embraced the possibilities of ecosystem restoration as an additional tool to improve water quantity and quality for the municipality.

Restoring the uMngeni catchment would require a landscape scale approach, with the inclusion of a number of relevant partner organisations across the catchment. Hence, the uMngeni Ecological Infrastructure Partnership was initiated at an event held in Durban in 2013. Nineteen partner organisations committed to the vision of the UEIP by signing a Memorandum of Understanding. These partners include municipalities, government departments, environmental organisations, production sector associations and water boards. Although the partnership is still new, several rehabilitation projects are already planned for highly degraded areas of the catchment. The UEIP will also coordinate existing projects in the catchment that are already being run by the various partners. In addition, the partnership has secured funding through South Africa's Green Fund for research that is exploring and developing potential public and private funding mechanisms for investing in ecological infrastructure in the catchment. A WWF-SA led aspect of the project will investigate private sources of funding, including certification schemes and funding through

the insurance sector. The University of KwaZulu-Natal will explore public funding sources, such as budget re-alignment, water pricing, biodiversity offsets and natural resource management programmes. News of the project has spread internationally, with the Secretary-General of the Ramsar Convention on Wetlands labelling it a highly innovative approach at the World Parks Congress in November 2014.

The UEIP is an important ***landscape-scale demonstration project***. It is an essential proof of concept for 'ecological infrastructure' as a way of communicating the necessity of ecosystem management and restoration. It is hoped that the large scale of the pilot project, the partnerships developed and the high level of support received thus far will help to embed the principles of ecological infrastructure within those institutions responsible for water security. This will provide evidence for the approach, which if successful, could then be expanded to other catchments within South Africa, and could influence broader policies related to water management, water pricing, land use management and regulation.

2.5 Mainstreaming into the agricultural sector

The South African agriculture sector includes both rangelands and cultivated lands. Due to aridity, only approximately 12% of the country's land area is suitable for planted crops, which include primarily maize, wheat, sugar cane and sunflowers (GCIS, 2014). However, much of the remaining land area is used as grazing land for cattle and sheep. There is a dual agricultural economy consisting of large commercial farms and a rural, subsistence sector. The commercial agro-industry contributes approximately 12% of the country's GDP (GCIS, 2014). The agricultural sector is an important target for biodiversity mainstreaming because of its large spatial footprint and significant impacts on ecosystems and species, both freshwater and terrestrial. Consequently, a number of programmes over the years have attempted to mainstream biodiversity into the agriculture sector, with varying degrees of success.

The CAPE partnership programme (2001 – 2010) helped to implement a number of biodiversity mainstreaming initiatives focussed on the agriculture sector in the Western Cape Province. These initiatives were conducted in partnership with the provincial conservation agency (CapeNature) and several environmental non-governmental organisations, including WWF-SA, Conservation South Africa, Flower Valley Conservation Trust and the Botanical Society of South Africa, with funding from the Critical Ecosystem Partnership Fund (CEPF) and the GEF. The projects aimed to encourage best agricultural practice for wine, potatoes, rooibos and indigenous flowers. Although initial uptake was encouraging, follow-up assessments have shown that best practice management is not necessarily maintained. ***Without a strong regulatory framework***, landowner interventions are subject to high rates of dropout as a result of market forces. Farmers are unlikely to maintain best practice when it means they are losing profits to neighbours who do not even meet basic legal or regulatory requirements.

The Grasslands Programme, also included a dedicated agriculture component. The agriculture component chose to focus on the red meat sector, where it was thought that biodiversity mainstreaming could have the most significant impact, partly because appropriately managed rangelands can be compatible with conservation of Grassland ecosystems, which evolved with grazing as part of the system. The interventions of the agriculture component were two-fold. First, plans were made to influence policy changes at a national level by contributing to revision of a key piece of legislation, the Conservation of Agricultural Resources Act (CARA). Although changes to law and policy can be powerful biodiversity mainstreaming tools, policy revisions are often not under the control of biodiversity mainstreaming projects. Biodiversity mainstreaming interventions can only influence policy reviews when they happen. Despite ongoing engagement with the Department of Agriculture, Forestry and Fisheries (DAFF), the legislative review period extended beyond the project's timeframe. However, the interactions helped to ***create good foundational relationships*** that allow for ongoing contributions to policy processes, thus enabling SANBI to make inputs when the CARA revisions do occur. Secondly, the agriculture component set up a number of pilot projects within the Grassland biome, aiming to encourage uptake of biodiversity

good practice amongst red meat farmers. While intentions to create a biodiversity-friendly red meat label were hampered by a limited market for such products and a complicated value chain, broader aspects of biodiversity good practice have been successfully implemented. Subsequent projects, such as the Meat Naturally Initiative implemented by CSA, have learnt important lessons from these pilot projects. These initiatives are showing promising financial returns for biodiversity-friendly grazing practices.

Within both the CAPE and Grassland Programmes, biodiversity stewardship was a biodiversity mainstreaming intervention with proven success in the agriculture sector. Biodiversity stewardship is an approach to enter into agreements with private and communal landowners to protect and manage land in biodiversity priority areas, led by conservation authorities in South Africa (SANBI, 2014). In particular, the Protected Environment biodiversity agreement type is valuable in agricultural landscapes. Protected Environments can be declared across multiple properties and can allow for some forms of production on the land, as long as this is integrated into an approved management plan (SANBI, 2014). Several fiscal incentives are available for landowners to enter into biodiversity stewardship agreements, such as property tax exclusion and income tax deductions. Other incentives include technical advice and support on biodiversity management. Biodiversity good practice management has been implemented at a number of biodiversity stewardship pilot sites across the country. These pilot projects worked best where they were able to capitalise on strong existing landowner communities. A further motive for participation was the imminent risk posed to the agricultural sector, as well as important ecosystem services such as water production, from land uses such as mining, which are not optimal in such landscapes when taking a broader view of water and food security. Such land-uses would be prohibited under a biodiversity stewardship agreement. These pilot projects have in turn sparked other similar biodiversity stewardship projects in other comparable farming communities.

Throughout SANBI's interactions with the agriculture sector, a number of important lessons have been learnt about biodiversity mainstreaming (SANBI, 2014). These lessons would apply to all sectors, but are particularly acute within the agriculture sector in South Africa. Perhaps most significant is the realisation that the agriculture sector is broad and complex, and that interventions should be strategically planned to align with existing initiatives. Complexity arises from multiple factors at different spatial and institutional scales. The sector has a broad scope, including many types of crop agriculture, horticulture and various forms of livestock farming. Each of these has very different functions, operations and regulations. The differences in management between commercial and communal farming add further complexity. ***An in-depth understanding of the sector is necessary*** to focus on those interventions that are likely to be most effective. Liaising more closely with sector associations and DAFF to better understand and meet acknowledged needs would be a good starting point. Another important lesson is not to separate interventions between private sector and regulators. Biodiversity mainstreaming that targets only farmers will have limitations when regulatory drivers are not considered simultaneously. Acknowledging and building on these lessons, plans are underway for a new biodiversity mainstreaming project that will focus exclusively on the agriculture sector.

3. Barriers and challenges

Through the interventions implemented in these case study projects and others, a number of common barriers and challenges to biodiversity mainstreaming have been identified. Many biodiversity mainstreaming initiatives have had to tackle these barriers (explained below), delaying progress towards effective biodiversity mainstreaming. Addressing these barriers, or simply accepting them as a practical reality, will help to ensure that further biodiversity mainstreaming projects are able to achieve their full potential.

3.1 Project design

Biodiversity mainstreaming in South Africa often relies on funding from large donors, which have certain requirements for project design. However, biodiversity mainstreaming presents a challenge to traditional project design models. The process of biodiversity mainstreaming is inherently adaptive and emergent, and therefore unpredictable. This is not compatible with the rigid project design that is often required by large funding agencies. Project designs such as the commonly applied logical framework approach, which require distinct outputs, activities and measurable indicators, are not well suited to the idiosyncratic and often erratic nature of biodiversity mainstreaming. Thus, projects applying for funding for biodiversity mainstreaming have to limit their activities to those that can be adequately captured within a traditional project design. A significant amount of time and effort is often taken in adapting biodiversity mainstreaming projects to correspond with these project design protocols. Developing a strong relationship with large funders, and maintaining a proven record of high quality delivery, can improve the options for flexibility in project design. However, biodiversity mainstreaming has often proven most successful when taking full advantage of unexpected opportunities. There is often little scope for significant revisions to project design during the course of the project under traditional project design models. If initial project designs are less-flexible, then the mid-term project reviews become very important for changing the direction of large, multi-year projects. What is required is an acknowledgement and accommodation for the unpredictable outcomes that sometimes emerge from biodiversity mainstreaming. In addition, indicators need to be developed that can effectively track the institutional and behavioural changes that are the focus of biodiversity mainstreaming. Possible indicators may include poverty alleviation, changes to legislation, government staffing, consumer awareness, private sector partnerships, training or commodity market indicators (Huntley & Redford, 2014).

3.2 Time

The length of time required for successful biodiversity mainstreaming is often underestimated. Biodiversity mainstreaming needs to be founded on established relationships and institutional partnerships, which take time to mature. Even after relationships are established, an inordinate amount of time is often still required to develop the necessary common language and integrated cross-sector conceptualisation. Therefore, biodiversity mainstreaming can easily require 10 years of effort, well beyond the span of a single project, budget or political cycle of an institution. The continuity required within organisations to sustain long projects is often limited, with changes in staff, budget and strategies often occurring at shorter frequencies during the course of a biodiversity mainstreaming project. Successful biodiversity mainstreaming in South Africa has thus often occurred through layering interventions from a series of sequential donor funded projects. Later projects have been able to capitalise on established relationships developed during earlier projects. However, this form of layered interventions can be difficult to plan and implement. Large funders are often reluctant to fund projects in the same areas with similar objectives to previously funded projects. For this reason, biodiversity mainstreaming initiatives often have to be completed within short funding cycles, with little chance of extension or further funding, despite the lengthy nature of biodiversity mainstreaming.

3.3 Skills

The skill set required to lead biodiversity mainstreaming projects is rare, given that it usually requires technical and institutional knowledge of multiple sectors, as well as effective leadership and interpersonal skills. In many cases, the success of biodiversity mainstreaming projects can be significantly attributed to a particular champion or leader. What is often required is an individual who can bridge the divide between the biodiversity sector and relevant production sector or government department through sound experience and strong relationships. It often proves difficult to find and appoint such an individual through traditional staff recruitment methods. Once in the position, it often falls to the project leader to establish, build and

maintain the vital partnerships that are essential for biodiversity mainstreaming. This requires tact, persistence and a level of trust to be established, as the project leader is often in a position to mediate between various partners. The scarcity of the required skill set is often a limitation to biodiversity mainstreaming.

3.4 Measurement

It is often very difficult to measure the success or impact of biodiversity mainstreaming interventions. Baylis *et al*. (2015) identified a number of difficulties in evaluating the impact of conservation policy interventions, including issues of multiple scale, spatial correlation, confounding variables and randomisation limits. It can also be challenging to determine counterfactual conditions, i.e. to determine how the situation would have been different if the biodiversity mainstreaming interventions had not been implemented. This is a challenge to traditional project reporting, especially if the aim of the biodiversity mainstreaming is avoided loss. In addition, the results of biodiversity mainstreaming are often subtle, diverse and sometimes intangible. Unlike other conservation initiatives, which can often be simply measured in terms of hectares secured, there are fewer appropriate indicators for biodiversity mainstreaming. Biodiversity mainstreaming often aims to change the attitudes or internal processes of government or production sector organisations and officials. Since such changes are often internalised slowly, there may be a time lag between biodiversity mainstreaming interventions and the consequent results. Outcomes can also be in different form to what was anticipated, as it is difficult to predict upfront the possible emerging products, policies or regulations. Thus, there remains a need for innovative monitoring and evaluation mechanisms to measure the impact of biodiversity mainstreaming. This will require a clearly identified 'theory of change' and integrating hypotheses that can be tested into project design (Huntley & Redford, 2014; Baylis et al., 2015). Such monitoring and evaluation would allow biodiversity mainstreaming to become a learning process, through which knowledge gained is used to improve future initiatives (Huntley & Redford, 2014).

4. Key ingredients and lessons

As well as identifying some of the barriers towards biodiversity mainstreaming, implementation of mainstreaming projects and initiatives in South Africa has also revealed a number of lessons and key ingredients for effectiveness. These factors are often present in successful biodiversity mainstreaming initiatives and should be considered as fundamental requirements before initiating a biodiversity mainstreaming project.

4.1 Good science

In every case, effective biodiversity mainstreaming is based on credible biodiversity science. It would be impossible to achieve buy-in from sceptical production sectors or regulatory departments without a sound scientific basis. When dealing with those outside of the biodiversity sector, reliable evidence and proven science is essential to establishing trust and credibility. In South Africa, this science very often takes the form of spatial biodiversity priority areas represented on maps. South Africa has a long history of biodiversity science and a strong existing community of practice for science-based biodiversity planning. Biodiversity maps can be a valuable way to initiate dialogue around biodiversity mainstreaming, providing a tangible view of biodiversity objectives and how these could be mainstreamed in a spatially explicit manner. Good biodiversity science needs to be transparent and defensible to meet the burden of evidence demanded during such discussions. When a biodiversity mainstreaming intervention is planned, or an opportunity arises, there is often existing scientific information available, which can be utilised or adapted as required. Such biodiversity information is available in the form of spatial maps, guidelines and databases, many of which are freely available through online platforms such as the SANBI Biodiversity

GIS website (http://bgis.sanbi.org). Pilot projects can often play an essential role, delivering on-the-ground experience and proof of application within the intended institutional context.

4.2 Development objectives

Biodiversity mainstreaming initiatives work best if there are genuine links to development objectives in the country concerned. Development objectives provide the policy context in which biodiversity mainstreaming occurs. By aligning with the national development agenda, and capitalising on current government priorities, biodiversity mainstreaming projects can receive the required level of interest and attention to become well integrated into the policy environment. In South Africa, this is illustrated by the attention received by the concept of ecological infrastructure, in line with the focus on built infrastructure in the country. Similarly, the buy-in received for biodiversity mainstreaming in the mining sector, an important component of South Africa's GDP, was achieved through attention to the needs of the sector. It was also evident that biodiversity mainstreaming was better accepted when aligned with presidential delivery outcomes and national development plans. As has been seen in the above case studies, biodiversity mainstreaming has often occurred through alignment with national planning processes. Through intentional alignment of biodiversity mainstreaming with development objectives, the importance of biodiversity is formally recognised in the National Development Plan, National Water Resource Strategy, the presidential Strategic Infrastructure Projects, the National Strategy for Sustainable Development, the Mining and Biodiversity Guideline and in numerous municipal Integrated Development Plans (RSA, 2014).

4.3 Communication

In part, aligning with development objectives is about better communication. It was realised that while the mainstreaming tools and products were definitely having an effect at a technocratic level, for a wider acceptance there needed to be a change of 'hearts and minds' to reposition biodiversity as an integral component of society and the economy. In 2011, SANBI embarked on the development of a communications strategy, called *Making the Case for Biodiversity*, out of a realisation that the communications efforts associated with biodiversity mainstreaming could be more effective (SANBI, 2011). Despite the efforts towards biodiversity mainstreaming, the primary perception was still one of biodiversity in conflict with economic development. Through testing with targeted audiences, the strategy found that the most positively received messages in the South African context related to economic values (biodiversity as a national asset), emotional values (biodiversity as our children's legacy) and practical values (practical solutions) (SANBI, 2011). The main finding of *Making the Case for Biodiversity* strategy was that the current messaging was based too strongly in the traditional biodiversity sector language of 'fear of loss'. Whilst this might portray the factual realities of the state and trends of biodiversity, it bred apathy in the target audiences, and therefore did not engender a need to address biodiversity loss. Based on the lessons from South Africa at least, messaging should instead focus on delivering a value proposition for biodiversity, although not necessarily a monetary value. The improved messaging has already shown better acceptance amongst target audiences, gaining political and policy traction quickly, deepening engagements with production sectors and improving visibility in the mainstream media (Maze et al., under review).

4.4 Working relationships

Much of the business of biodiversity mainstreaming is founded on strong interpersonal relationships, coupled with ongoing working relationships. Thus, building robust networks of partners is fundamental to effective biodiversity mainstreaming. Establishing trust takes time and a consistent approach, but is worth the investment. This means that short-term consultants cannot effectively implement biodiversity mainstreaming through once-off projects. Often, a clearly defined point of contact is valuable, as people

trust individuals before they trust institutions. Also necessary is a deep understanding of the institutional and operational context, in order to know what interventions are likely to be effective in any particular situation. Making use of existing governance structures can be valuable. Relationships can be improved through respectful, genuine listening, which helps to build awareness of institutional structures and understanding of the terminology and language of the target institution. Once relationships are established, they can be maintained by regular contact and in-situ support for the use of biodiversity mainstreaming products. Whichever biodiversity mainstreaming interventions are attempted, nothing can replace the in-depth engagement necessary to support their uptake and continued success.

4.5 Windows of opportunity

Opportunities for biodiversity mainstreaming can occur unexpectedly. These can include policy revisions, problems that require innovative solutions, world events, funding opportunities and newly emergent production sector needs, amongst others. Making full use of windows of opportunity can be a particularly effective strategy for biodiversity mainstreaming. However, fully capitalising on such opportunities requires significant levels of flexibility, as well as an astute ability to recognise such potential opportunities as they arise. A close relationship with the target institution can also help to identify opportunities early, as they are first conceptualised within the target organisation. Becoming involved as early as possible makes it easier to introduce biodiversity mainstreaming objectives into opportune processes. This has implications for project design and adaptive management. Best use is made of opportunities when there are already strong relationships in place and a thorough understanding of the institutional environment. The need for strong internal institutional capacity again indicates why short-term, outsourced projects can be ineffective. Thus, there is also significant foundational work that is necessary before full advantage can be taken of unexpected opportunities.

5. Discussion

Biodiversity mainstreaming can be very complex and is always context specific. Nevertheless, in South Africa it has been shown that certain barriers and key ingredients of success are often common across many biodiversity mainstreaming interventions. Ultimately, biodiversity mainstreaming can be distilled into three fundamental aspects: people, products and processes. These three aspects are covered in more detail in the publication *Biodiversity for Development* (Cadman et al., 2010).

People, including their skills, relationships and time spent interacting are a primary factor in biodiversity mainstreaming. Biodiversity mainstreaming initiatives can stand or fall based on the quality of the leadership and the relationships built among partners. The scarcity of skills for effective biodiversity mainstreaming leadership remains a barrier to such initiatives. In many South African cases, partnerships are the foundation for successful biodiversity mainstreaming, in which organisations from different sectors come together to solve issues of mutual interest. Thus, investing time and resources in developing people and partnerships should be a significant part of the practice of biodiversity mainstreaming. Targeted capacity building could address many of the barriers and challenges to biodiversity mainstreaming that have been identified. Addressing issues of capacity building and providing the necessary technical support assistance would assist further development and co-operation.

Products are often the most practical, tangible tools of biodiversity mainstreaming. Products usually include guidelines, maps or databases that assist with integrating biodiversity into regulatory or production processes. In particular, maps of spatial biodiversity priority areas, with associated interpretive material, have proven to be very effective tools. It is generally through products that the primary objective of integrating biodiversity conservation into economic sectors is actually achieved. Products help to make the priorities of the biodiversity sector explicit. Products are often the best mechanism through which to introduce sound scientific information, and they often provide a focus for constructive debate over the

principals involved. Those products arising from the target sector's own activities can also be a valuable way to integrate biodiversity information into operational processes. Products also form one of the few measurable aspects of biodiversity mainstreaming, including records of dissemination, uptake and endorsement.

Finally, biodiversity mainstreaming is an ongoing ***process***, not a single event. In many ways, biodiversity mainstreaming is an iterative and adaptive process that continues to evolve along with other aspects of society. Adaptive co-learning is an important part of the process, and acknowledging such will improve chances of successful biodiversity mainstreaming. The process of biodiversity mainstreaming is assisted by flexible project design, which allows full advantage to be taken of unexpected windows of opportunity. Aligning with current development objectives can significantly expedite the process of biodiversity mainstreaming. Not only is biodiversity mainstreaming a process in its own right, but it should always attempt to align and integrate with sector based processes. Fully integrating biodiversity objectives into the actual operating procedures of organisations mitigates loss of key staff or champions. Subsequent policy revisions will then have protocols for retaining biodiversity objectives, once direct support from the biodiversity sector has ceased. However, effective biodiversity mainstreaming is time consuming and it should be recognised that the process usually needs to be sustained over a number of years.

Biodiversity mainstreaming will always be a complex process, but if these three aspects are in place, biodiversity mainstreaming is in a position to fulfil its primary objective of integrating the conservation, management and sustainable use of biodiversity into all relevant sectors.

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