The integration of biodiversity in local land-use planning: Gert Sibande District Municipality, South Africa.

by

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PREFACE

The research contained in this dissertation was completed by the candidate while based in the Discipline of Environmental Science, School of Agricultural, Earth and Environmental Sciences of the College of Agriculture, Engineering and Science, University of KwaZulu-Natal, Pietermaritzburg Campus, South Africa. The research was (partly) financially supported by NRF.

The contents of this work have not been submitted in any form to another university and, except where the work of others is acknowledged in the text, the results reported are due to investigations by the candidate.

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ABSTRACT

Twenty-five years after the Convention on Biological Diversity (CBD), much emphasis has been placed on the integration of biodiversity priorities and concerns into the development sectors. South Africa has made substantial progress in this regard. The understanding of threats to biodiversity, ecosystem services, sustainable development, and the link between ecosystem services and human well-being, in high levels of government, were fundamental factors in mainstreaming biodiversity in South Africa. The change in government and democratisation in 1994 has also facilitated the positive outcomes for integrating biodiversity into development. It has become a mandate for local government to address the socio-economic development needs of communities. Within the local land-use planning arena, the Integrated Development Plan (IDP) has been used as a comprehensive tool for guiding local development objectives. However, the promulgation of the Spatial Planning and Land Use Management Act (Act 16 of 2013) has elevated the status of the Spatial Development Framework (SDF) to guide other municipal plans. It has been suggested that integrating biodiversity priorities and conservation plans into comprehensive planning tools, such as the SDF, yields greater opportunity for biodiversity conservation to be prioritised in development planning and implementation. In contrast, the consideration of biodiversity priorities and conservation plans by local land-use planners during reactive post-hoc decision-making processes yields the least potential for biodiversity conservation. The main objective of this study was to assess the ability of local government to incorporate the principles of biodiversity conservation plans into their SDFs, and the implementation of these plans during their daily land use planning processes. I assess both suggestions in chapter 2 and chapter 3 of this thesis respectively.

In chapter 2, I assess the review schedules, and the text making up the SDFs, and the integration of conservation plans into the Gert Sibande local municipalities SDFs, using geographic information systems (GIS) techniques. Biodiversity priorities were considered in the SDFs, and biodiversity conservation maps were integrated in the SDF. However, much of this integration can be credited to the outsourced service providers (consultants) who assist municipalities to develop the SDFs, as opposed to the land-use planners within government themselves. In chapter 3, I conducted interviews with the local municipality land-use planners, in order to gain insight into the extent to which they consider biodiversity priorities, and their use of conservation plans, during daily implementation/compliance processes. The

consideration of biodiversity priorities, and the use of biodiversity conservation products, was largely inadequate during daily compliance processes. Another key finding was that there were still human capacity and financial constraints at the local level that prevented the proper and effective functioning of municipal government. Increased competency, and awareness about the importance of integrating biodiversity into local land-use planning, must be raised at local government, especially amongst local land-use planners.

The findings of this study have implications for local level biodiversity conservation. A better understanding of the barriers to mainstreaming biodiversity into land-use planning is required by both land-use planners and conservation planners. Resolving these barriers could prevent biodiversity loss and improve biodiversity mainstreaming. At a broader scale, the insufficient use of conservation planning products in local government can have a major impact on efforts to achieve sustainable development goals, and the CBD objectives.

Keywords: Biodiversity, Conservation plans, land-use planning, spatial development frameworks.

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CHAPTER 1: INTRODUCTION

1.1 Rationale for the research (nature and scope)

The fate of biodiversity will almost certainly be determined over the next few years by the activities of a single species – *Homo sapiens* (Ehrlich & Pringle, 2008). Land-use has been, and still is, a formidable agent of change worldwide (Theobald et al., 2000). As communities grow, their borders expand (Cohn & Lerner, 2003), resulting in the conversion of natural habitats to urban, suburban, and exurban land-uses. Such expansion has led to biodiversity loss, and degradation and fragmentation of the habitats that animals and plants need for survival, and have affected fundamental ecological processes (Theobald et al., 2000; Groves, 2003; Wessels et al., 2003; Stokes et al., 2009).

The United States population became more aware of environmental issues between the 1960's and the early 1970's (Dalal-Clayton & Bass, 2009). As a result, higher education institutions increased their focus on environmental sciences (Cairns & Crawford, 1991), and many international governments ratified and participated in numerous environmental conventions at a global scale and passed laws locally (Dalal-Clayton & Bass, 2009). For example, 150 countries signed a global Convention on Biological Diversity (CBD) in June 1992 at the United Nations Conference on the Environment and Development in Rio de Janeiro. The main objectives of this treaty were "the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising from genetic use of resources" (United Nations Convention on Biological Diversity (UNCBD), 1992; Groves, 2003). One of the many requirements of the CBD is for governments to "Develop national biodiversity plans and strategies and integrate these plans into broader environmental and development plans" (UNCBD, 1992; Groves, 2003). Different approaches to manage and conserve biodiversity have been used to fulfil this requirement.

The Millennium Ecosystem Assessment (MEA) was initiated in 2001 as a response to the desired outcomes of the CBD and other international conventions (Ahmed, 2002). The MEA was directed by a multi-stakeholder board consisting of more than 1360 representatives from international institutions, governments, native people, non-government organisations (NGO),

and businesses (Carpenter et al., 2006; Norgaard, 2008). The aim of the MEA was to assess the consequences associated with ecosystem change for human welfare, and to establish actions, with a firm foundation in science, which will be needed to improve the conservation and sustainable use of ecosystems, and their contributions to human welfare (MEA, 2005).

In 2012, governments around the world agreed to establish the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). The IPBES is the leading independent intergovernmental body with the goal of "strengthening the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development" (http://www.ipbes.net). The IPBES builds on the basis of the MEA conceptual framework and influence (Carpenter et al., 2009) by catalysing the generation of new knowledge, producing assessments of the state of biodiversity and ecosystems, supporting policy creation and implementation, and building capacities relevant to achieving its goal (Diaz et al., 2015). This is to ensure that decisions concerning conservation and the sustainable use of biodiversity and ecosystem services are made based on the best available scientific information (http://www.iucn.org/).

In 2015, leaders from 193 countries worldwide, came together to discuss the future. This meeting resulted in the formulation of 17 Sustainable Development Goals (SDG). The SDG are set to address the global challenges such as poverty, inequality, climate, environmental degradation, prosperity, and peace and justice by the year 2030 (United Nations Development Programme (UNDP), 2015). Biodiversity loss is addressed in goal 15 - Life and Land, which seeks to "protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss". Although biodiversity loss is addressed in goal 15, it is also indirectly addressed in most of the other goals, which shows that these goals are interrelated (https://www.un.org/sustainabledevelopment/sustainable-development-goals/).

Natural resource managers, conservation practitioners, and scientists, internationally reacted and sought approaches to implement the requirements of the conventions and laws to combat biodiversity loss (Miller et al., 2008). These approaches included: (1) integrating biodiversity

into sectoral policies and programmes such as environmental impact assessments (EIA) (Wynberg, 2002; Mortberg et al., 2007); (2) integration of biodiversity spatially in physical planning, such as in land-use planning (Beatley, 2000; Groves, 2003); and (3) developing protected areas (Butchard et al., 2010), amongst others. Conserving biodiversity in protected areas is important, but is insufficient for safeguarding biodiversity resources for the present and future generations, globally (Miller & Hobbs, 2002; Butchard et al., 2010). Unfortunately, protected areas fail to protect all components of biodiversity in many biologically diverse parts of the world, including South Africa (Rouget et al., 2003). This is because, historically, the establishment of protected areas was impromptu, was done on land marginal for agriculture or other uses, and failed to include a representative sample of all ecosystems (Margules & Pressey, 2000). This human practice, to set aside areas of the natural environment, has been viewed as being reactive rather than strategic (Groves et al, 2002).

The ad hoc methods of protected area establishment were replaced by scientific methods that are defensible and quantitative, known as systematic conservation assessments (hereafter conservation assessments) (Margules & Sarkar, 2007). Conservation assessments are spatial techniques that evaluate and identify suitable natural areas for protection, against activities that could potentially degrade or destroy them (Knight et al., 2008). Conservation assessments serve to provide information to decision makers on where to place conservation initiatives, but do not direct how these initiatives should be implemented (Scott & Csuti, 1997). Hence, conservation assessments have been formalized as key components and operational models of conservation planning (Knight et al., 2006; Sarkar & Illoidi-Rangel, 2010).

Biodiversity mainstreaming[1] is another key process that has been identified to address biodiversity loss (Karlsson-Vinkhuyzen et al., 2014). The CBD's Strategic Plan for Biodiversity 2011-2020 and its Aichi biodiversity targets adopted in 2010, has reinforced the

[1] "Mainstreaming involves taking the specific objective of one issue domain (here biodiversity) and seeking to integrate this into other issue domains (agriculture, forestry, etc.) where it is not sufficiently addressed according to some normative standard" (Karlsson-Vinkhuyzen et al., 2014:11). Biodiversity mainstreaming can be achieved in local, national, global and multilevel contexts within the sectors that impact in biodiversity.

importance of biodiversity mainstreaming (Whitehorn et al., 2019). The Cancun Declaration (CBD, 2016) adopted during the 13th Conference of Parties (COP) meeting in 2016, and the Sharm El-Sheikh Declaration (CBD, 2018) adopted in the 14th COP meeting in 2018, further emphasize the importance of biodiversity mainstreaming. Biodiversity mainstreaming has been found to be very effective when it occurs across the different spheres of government, when relevant stakeholders from different sectors are included in the process, when there is financial support, and when mainstreaming strategies are developed in line with nature protection policies (Chandra & Idrisova, 2011; Hutley, 2014; Karlsson-Vinkhuyzen et al., 2017).

The entry points for biodiversity mainstreaming are at a) national level through policies and plans such as National biodiversity strategies and action plans, Green growth strategies, national budgets; b) sector level through sector development plans, strategies and policies, sector investment programmes; c) project level during the prefeasibility, operational, and decommissioning project cycles; and d) local level were local government and community action manage, conserve and sustainably use biodiversity and ecosystem services (Organisation for Economic Co-operation and Development (OECD), 2018).

In recent years, land-use planning is increasingly recognized as another strategic vehicle to conserve biodiversity (Theobald et al., 2000). The integration of ecological information with development planning efforts, can result in the support of conservation efforts during the development process, reduced loss of open space, and an increased quality of life (Michalak & Lerner, 2007). This is mainly influenced by the fact that many environmental management tools, including strategic planning, can be represented spatially, and can, therefore, relate strongly to the land use management and planning system (Schoeman et al., 2017).

Numerous authors have called for increased coordination between land-use planners and ecologists, and, therefore, for greater incorporation of principles of ecology and conservation biology in local land-use planning (e.g., Dale et al, 2000; Theobald et al., 2000; Michalak & Lerner, 2007; Stokes et al., 2009). As a result, ecologists, biodiversity planners, and other environmental professionals, have produced and proposed a variety of guidelines and tools for

land-use planners, aimed at protecting habitat, and minimizing negative impacts of development on biodiversity (Dale et al., 2000; Pierce et al., 2005; Miller et al., 2008).

The responsibility of planning and regulation of land use in many countries is with the lowest possible level of government, i.e. municipalities (Theobald et al., 2000; Dale et al., 2000; Pierce et al., 2005; Miller et al., 2008). The local government, and, in particular, the local land-use planners, have been identified as being the potential and critical role-players for conserving biodiversity (Crist et al., 2000; Diaz et al., 2006; Wilhelm-Rechmann & Cowling, 2013). This is despite the fact that these decision makers are usually confined to the political boundaries of their respective municipal jurisdictions (Dale et al., 2000; Groves, 2003).

South Africa, covers an area of approximately 1.22 million km^2. It is a megadiverse country, full of an exceptionally rich and varied array of life forms, and ranks in the top 10 of the most biologically diverse countries in the world (Mittemeier & Goettsch Mittermeier, 1997; Wessel et al., 2003; Berliner et al., 2007). It contains three of the world's 34 biodiversity hotspots; the Cape Floristic Region, consisting mainly of the fynbos in the south-western Cape; the succulent Karoo of the Western and Northern Cape; and the Maputaland – Pondoland – Albany, composed mainly of forest and thicket along the eastern seaboard (Mittemeier et al., 2005). South Africa is comprised of an astonishing variety of biomes, namely, forest, thicket, savanna, grassland, nama karoo, succulent karoo and fynbos (Mucina & Rutherford, 2006). High species diversity and endemism exist within these biomes (Egoh et al., 2009; Murphy et al., 2016).

The vast biodiversity of South Africa is under threat, which emanates from the direct exploitation of biological resources, and, also, from indirect pressures such as pollution, habitat destruction, foreign plant and animal invasions, and climate change, among others (DEAT, 1997; Wessels et al., 2003; Czech, 2008). These threats all intertwine to create synergies that intensify and compound the impact on biodiversity loss, which leads to further degradation and loss (DEAT, 1997). Some of these threats are natural, but most are as a result of human activities (Ehrlich & Wilson, 1991).

One particular piece of legislation being implemented to manage environmental and sustainability issues is the National Environmental Management Act (No. 107 of 1998), which, amongst other things, provides for the inclusion of sustainable development into planning and development processes (Sowman & Brown, 2006). NEMA aims to fulfil this aim by focusing on these three main areas: pollution control and waste management, environmental authorizations, and natural and cultural resources use and conservation (NEMA (No. 107 of 1998)). At national and provincial spheres of government NEM:BA provides for the implementation of the National Spatial Biodiversity Assessment (NSBA)[2] 2004, the National Biodiversity Strategy and Action Plan (NBSAP)[3] 2005, the National Protected Area Expansion Strategy (NPEAS)[4] 2008, and the National Biodiversity Framework (NBF)[5] 2008.

It is also important to note that the Environmental Impact Assessment (EIA) Regulations (No. 38282 of 2014 as amended in 2017 and corrected in 2018), which play a major role in regulating development applications, were promulgated under NEMA in South Africa (Walmsley & Patel, 2011). Other strategic environmental management instruments that are

[2] The NSBA "is part of South Africa's obligations as a signatory to the Convention on Biological Diversity (CBD). It will provide an overarching framework for the conservation and sustainable use of South Africa's biodiversity, and equitable sharing of benefits from use of genetic resources" (Driver et al., 2005:1).

[3] The NBSAP "sets out a framework and a plan of action for the conservation and sustainable use of South Africa's biological diversity and the equitable sharing of benefits derived from this use" (DEAT, 2005:6).

[4] "The goal of South Africa's National Protected Areas Expansion Strategy (NPAES) is to achieve cost effective expansion of the protected area estate for improved ecosystem representation, ecological sustainability, and resilience to climate change. It sets national protected area targets, maps priority areas for protected area expansion, and makes recommendations on mechanisms for achieving the targets, under both the National Environmental Management: Protected Areas Act (Act 57 of 2003)" (DEA, 2018:6).

[5] The NBF "is a short to medium-term coordination tool that shows the alignment between the strategic objectives and outcomes identified in the National Biodiversity Strategy and Action Plan (NBSAP v.2, 2015) and other key national strategies, frameworks and systems that currently guide the work of the biodiversity sector, and identifies mechanisms through which this work is coordinated. It also identifies a set of interventions or "acceleration measures" that can unlock or fast-track implementation of the NBSAP, and indicates the relative roles of the many agencies involved in implementing these activities" (DEA, 2018:3).

prepared in terms of this law include the Environmental Management Frameworks (EMFs)[6] and the Strategic Environmental Assessments[7] (SEAs). In addition, conservation planning (also known as biodiversity planning) is provided for in the NEM: Biodiversity Act (No. 10 of 2004).

EMFs were developed in 1989 parallel to the development and implementation of the EIA system (Marais et al., 2014). EMFs are uniquely South African and are created to provide a spatial understanding of environmental sensitivity through map compilations, to provide strategic input into the EIA process, and also to inform the Spatial Development Frameworks (SDF) (Marais et al., 2014; Schoeman et al., 2017).

The uptake of SEA since 1990 in South Africa was driven by the need for more strategic environmental considerations beyond the EIA system (Retief et al., 2007; Kidd & Retief, 2009). SEAs are very important in developing countries because the economies are heavily dependent on agriculture, tourism, and mining activities, and many biodiversity hotspots and pristine environments are found in developing countries (World Conservation Monitoring Centre, 2002). This implies that the protection of biodiversity, ecosystem services and sound environmental management are vital for livelihoods and wellbeing of these countries (Retief et al., 2008). In South Africa, SEA is not only understood as an assessment tool, but has been aligned with the planning system as a planning tool (DEAT, 2000; Schoeman et al., 2017).

[6] "EMF means "a study of the biophysical and socio-cultural systems of a geographically defined area to reveal where specific land uses may best be practiced and to offer performance standards for maintaining appropriate use of such land" (Schoeman et al., 2017:167).

[7] The EIA systems served as a platform for SEA in the context of developed countries (Retief et al., 2008). The uptake of SEA has been better in developed countries compared to developing countries. Due to the fact that a SEA can be developed in different contexts, they have continued to be diversified on an international scale since the mid to the late 1990s. The diversity has made it impossible for SEA to have an internationally accepted common definition although there are international principles that have been suggested for a common approach to guide the development of SEA (Brown & Therivel, 2000).

Conservation planning was initiated in 1983 (Pressey, 2002), and, over time, has become increasingly productive and influential (Adams et al., 2018). Conservation planning can be defined as "the structured process of identifying priorities and developing a strategy for implementing a suite of actions designed to meet conservation goals in the context of stakeholder participation" (Sewall et al., 2011:689). There are many peer-reviewed publications on this subject (Moilanen et al., 2009; Álvarez-Romero et al., 2018), and it has been applied to regional conservation planning by government and non-government agencies worldwide (Groves & Game, 2016). From the onset, conservation planning was done separately from the implementation phase (Ban et al., 2013). This caused a gap between the assessment phase and the implementation phase, making the implementation of conservation plans difficult (Knight et al., 2006). Researchers adopted knowledge co-production[8] mechanisms to provide a critical platform for transition, from research (assessments) to implementation, in order to yield tangible conservation gains (Knight et al., 2006; Sewall et al., 2011, Nel et al., 2015b). The development of the implementation strategies to assist with the transition is usually done in collaboration with other stakeholders, (e.g. land-use planners) (Knight et al., 2006).

Conservation planning has advanced greatly over the last two decades in South Africa (Cowling et al., 1999; Sinclair et al., 2018). From a decision making perspective, conservation planning has provided useful tools that can be integrated into land-use planning strategic tools for proactive consideration of biodiversity, which could ultimately result in mainstreaming of biodiversity in environmental decision-making (de Villiers, 2003).

Biodiversity loss can be abated through sound environmental management and municipal planning (Claassen, 2009). Environmental management and municipal planning have a mutual objective (Kihato, 2012), to control land-use and activities in a responsible manner. Municipal planning is concerned with land-use and the planning and management thereof, i.e. the ‘what’

[8] Knowledge co-production is defined as “the collaborative process of bringing a plurality of knowledge sources and types together to address a defined problem and build an integrated or systems-oriented understanding of that problem” (Armitage et al., 2011:996).

and 'where' of development (Nel et al., 2015a), while environmental management is focused on the impact that the proposed activity will have on the environment and the regulations that govern these activities (Retief & Cilliers, 2015a).

The environmental management (EM) and municipal planning (MP) disciplines worked independent from each other for many years (Todes et al., 2005), and synchronising the two disciplines on a strategic level has been challenging (Cilliers et al., 2014). For this to be possible, an interface needs to be established between the legislative frameworks and strategic planning tools that exist within the environmental management and municipal planning disciplines across all spheres of government (van Wyk, 2012; Cilliers et al., 2014; Retief & Cilliers, 2015a).

Municipal planning in South Africa consists of both strategic planning instruments which are also known as forward and master planning (e.g. Integrated development plans (IDPs)[9] and SDFs[10], as well as land-use control mechanisms (e.g. zoning, municipal schemes and consent uses) (Kidd, 2011; Retief & Cilliers, 2015a). The forward planning tools lay out the vision for the community and provide the goals, objectives and limitations of planning, and also the future land use maps (Dale et al., 2000; Sowman & Brown, 2006; Michalak & Lerner, 2007). The land-use control mechanisms serve as project-level instruments that regulate land-use rights and set development controls (Retief & Cilliers, 2015b).

On a strategic level EM has tools such as EMFs, conservation plans, and SEAs that can be adopted to inform MP. While MP has IDPs and municipal SDFs that can perform a local environmental governance role (Nel et al., 2015a). The spatially based instruments allow for

[9] IDPs are required in terms of Chapter 5 of the Municipal Systems Act of 2000 and according to the Spatial Planning and Land Use Management Act (Act 16 of 2013). They link, integrate and coordinate various sector plans taking into account the development proposals within the municipality, forms the basis on which annual budgets are set (Sowman & Brown, 2006; Forbes, 2013).

[10] The SDF is also known as Spatial Plan, Development Plan, Master Plan, Comprehensive Plan, or Urban Development Framework in other countries. It is a spatial depiction of the IDP and is the principal strategic planning instrument which guides and informs all planning and development (du Plessis, 2010).

the strategic alignment of MP and EM and for the integration of environmental concerns/priorities within MP for environmental management and local environmental governance purposes (Nel et al., 2015a). The alignment and integration of the two disciplines at this strategic level has been identified to allow for the greatest potential for biodiversity conservation (Cowling et al., 2003; Pierce & Mader, 2006; Michalak & Lerner, 2007; Daniels, 2009; Knight et al., 2011; Wilhelm-Rechmann & Cowling, 2013). These strategic EM and MP tools also provide the foundation for the implementation of regulations, incentives, policies, and zoning schemes (Figure 1.1) (Michalak & Lerner, 2007).

On a project level, EM has tools such as biodiversity offsets[11] and the day to day compliance authorisation application review[12] process (Environmental Authorization) (Theobald et al., 2000; Cowling et al., 2003; Michalak & Lerner, 2007). MP has tools such as the title deed endorsements, zoning, municipal schemes, and consent uses that can be used to integrate environmental considerations. The authorisation application review process ensures that developments adhere to the goals and objectives of the long term plans, and that they comply with the existing regulations at all scales of government (Forbes, 2011). At a local level it is the planning commissions, zoning officials, and elected officials, who review the development proposals to ensure compliance (Kihato, 2012; Forbes, 2011). This stage has the least potential to influence biodiversity conservation, because it is difficult to alter development plans at this late stage of the development process, and intervention at this stage could exacerbate conflicts between developers and planners (Pierce et al., 2005; Michalak & Lerner, 2007).

The above-mentioned two points of intervention are synonymous with the two types of land-use planning that typically occur at a local level - master planning (conservation planning) and

[11] Biodiversity offsets are applied as the last option in the context of the mitigation hierarchy and are used as a mechanism to remedy the negative impacts of project development on biodiversity (Brownlie et al., 2017).

[12] Compliance authorization application review refers to EIA applications under review by the DARDLEA / DEA for authorization. From a local government perspective, such EIA applications are reviewed by the local municipality in their capacity as a 'commenting authority' to ensure alignment with the development priorities and environmental attributes in their area of jurisdiction.

site review (implementation compliance) (Theobald et al., 2000). Although all the places of integration are important to some degree, EM tools will have more influence, and produce the desired impact on development patterns, if they are integrated at the initial planning stages i.e. strategic level (Michalak & Lerner, 2007). This means that environmental managers should also be involved in the long term planning stage, so that the conservation priorities are identified, relevant data are shared with planners, and, ultimately, ensure that development is not sited on sensitive areas (Press et al.,1996; Knight et al., 2003; Pierce et al., 2005; Stokes et al., 2009).

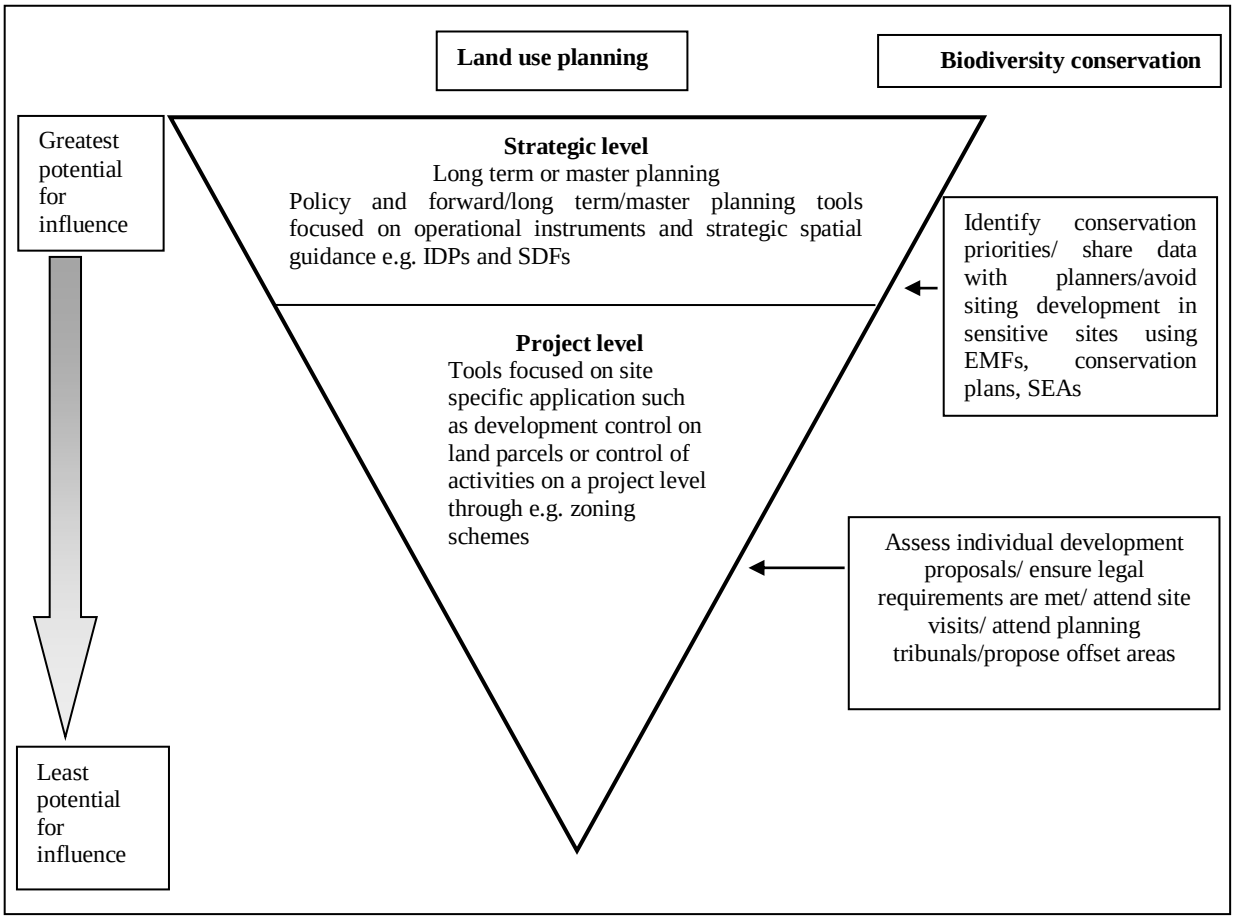

Figure 1. 1: Points within the South African land-use planning context were biodiversity/conservation planning could be integrated

Source: Michalak & Lerner, 2007 (Modified)).

1.2 Justification/Research questions

There is a perception around the world that science can bring forth positive impacts and solve many current global issues such as climate change and biodiversity loss (Bertuol-Garcia, 2018). However, despite many scientific knowledge and solutions available, applying such solutions practically to solve global issues and support decision-making is difficult (Bertuol-Garcia, 2018). This disconnection between science and practice is known as the science-practice, research-implementation, research-practice, assessment-implementation or knowing-doing gap across many fields (Bero et al., 1998; Anderson, 2007; Knight et al., 2008; Knight et al., 2011; Adams et al., 2018).

In Ecology and Conservation, it has been found that majority of the research questions are not relevant and valuable to meet the information requirements of decision-makers (Linklater, 2003; Esler et al., 2010; Anderson, 2014), hence the evidence within these disciples is seldom used to inform decision-making (Sutherland & Pulling, 2004; Cook et al., 2012). In order to address this, many ecologists and conservation scientists have called for conservation practices that are evidence-based or evidence-informed (Sutherland & Pulling, 2004), while others have recommended for knowledge co-production between scientists and decision-makers (Shackleton et al., 2009; Nel et al., 2015b).

Over the years, there has been substantial progress in bridging the gap between conservation and land-use planning (Pressey, 1999; Theobald et al., 2000; Pierce et al., 2005). To date, much of the research with regards to research-implementation focuses on the perceptions of academics/ researchers, and not those of decision-makers (Gossa et al., 2014). Knowledge of how decision-makers at local government level perceive, or use, conservation planning products, is negligible (Miller et al., 2008; Stokes et al., 2009; Wilhelm-Rechmann & Cowling, 2013). Research has shown that out of all the conservation plans that were published between 1998 and 2000, only one third of these were implemented on a global scale (Knight et al., 2006). This is known as the "research-implementation" gap (Knight et al., 2008) or the "assessment-implementation" gap (Knight et al., 2011; Adams et al., 2018). "The lack of evaluations focused on measuring implementation success in conservation planning mean the

precise nature or size of the assessment-implementation gap remains unknown" (Adams et al., 2018:5).

In South Africa, the outcomes of conservation planning products are required to be integrated into SDFs, and this relies on the alignment and integration of the tools to avoid duplication and conflict (Retief & Cilliers, 2015b). This research study sought to investigate the integration of the conservation plan and other environmental issues into the strategic level and project level tools. Previous research studies done by others focused on assessing the integration of conservation plans into the IDP, using planning and development legislation that existed prior to SPLUMA (Ruwanza & Shackleton, 2016). Here, I shift the focus from IDPs to SDFs, since the new SPLUMA legislation aims to formalise SDFs throughout all the spheres government. The SDF is the principal strategic planning instrument which guides and informs all planning and development, and all decisions with regard to planning, management, and development, in the municipality.

The principles of SPLUMA also advocate that environmentally sustainable land-use practices should underpin all development at the local level, and that a strategic environmental assessment has to be conducted and finalized prior to land-use planning taking place. The effective implementation of conservation plans, depends on local government (Pierce et al., 2005), and it is not clear whether plans are effectively translated into practice, and, therefore, not realizing their full potential. Hence, a case study example is needed to assess this, and any barriers or opportunities for shared learning. On a broader scale this study will enhance the understanding of the factors that facilitate or hinder the transition from assessment to implementation in conservation planning.

Key research questions:

1. Are the long-term planning tools (SDF's) based on accurate, relevant, and best available biodiversity data? (Chapter 2)
2. Are biodiversity concerns being integrated with the other spatial priorities expressed in the SDF's? (Chapter 2)
3. Are the conservation planning products (i.e., MBSP) being used to influence the reactive decision-making process? (Chapter 3)

4. Will SPLUMA assist in integrating biodiversity priorities into the decision making process? (Chapter 2 & 4)
5. How can these insights be used to support conservation planning? (Chapter 4)

1.3 Aims

The aim of the study was to use conservation and land-use planning in South Africa as a case study to understand the complexity and challenges to mainstreaming biodiversity, and to assess whether systematic conservation planning translates into best practice implementation by local land-use planning government officials.

1.4 Objectives

1. Investigate the relevant environmental and land-use planning legislative and policy frameworks that guide biodiversity mainstreaming into land-use planning in South Africa.
2. Review Gert Sibande local municipalities SDFs in order to determine the integration of biodiversity priorities into municipal SDFs.
3. Assess whether systematic conservation planning translates into best practice implementation by local land-use planning government officials.

The information obtained during this study is presented in four chapters (Figure 1.3). The first chapter provides the rationale and context for the study (this chapter). The second chapter deals with the integration of biodiversity into local land-use planning in GSDM. The legislative and policy frameworks that facilitate biodiversity mainstreaming into land-use planning are reviewed and discussed. Thereafter, the municipal SDFs are reviewed and GIS analyses are used to determine the integration of biodiversity priorities into the SDFs. The third chapter deals the use and effectiveness of systematic conservation plans in reactive decision-making in land-use planning. Data from semi-structured interviews are analysed in order to determine whether systematic conservation planning translates into best practice implementation by government officials in non-environmental land-use roles. The last chapter presents the general conclusions of the study.

1.5 Study area

Mpumalanga Province, meaning "place of the rising sun" (State of Environment Report (SOER), 2003), is characterised by diverse and spectacular scenic beauty and rich biodiversity, which provides valuable products for the tourism and wildlife industry, with potential to generate considerable economic revenue from nature reserves, game farms, and hunting lodges. Mpumalanga has a rich array of species and ecosystems, wetlands, and several important river systems (MTPA, 2014).

Mpumalanga incorporates elements of three different biomes of South Africa; namely, grassland, savanna, and forest. From the three, the grassland biome occupies 64% of the surface area, and occurs in the central highveld and escarpment regions of the province. The grassland biome also occurs on deep fertile soils of high agricultural value; it has been largely modified by mining activities, the cultivation of crops and timber, or by intensive animal production. These activities caused a lot of fragmentation and degradation, and have resulted in the grassland biome being regarded as threatened or at risk (Driver et al., 2005; Mucina & Rutherford, 2006; MTPA, 2014). These grasslands provide habitat for endemic and endangered animal and plant species, and are critically important water-production landscapes, playing a vital role providing the natural resources and ecological infrastructure[13] for human wellbeing (Cadman et al., 2010). The diversity of grassland habitats, with the high diversity of endemic or threatened fauna and flora along the escarpment, make them a remarkable, significant and irreplaceable biodiversity asset, not just of Mpumalanga or South Africa, but globally (Cadman et al., 2010; MTPA, 2014). Significantly, the Mpumalanga Province is strategically situated between Gauteng Province – the economic hub of South Africa – and the two bordering countries of Mozambique and Swaziland (see Figure 1.2) (GSDM, 2014).

[13] "Ecological infrastructure refers to naturally functioning ecosystems that deliver valuable services to people, such as water and climate regulation, soil formation and disaster risk reduction. It is the nature-based equivalent of built or hard infrastructure, and can be just as important for providing services and underpinning socio-economic development" (https://www.sanbi.org/biodiversity/science-into-policy-action/mainstreaming-biodiversity/ecological-infrastructure/).

Mpumalanga province is divided into three district municipalities, namely Ehlanzeni, Nkangala, and Gert Sibande District Municipality (GSDM) (formerly known as Eastvaal District Municipality). At 318456 km², and covering approximately 41% of the total Mpumalanga Province land area, GSDM is the largest of the three district municipalities. Its population increased from 900 007 in 2001 to 1 043 194 in 2011, yielding a percentage change of 15.9% (http://www.statssa.gov.za/). The GSDM is bordered on the south by KwaZulu-Natal and the Free State, on the east by Swaziland, and on the west by Gauteng. It is comprised of seven local municipalities (see Figure 1.2), namely Chief Albert Luthuli, Dipaleseng, Govan Mbeki, Lekwa, Mkhondo, Msukaligwa, and Dr Pixley ka Isaka Seme. This district is characterized by vast farming areas, with hubs of economic activity such as mining and power stations (GSDM, 2014).

GSDM contains significant biodiversity assets that are at risk of being compromised by unsustainable land-use patterns and practices that are not well informed (GSDM, 2015). The District is dominated by grassland (96%), which hosts many rare and threatened species of regional, national and international importance (MTPA, 2015). The district consists of 25 vegetation types from the grassland, forest, and savanna biomes, with 18 of the 25 found nowhere else within Mpumalanga (Mucina & Rutherford, 2006; MTPA, 2014). Thirteen vegetation types are listed as threatened, and only two are currently well protected (GSDM, 2018). There is an extensive network of wetland areas, of which the Chrissiesmeer pans, comprising of 279 water bodies, is a part of the district (MTPA, 2015). The Chrissiesmeer pans are wetlands of international importance and there is an intent to have them declared as a Ramsar site, and they also fall within the Chrissiesmeer Protected Environment (https://www.wwf.org.za/?uNewsID=7781; MTPA, 2014). The high diversity of ecosystems within this district emphasises the need for sound biodiversity management and conservation, and, therefore, the importance of having a biodiversity conservation plan which is integrated into the district and local municipality IDPs and SDFs, to facilitate sound land-use decision-making (MTPA, 2015).

A similar study to protect the Subtropical Thicket biome from development impacts was done in the Eastern Cape. This study was known as the Subtropocal Thicket Ecosystem Planning (STEP) project and it commenced in July 2000 (Knight et al., 2011). The STEP was aimed at

improving the conservation status of the subtropical biome. A systematic conservation plan was produced together with a handbook and these products were mainstreamed into land-use decision making processes within local government (Wilhelm-Rechmann & Cowling, 2013). A description of how the training materials were developed, and the training efforts implemented to mainstream the use of the conservation plan in land-use planning processes, was done by Pierce et al. (2005). The successes, failures and lessons learnt from this project are also detailed by Knight et al. (2011). Given that the findings from STEP are not limited to specific locations but assumed to be applicable to all other municipalities in South Africa and beyond, Gert Sibande was the chosen municipality to assess this.

Gert Sibande was the first district municipality that the MTPA worked with in order to have the first bioregional plan of the province gazetted. In addition to the GSDM characteristics mentioned above, this study was largely exploratory and the greater number of local municipalities within GSDM increased the number of planners interviewed, the number of SDFs reviewed, the methodological rigor of the study, and more reliable results.

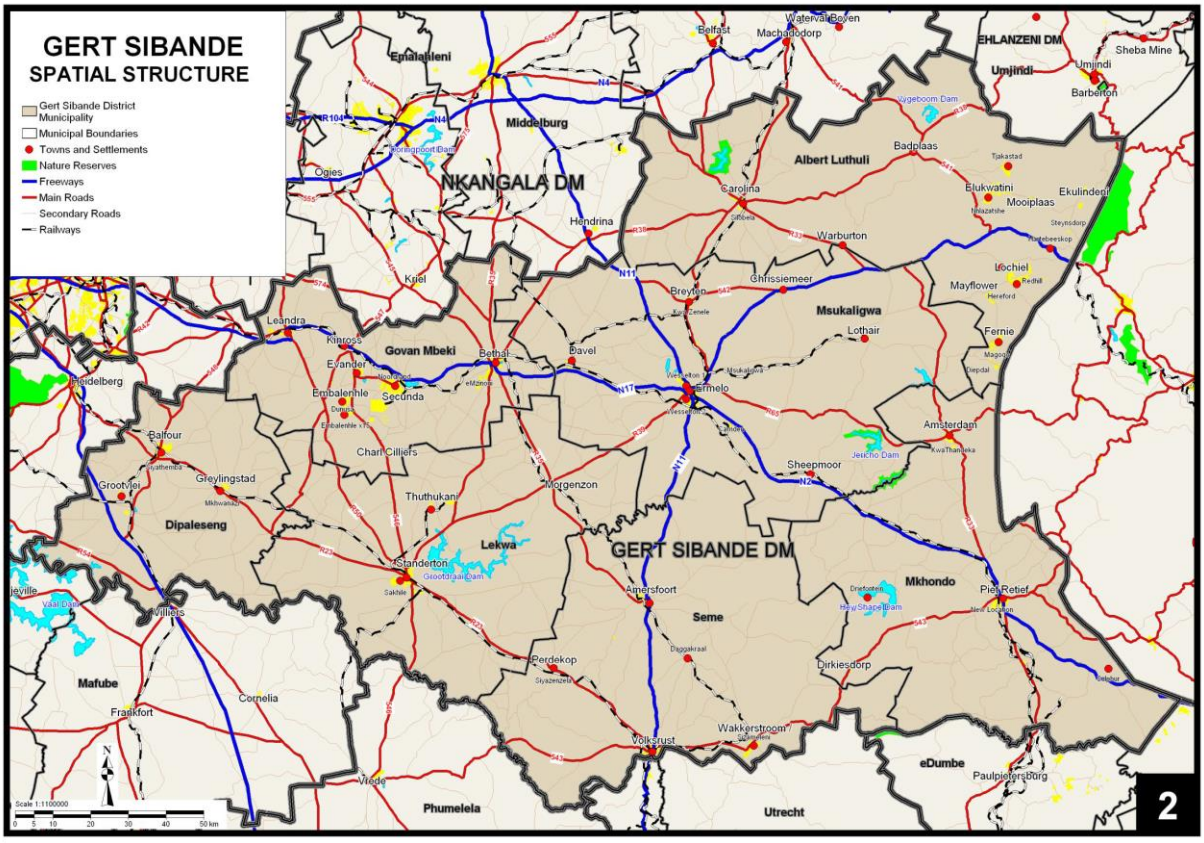

Figure 1. 2: Location map for GSDM and its local municipalities

Source: GSDM (2014).

1.6 Overall research methodology

A literature investigation formed the theoretical and conceptual basis of this research. The main areas focused on in the literature review included: theoretical issues underpinning the relationship between environmental management and planning in South Africa, biodiversity mainstreaming, into municipal planning processes, and the research implementation gap.

The legislative and policy framework on environmental management and land-use planning, the challenges and complexities of these frameworks, the roles and responsibilities of different spheres of government, and the ability of these frameworks to facilitate biodiversity mainstreaming into municipal planning are discussed.

SDF documents from the seven local municipalities of Gert Sibande were reviewed in order to determine if they were based on accurate, relevant, and best available data. Questions adopted from a similar study done by CapeNature were used to investigate the mentioned parameters.

Geographical Information System (GIS) analytical tools in ArcGISPro were used to investigate the integration of the MBSP into municipal SDFs.

Semi-structured interviews were conducted with municipal officials to obtain insight into their understanding, use, and effectiveness of the conservation plans by land-use planners within Gert Sibande District Municipality (GSDM), and its local municipalities. The guiding questions were informed by the literature review.

1.7 Outline of dissertation/thesis structure

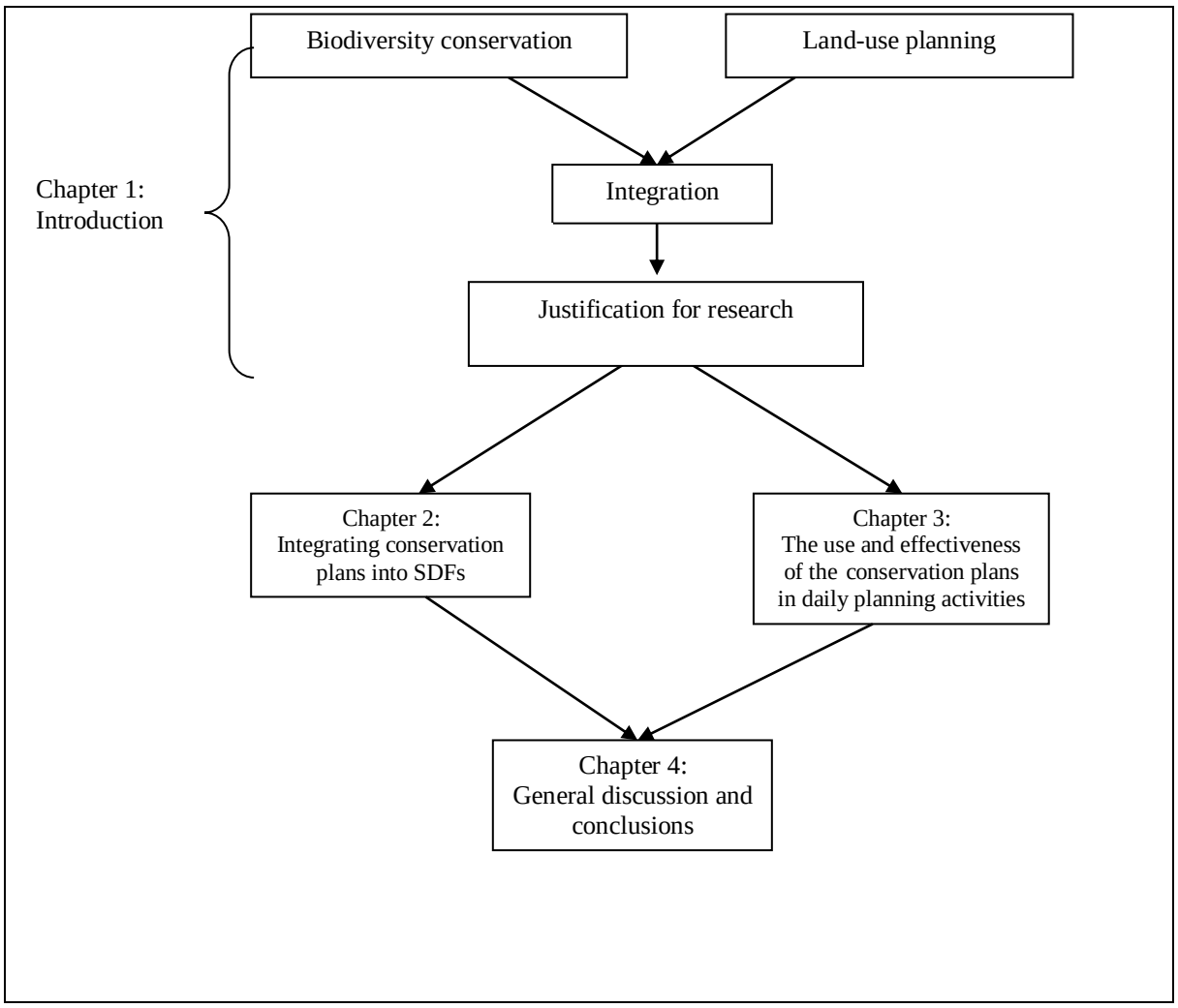

Figure 1. 3: Schematic representation of the thesis framework and chapter outline.

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CHAPTER 2: THE INTEGRATION OF BIODIVERSITY INTO LOCAL LAND-USE PLANNING IN GERT SIBANDE DISTRICT MUNICIPALITY, SOUTH AFRICA (PAPER 1)

2.1 Abstract

Environmental issues are cross-cutting, and they cannot be adequately addressed across different sectors through policies and plans of a single environmental department, hence mainstreaming for broader take-up is key. The land-use planning sector offers a great opportunity for mainstreaming and implementing biodiversity conservation plans within local government planning tools. Here, we establish the extent to which the local municipalities within the Gert Sibande District Municipality, South Africa, integrated the principles of biodiversity and conservation plans into statutory Spatial Development Frameworks (SDFs). Reviewing of SDFs by most municipalities was behind schedule due to resource constraints. However, for municipalities that had reviewed and updated their SDFs, biodiversity priorities and the conservation maps, were being sufficiently integrated into the SDF, and were carried through to the final SDFs. We found that the legal framework regulating the integration of conservation plans into proactive planning tools enabled the integration, despite the institutional limitations that exist. The availability of credible, easily accessible biodiversity data and conservation plans was also an added benefit to the integration process. The presence of dedicated staff to support the integration within the appropriate proactive planning tool was also of great importance. These results indicate that there is an improvement with regards to bridging the assessment-implementation gap in South Africa at the planning phase.

Keywords: biodiversity, mainstreaming, local government, land use planning, spatial development frameworks

2.2 Introduction

Conserving biodiversity involves a wide network of actors (Pasquini & Shearing, 2014), but local government has been identified as a crucial role player in both the conservation of, or destruction of, biodiversity worldwide (Crist et al., 2000). The idea that local government could play a significant role in conserving biodiversity was inconceivable in the minds of biologists, policy makers, and the general public (Press et al., 1996). This was because most decisions concerning biodiversity were taken at a national scale (Press et al., 1996). The realization that habitat conservation is ultimately a local land-use matter, that requires local support, has since changed that thought process (Stokes et al., 2009). Local government has an important role to play in development planning, and in managing biodiversity (Diaz et al., 2006). This is because local governments are rightly positioned between local communities and governance, to apply and incorporate the products of biodiversity conservation planning into spatial planning, and to assist with the regulation and management of biodiversity (Press et al., 1996; Schoeman, 2015).

Historically, local planning did not address biodiversity conservation systematically, and conservation groups and agencies did not always use land-use planning processes effectively for biodiversity protection because the two disciplines worked independent of each other (Cohn & Lerner, 2003; Kihato, 2012). As a result of their independent mandates, the two disciplines competed with each other (Todes et al., 2005). Machalak & Lerner (2007) compared land-use planning and conservation planning, and came to the conclusion that they were, in fact, complementary processes. Taking into consideration that land-uses are not static, and will evolve over time (Wessels et al., 2003), both processes make use of spatial data to identify priority areas for various actions/land-uses, and project into the future to make decisions that affect the character of the landscape (Machalak & Lerner, 2007).

Land-use planners in local government can assist with biodiversity conservation by integrating biodiversity priorities and environmental management tools into their land-use planning tools (Theobald et al., 2000). The importance of integrating biodiversity

conservation or environmental issues into various regional and local government plans has been well documented (Theobald et al., 2000; Dalal-Clayton & Bass, 2009; Pasquini et al., 2013; Ruwanza & Shackleton, 2015). The integration of biodiversity priorities into other sectors is also known as biodiversity mainstreaming, a process defined as "embedding biodiversity considerations into policies, strategies and practices of key public and private actors that impact or rely on biodiversity, so that it is conserved, and sustainably used, both locally and globally" (Huntley, 2014:1) This definition highlights that environmental mainstreaming is a deliberate process, that it can be achieved through different routes or outputs (e.g. policies, legislation, strategies), and that it should occur across different government levels (Nunan et al., 2012).

The term "mainstreaming", is commonly used in the United Nations, inter-government institutions, and associated treaty and implementation bodies related to conservation (Redford et al., 2015). Mainstreaming is included in article 6(b) of the CBD, which requires the treaty signatories to "integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programs, and policies" (CBD, 2003). Article 10(a) of the CBD also requires signatories to "integrate consideration of the conservation and sustainable use of biological resources into national decision-making" (CBD, 2003).

Chapter 8 of Agenda 21, named 'Integrating environment and development in decision-making', advocates for the sustainable integration of environmental and development policies at community level (Tuts, 1998). Mainstreaming conservation into other sectors is not only crucial for biodiversity conservation, but it is widely accepted that it is also critical for sustainable development (Geerlings & Stead, 2003; Nunan et al., 2012). One of the requirements of sustainable development is that policy-making for land-use and environment has to be undertaken in a holistic manner, rather than in silos across different departments and spheres of government (Feris, 2010). Policy co-ordination and integration is essential to ensure that packages of complementary policies are implemented at all spheres of government (Geerlings & Stead, 2003).

Mainstreaming conservation into other sectors has been done successfully in Europe, Australia, and North America (Lafferty & Hovden, 2003). This success can be attributed to progressive and new legislation, improved and detailed land-use planning, and the benefits of mainstreaming visible on the ground (Huntley, 2014). However, lack of political change, good governance and strong institutions, has hindered the progress of mainstreaming in many parts of Africa, with the exception of South Africa (Cowling et al., 2002; Petersen & Huntley, 2005).

In South Africa, the initial stages of mainstreaming are characterised by projects such as the Working for Water project initiated in 1995 (Hobbs, 2004). Then it evolved to systematic planning initiatives, also known as conservation planning. Through conservation planning, terrestrial, freshwater and marine ecosystems biodiversity priority areas have been identified and spatially mapped, from national to municipal levels (Manuel et al., 2016). The Cape Peninsula Biodiversity Conservation project (2001 - 2010), funded by the Global Environmental Facility (GEF), and the collaborative work between the South African National Biodiversity Institute (SANBI) and the Western Cape Department of Environmental Affairs and Development Planning (DEA & DP) to include biodiversity plans into its provincial Spatial Development Framework (SDF) (Knight et al., 2006), marked the beginning of mainstreaming biodiversity into decision-making processes in land-use planning and implementation (Pierce, 2003).

The increasing mainstreaming of biodiversity into development in South Africa is as a result of four factors: good scientific information and understanding; institutional capacity and commitment; strategic cross-sectoral and public-private partnerships; and a willingness by the scientific and conservation community to seize opportunities and demonstrate that policies that promote biodiversity conservation can provide socioeconomic opportunities for the poor (Pierce et al., 2002).

The two most varied and intricate areas of public law in South Africa are the environmental and the local government laws (du Plessis, 2009). Section 24 of the Constitution of the Republic of South Africa provides, that "everyone has the right (a) to an environment that is not harmful to their health or well-being; and (b) to have the environment protected, for the

benefit of present and future generations, through reasonable legislative and other measures that – (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development" (Constitution of the Republic of South Africa, 1996). The Constitution also devolved planning powers to the local government, and has given them an objective to promote a safe and healthy environment (Kotze et al., 2007). Municipalities "form a significant part of the operational state" (du Plessis, 2009:57). Their responsibility has shifted and increased from service provider role to active developmental agent role, as they are also responsible for the realisation of the constitutional environmental right (Rossouw & Wiseman, 2004; du Plessis, 2009). Therefore, it may be expected that there will be a significant intersection between local government and the environmental law statute (du Plessis, 2009). However, structural fragmentation between the three spheres of government, and within different line functions (sectors) within each sphere, still exist (Kotze et al., 2006).

Research has found that the long-term comprehensive plans provide a high level opportunity for mainstreaming of biodiversity into land-use planning, and, ultimately, for biodiversity conservation (Michalack & Lerner, 2007). In South Africa, prior to the promulgation of the Spatial Planning and Land Use Management Act (SPLUMA) (No. 16 of 2013), the Integrated Development Plan (IDP) superseded all other plans that guide local development (Department of Provincial and Local Government and German Agency for Technical Cooperation, 2001). A few studies assessing the mainstreaming of environmental issues into IDPs were done (Sowman, 2000; Sowman & Brown, 2006; Pasquini et al., 2013 and 2015, Ruwanza & Shackleton, 2016), and they found that there is limited progress within municipalities to integrate environmental management into IDP processes and final plans. The lack of sufficient progress was attributed to barriers such as individual-level barriers (e.g. lack of education and awareness on biodiversity conservation value), regulatory/institutions barriers (e.g. lack of political will and sufficient funds), and socio-cultural barriers (e.g. lack of interest within municipal staff) (Pasquini et al., 2013, 2015; Ruwanza & Shackleton, 2016).

The SPLUMA (No. 16 of 2013) presents the SDF as the best opportunity for mainstreaming biodiversity priorities into land use plans (Department of Environmental Affairs, 2016). The

SDF is a legal policy document that seeks to guide the overall spatial distribution of current and desirable land uses within a sphere/municipality, in order to give effect to the vision, goals and objectives of development. According to the SPLUMA (No. 16 of 2013), the SDF is required to be aligned and consistent with the frameworks of other sectors. Section 21(c) of the SPLUMA elevates the SDF as a long term spatial vision and as a decision making tool as opposed to it being merely a spatial expression of the IDP. Section 22(1) of SPLUMA states that no decision on land development applications must be inconsistent with the SDF. It is a statutory requirement for SDFs to be prepared, reviewed and update every five years (Pierce et al., 2005).

The aim of the study was to use conservation and land-use planning in South Africa as a case study to understand the complexity and challenges to mainstreaming biodiversity. The objectives of this study were to: (1) review and analyse the legislation, strategies, regulations, and mandates, across biodiversity and land-use, and different levels of government, that guide biodiversity mainstreaming into land-use planning; (2) To review Gert Sibande local municipalities SDFs in order to determine the integration of biodiversity priorities into municipal SDFs.

This research involved a case study conducted in the Gert Sibande District Municipality (GSDM), located in Mpumalanga Province, South Africa. GSDM is comprised of seven local municipalities. The increasing development within the municipality, and, with growing population size, the area of developed land is projected to expand during the next decade (GSDM, 2018). This increase will place an immense pressure on the existing biodiversity and sensitive ecosystems within the municipality (Gallo et al., 2009). A similar study, known as the Subtropical Thicket Ecosystem Planning project (STEP), was done in the Eastern Cape with the aim of conserving the Thicket biome from development impacts. The successes, failures and lessons learnt from developing and implementing the conservation plan and its products were published by Pierce et al., (2005) and Knight et al., (2011). The STEP project informed the local South African approach to biodiversity mainstreaming and served as a precedent for future use of land-use planning as an avenue for mainstreaming in South Africa. Since the findings from STEP are not limited to specific locations but assumed to be applicable to all other municipalities in South Africa and beyond, Gert Sibande was the

chosen municipality to assess this. Gert Sibande was the chosen district municipality because the first draft bioregional plan in Mpumalanga was created for this specific district, and training sessions on the Mpumalanga Biodiversity Sector Plan (MBSP) and the bioregional plan had also been conducted with municipal officials.

2.3 Methods

2.3.1 Assessment of the legislative framework guiding mainstreaming and assessment of municipal SDFs

We searched for important pieces of legislation that recognise the devolution of power to local government, and that influence the integration of biodiversity into land-use planning in South Africa within the environmental and land-use planning sectors. Once the legislation was identified, the provisions/relevant aspects advocating for or addressing the integration and consideration of environmental issues in planning and vice versa were identified and listed. The sector and the government department or institution responsible for enacting the provisions stipulated in the different legislation were identified. Thereafter, the pieces of legislation were assessed in relation to one another to determine their ability to facilitate biodiversity mainstreaming in land-use planning.

The document analysis method was used in this qualitative research so that the researcher can examine and interpret data in order to it give a voice and meaning (Corbin & Strauss, 2008; Bowen, 2009). Document analysis is often used in combination with other research methods so that the researcher can be able to corroborate findings across data sets and reduce potential bias that can emanate from a single method (Patton, 1990; Bowen, 2009). SDFs were reviewed and Geographical Information System (GIS) analytical tools were also used to investigate the integration of biodiversity into municipal SDFs.

The first step of the SDF assessment was to ascertain whether the SDF reviews were done on schedule or not (Table 2.1). Secondly, in order to determine whether the long-term planning tools (SDFs) were based on accurate, relevant, and best available data, and whether biodiversity concerns were being appropriately integrated with the other spatial priorities

expressed in the SDFs, it was important to assess the text making up the SDF document, and the various input GIS layers/shape files used to create the SDFs.

A total of four SDFs (the Lekwa, Chief Albert Luthuli, Govan Mbeki, and Mkondo local municipality SDFs), that were reviewed by municipalities during 2014 – 2017, were sourced and assessed to determine integration of biodiversity priorities and the MBSP (2014). The MBSP includes both terrestrial and freshwater conservation priority areas maps of Mpumalanga Province. These include critical biodiversity areas, ecological support areas, moderately or highly transformed areas, protected areas, and climate change corridors. It is one of the conservation planning products produced by the Mpumalanga Tourism and Parks Agency (MTPA), and it available for download on the South African National Biodiversity Institute BiodiversityGIS (SANBI BGIS) website.

Table 2. 1: Municipal SDF review progress and current status

	Municipal Name	Previous Review Year	Review Due	Status 2017	Status 2019
1.	Lekwa LM	2010	2015	Finalised	
2.	Chief Albert Luthuli LM	2010	2015	Finalised	
3.	Govan Mbeki LM	2010	2014	Draft	Finalised
4.	Mkhondo LM	2010	2015	Draft	Finalised
5.	Msukaligwa LM	2010	2015	Not yet reviewed	Draft
6.	Dr Pixley ka Isaka Seme LM	2010	2015	Not yet reviewed	Currently being reviewed (08/2019) Final expected 01/2020
7.	Dipaleseng LM	2010	2015	Not yet reviewed	Currently being reviewed (08/2019) Final expected 12/2019 [1]

[1] The SDF assessment was done for SDFs that were finalized (Lekwa LM and Chief Albert Luthuli LM SDFs) or in draft stages (Govan Mbeki LM and Mkhondo LM SDFs) in September 2017. Since then, the Msukaligwa SDF was completed and endorsed by Council in June 2019 and the Dipaleseng LM and Dr Pixley ka Isaka Seme LM SDFs are currently being reviewed (August 2019) and are expected to be completed in December 2019 and January 2020 respectively.

The SDFs were assessed in terms of various environmental and biodiversity component questions (Appendix A). These questions were originally compiled by CapeNature[1] and Department of Environmental Affairs and Development Planning (DEA & DP) for a study they conducted in the Western Cape in 2014, but they have been amended in the Mpumalanga Province context. The study was part of the Cape Action for People and the Environment (C.A.P.E) programme, and was undertaken as part of a two-year project that was aimed at improving the integration of biodiversity into land-use planning and decision making. The programme was driven by various interventions, including engaging in institutional co-ordination mechanisms; providing accurate materials and information; providing appropriate training and awareness-raising and support. One component of the study focused on ensuring that biodiversity priorities were reflected in the municipal SDFs throughout the C.A.P.E programme area (Naiker et al., 2014).

The questions best reflect what is considered relevant in terms of integrating biodiversity into SDFs. Questions were scored on a scale of 1, 3, or 5 (1 being the lowest and 5 the highest) according to the following criteria – 1 if the question was addressed, 3 if the question was adequately addressed, and 5 if there was a good answer to the question. The criteria for scoring were determined by CapeNature, DEA & DP to ensure that reviewing was consistent throughout all municipal SDFs. It is recognized that the final score allocated for each question is based on the subjective judgement of the researcher. Individual scores were summed up to gain a comparative score per municipality, and then the score was then divided by the number of questions to get an average score per municipality. This allowed for comparisons between municipalities, and helped to identify those municipalities that will require more support and assistance in producing the next round of SDFs. The average scores were divided into five categories, and municipalities were rated based on their score values as: Entirely Deficient (1), Poor (2), Unsatisfactory (3), Good (4), or Very Good (5) (Table 2.2).

[1] CapeNature is a government organization responsible for biodiversity conservation in the Western Cape (https://www.capenature.co.za/), while DEA & DP is one of the Provincial government departments in the Western Cape Province.

2.3.2 Data analysis

Lekwa and Chief Albert Luthuli LMs

It is important to note that at the time of this assessment, the district and local government officials lacked the capacity to review and produce the SDFs independently, so they appointed consultants to do the work on their behalf (Ruwanza & Shackleton, 2016). The GIS data of the municipal SDFs were sourced from the consultants and local municipalities. The 2014 MBSP was sourced from the MTPA. With the use of Geographical Information System (GIS) analytical tools, MBSP GIS data and the GIS data from the various SDF were loaded into ArcGISPro for analysis.

Firstly, the area geometry (size) of the terrestrial and freshwater MBSP Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs) were calculated (in hectares) for the municipalities, using GIS Geoprocessing tools. The output tables were then converted to Excel.

We noted that the municipal SDFs summarized and merged GIS data from several different environmental layers into one layer, that included: MBSP terrestrial and freshwater layers, high potential agricultural lands, and high hills and ridges. The merged environmental layers were variously named as the Environmental Management Areas (Lekwa LM and CALLM), Conservation Areas (Mkhondo LM), and Open Space (Govan Mbeki LM).

The merged environmental layer was then intersected with the MBSP layer. Thereafter, the area geometry of the terrestrial and freshwater CBAs and ESAs were calculated. This exercise was done in order to determine if the SDF environmental layers were a true reflection of the MBSP, and if there was any alignment or integration between the land-use planning tool (SDF) and the conservation planning map.

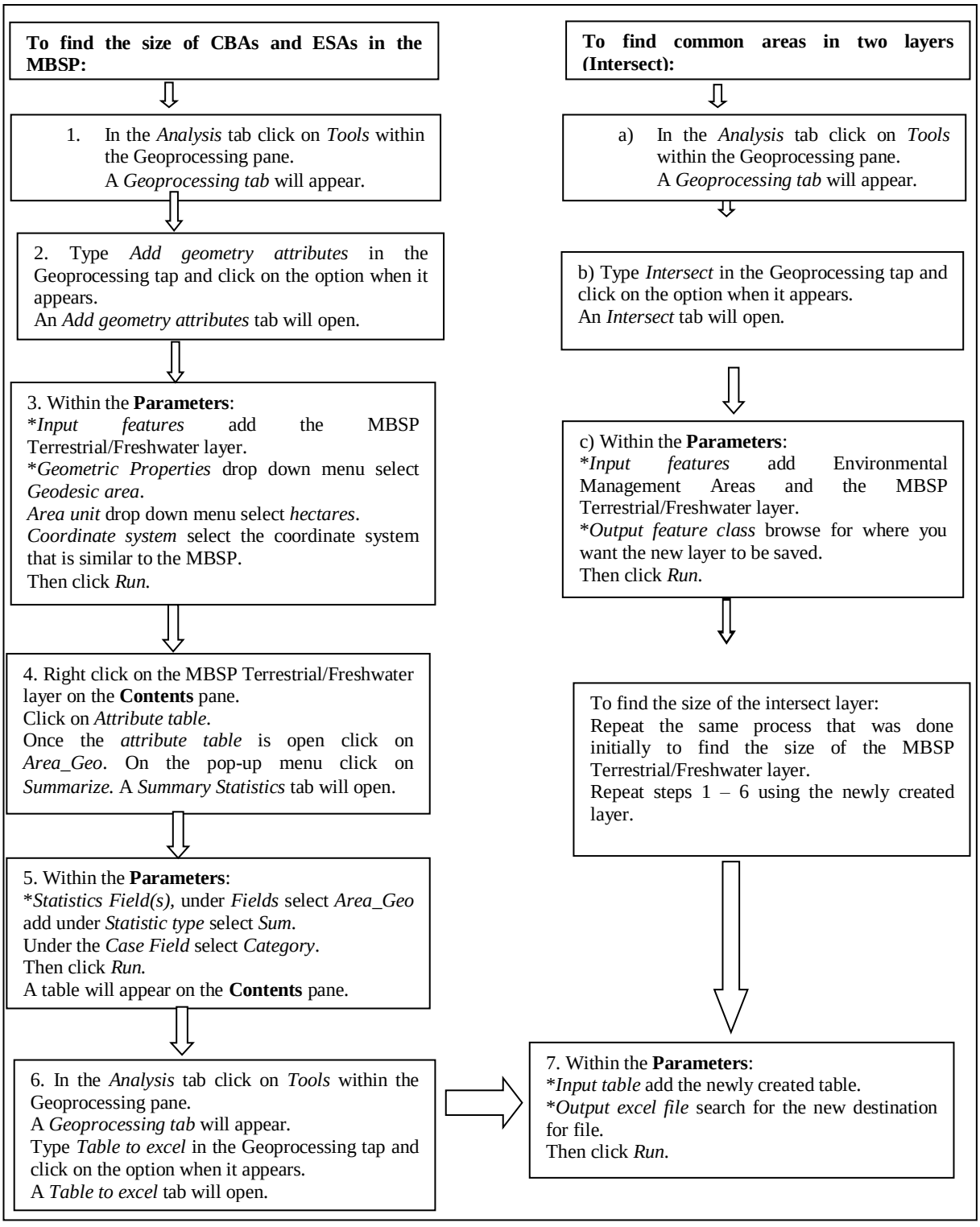

Figure 2. 1: Steps that were done as part of the GIS analysis with ArcGISPro

Govan Mbeki and Mkhondo LMs

The GIS data of the draft SDFs were not available, but the PDF SDF documents were available. With the use of GIS analytical tools, the PDF images from the draft SDF's were converted to tiff images, and then Georeferenced to a known projection using ArcGISPro. The MBSP terrestrial and freshwater GIS data were then overlaid on the georeferenced images, and then using the swipe tool, they were visually compared (i.e., the MBSP compared to the georeferenced images).

2.4 Results

Assessment of legislative and policy frameworks

There are various regulations that govern the development of land in South Africa. These regulations are in different sectors, are administered by different institutions, and their mandates are implemented in different spheres of government (Kihato, 2012). A few of these laws and regulations relevant to this study are assessed (Appendix B). These laws and regulations include The Constitution of RSA (No 108 of 1996), Development Facilitation Act (No 67 of 1995), Municipal Systems Act (No 32 of 2000), Spatial Planning and Land Use Management Act (No 16 of 2013), Integrated Development Plan, Spatial Development Plan, Land Use Scheme, National Environment Management Act (NEMA) (No 107 of 1998), NEM: Biodiversity Act (No 10 of 2004 as amended) and NEM: Protected Areas Act (No 57 of 2003).

The South African government system is comprised of the national, provincial and local sphere (municipalities) (Pasquini et al., 2013). South Africa is further divided into nine provinces. The national government has a Parliament and National Council of Provinces, and each province has its Provincial Legislature, and each Municipality a Council, all with a specific constitutional mandate. The Local Government: Municipal Structures Act No. 117 of 1988, differentiates the three types of municipalities in South Africa as, metropolitan municipalities (category A), local municipalities (category B), and district municipalities (category C). Similar to other countries, the Constitution of South Africa (1996) devolved all

land-use decision making to some 226 local municipalities, which are responsible for almost all land-use decisions (Brownlie et al., 2005; Ruwanza & Shackleton, 2016).

Initiatives to reform South Africa's policy, governance, and legislation, were undertaken after the country's transition into democracy in 1994 (Kotze et al., 2007). These changes also affected the environmental and planning laws. The policies and legislations of the environmental and planning sectors are intricately interconnected, as they deal with the common cause of sustainable development (Kihato, 2012). The interconnectivity allows for environmental governance to be executed within the planning sector, but structural fragmentations such as separate, and misaligned line functions at all three spheres of government, and within provinces, make governance efforts difficult (Bosman et al., 2004). Structural and legislative fragmentations cause inefficiencies at an operational level, which include, among others: duplication and overlap of the governance effort and responsibilities; unnecessary costly delays in decision making; and inefficient arrangements between government departments that control similar environmental media (Kotze et al., 2007).

SDF Review progress

The 2015 IDPs for the GSDM local municipalities have all been reviewed and adopted by relevant municipal councils. However, the SDFs, which are supposed to be the spatial version of the IDPs, are lagging behind. All the local municipal SDFs for the GSDM should have already been reviewed, but only two SDFs had been reviewed, and two were still in the review process by the municipalities as at December 2017 (Table 2.1).

The SDF review process that was anticipated to be completed by the municipalities is summarized in Figure 2.1. The Lekwa LM and Chief Albert Luthuli LM SDFs had been finalised, and adopted, which meant that they are already in operation. The Govan Mbeki LM and Mkhondo LM SDFs were in the second stage of review, which was the draft SDF preparation stage. Msukaligwa, Dr Pixley ka Isaka Seme and Dipaleseng local municipalities began with the their SDF review in 2019, despite the fact that they were due for review (Table 2.1). The status of the Msukaligwa, Dr Pixley ka Isaka Seme and Dipaleseng local municipality SDFs has since changed. The Msukaligwa LM SDF had been reviewed and

endorsed by council in June 2019, and the Pixley and Dipaleseng LM SDFs are currently being reviewed by hired consultants (August 2019).

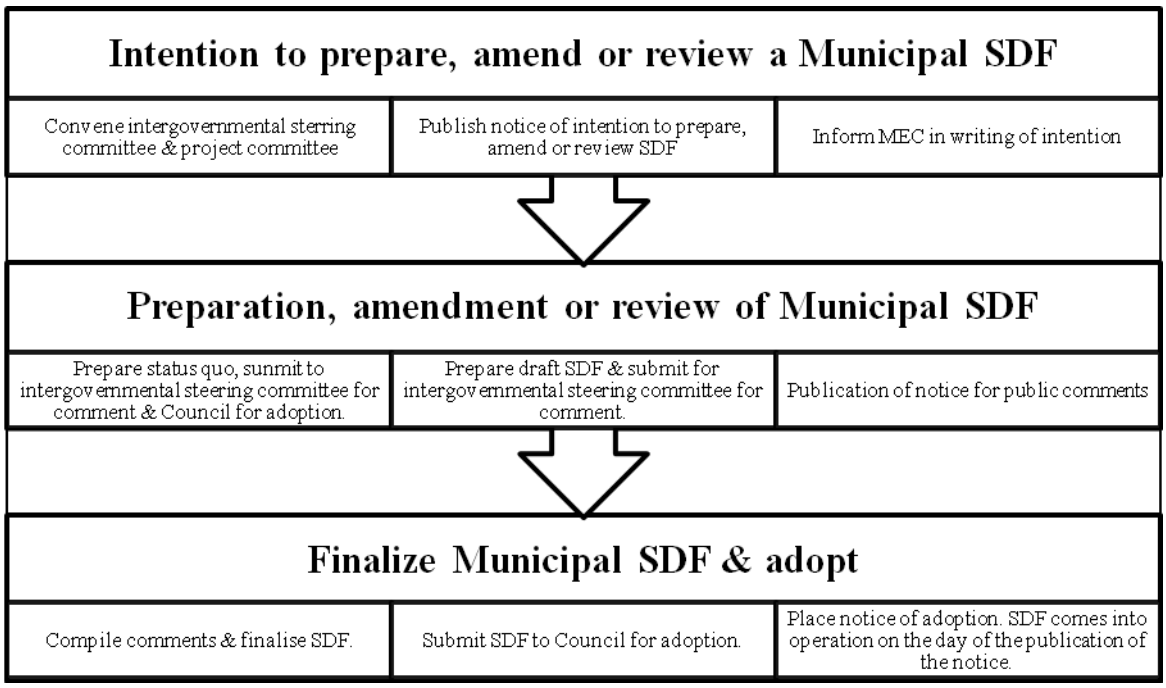

Figure 2. 2: Municipal SDF review process from intention to prepare for Council adoption

Source: Chief Albert Luthuli SDF document (2016)

SDF Assessment

All the SDFs had a very good description of the biophysical conditions within their jurisdictions, and considered both the MBSP terrestrial and freshwater priorities (Table 2.2). The average score for Lekwa LM and Chief Albert Luthuli LM was 4.4, and that of Govan Mbeki LM was 3.8. These scores showed that the SDFs were doing well at integrating most biodiversity priorities, and with carrying through biodiversity concerns to the final municipal SDF. The SDFs of Lekwa LM and Chief Albert Luthuli LM were very similar and their average score was also the same. This could be attributed to the fact that they were reviewed by the same consultants. Mkhondo LM had an average score of 3.4, which is unsatisfactory according to score categories. The other three local Municipalities had not initiated a review process.

Table 2. 2: SDF Assessment of biodiversity priorities/concerns integrated into municipal SDFs

Questions	Lekwa LM 2017	Chief Albert Luthuli LM 2017	Govan Mbeki LM 2014-34	Mkhondo LM 2016
1. Is there a general description of the biophysical conditions of the area?	5	5	5	5
2. Does the SDF (including maps) refer to latest terrestrial and freshwater conservation plans (Critical Biodiversity maps, Biodiversity Assessments) with spatial outputs / implications that are relevant to the municipality?	5	5	5	5
3. Are the municipal vegetation types and their accompanying ecosystems status distinctly defined and spatially represented in terms of the latest, relevant vegetation map of South Africa.	5	5	5	5
4. Have the CBAs (irreplaceable and optimal) been integrated /carried through to the final SDF map?	5	5	3	3
5. Have the ESAs been integrated /carried through to the final SDF map?	5	5	1	1
6. Have CBA's informed the proposed spatial form and medium term urban edge?	5	5	5	5
7. Are there composite maps integrating / overlaying mapped biodiversity features and other spatial planning elements?	5	5	5	5
8. Overall, is biodiversity appropriately integrated throughout the SDF, particularly with regards to other spatial priorities expressed in the SDF? Is integration meaningful, appropriate and feasible?	5	5	3	3
9. Is there a description of the envisaged climate change, climate change corridors and the possible implications of climate change for the municipality considered in the SDF?	3	3	3	1
10. Are identified priority conservation actions reflected in each municipal SDF, both spatially and reported on? (e.g. EMFs, MPAES, Environmental Projects - wetland rehabilitation, gully erosion control, invasive alien vegetation)	1	1	3	1
Average	**4.4**	**4.4**	**3.8**	**3.4**

Scores = lowest (1) and highest (5). **Average** = (Entirely Deficient (1), Poor (2), Unsatisfactory (3), Good (4) or Very Good (5))

CBA = Critical Biodiversity Areas **ESA** = Ecological Support areas

MBSP and intersect layer CBA and ESA area geometries (Sizes)and overlap

The EMA intersect layer was greater in size than the actual size of the terrestrial and freshwater MBSP CBA areas for Chief Albert Luthuli LM (Table 2.3). The EMA ESA intersect layer size was less than the MBSP ESAs in size for Lekwa LM and Chief Albert Luthuli LM (Table 2.3). The EMA layer is composed of different feature layers that are merged to create one layer. The MBSP feature layers that were carried over to the SDF include the MBSP terrestrial and freshwater features. Additional feature layers that were included are the gullies, high potential agricultural land, and high hills and ridges. As such, the difference in size of the EMA intersect layer and the MBSP areas can be attributed to the inclusion of these other features in the EMA layer. These additional environmental aspects could assist in conserving the environment, which could ultimately lead to the conservation of biodiversity.

The size of the SDF EMA does not necessarily have to be equal to the MBSP CBAs and ESAs within the municipal jurisdictions, but there should be an overlap between the EMA and the MBSP CBAs. All the CBAs were included in the EMA for both Lekwa LM and Chief Albert Luthuli LM.

Table 2. 3: Terrestrial and freshwater CBA and ESA intersect layer calculations in final municipal SDFs

Municipality	Assessment Type	MBSP CBA Size (m²)	**CBA areas covered in final SDF map (Size (m^2))**	MBSP ESA Size (m²)	**ESA areas covered in final SDF map (Size (m^2))**
Lekwa LM	Terrestrial	99750	99740	20061	4926
	Freshwater	6850	6850	70349	37252
Chief Albert Luthuli LM	Terrestrial	152035	168182	122459	38545
	Freshwater	15593	24765	268537	200381

MBSP and tiff images

Comparisons between the terrestrial and freshwater MBSP and the tiff images from Govan Mbeki LM and Mkondo LM using the swipe tool, indicated that the MBSP categories are well represented as is in the SDF. No changes have been made to the CBAs and the ESAs. The images are attached to Appendix C: Figure 8 & 9 for Govan Mbeki LM, and Figure 10 & 11 for Mkhondo LM.

2.5 Discussion

Studies have revealed that there are benefits to mainstreaming biodiversity into policies and practices of other sectors, including land-use planning (Press et al., 1996; Crist et al., 2000; Michalack & Lerner, 2007; Stokes et al., 2009; Miller et al., 2008; Wilhelm-Rechman & Cowling, 2013). Although this is theoretically possible, it has been proven that it is sometimes more difficult to implement in practice (Salafsky, 2011; Wilhelm-Rechmann & Cowling, 2013).

Our results suggest that legislative mandates are important in facilitating biodiversity mainstreaming in land-use planning (Stokes et al., 2009). There are three main pieces of legislation that underpin the importance of this study, namely, the Constitution of the Republic of South Africa (No. 108 of 1996), the SPLUMA (No. 16 of 2013) and NEM:BA (No. 10 of 2004).

The Constitution separates the government into the national, provincial, and local spheres of government. These three spheres of government have different independent and autonomous environmental departments (e.g. the Department of Environment, Fisheries and Forestry, the Department of Water and Sanitation, the Department of Agriculture), or line functionaries which are governed by different environmental legal frameworks (du Plessis, 2015). The environmental legal frameworks consist of many acts, which are silo-based, and that address specific environmental subjects (du Plessis, 2009). The NEM:BA, and most acts that have a direct or indirect influence on biodiversity conservation, operate in the national sphere of government. However, each of the nine provinces have their own legislation, and provisions that will essentially operate in the provincial sphere can also be published in the Provincial Government Gazette by the relevant Member of the Executive Council (MEC) (Kotze et al.,

2007; Nel, 2016). These legal frameworks, coupled with a multitude of procedures, processes and environmental management tools cause an overlap of jurisdictions, and could potentially cause conflict and confusion within the competent authorities responsible for implementation (Kotze et al., 2007).

It is agreed that the local government has an important role in the realisation of the constitutional environmental obligation by legislative and executive branches of the South African government (du Plessis, 2015). However, Schedule 4A of the Constitution, lists the "environment" as a function of the national and provincial government, and not local government. Consequently, the direct environmental governance role of the local government is very limited (du Plessis, 2015). Also, local authorities are mandated to conserve biodiversity by NEM:BA even though nature conservation is not listed as one of their competence areas in Schedules 4B and 5B of the Constitution. At a national scale, NEM:BA provides for the conservation of species and ecosystems that deserve protection, and at a municipal scale it makes allowance for the listed ecosystems and bioregional plans to be considered in the planning tools, including the IDP and the SDF (Paterson, 2012). The implementation of NEM:BA by local government "could be challenged by factors such as the lack of clear indications as to the shared and divided responsibilities of local and district municipalities, and by the lack of specialized knowledge on the content of the national biodiversity framework as well as listed ecosystems and invasive species, for example" (du Plessis, 2009:74).

Protected areas are not included in the constitutional functional areas of local government, but the NEM:PAA sets out a number of specific obligations to be fulfilled by local government (Appendix B) (Kotze et al., 2007). These obligations could be difficult to implement successfully, in cases where the protected area transcends municipal boundaries. There are inconsistencies within legal statues, some acts are viewed to be conservative in their regulation and/or involvement of local government (e.g. the NEM:BA and the NEM:PAA), while others have assigned significant powers, functions, and duties to local government (e.g. the NEM: Air Quality Act and the NEM: Waste Act) (du Plessis, 2009).

In general, there are concerns that the mandate of local government is expanding, as national environmental law increasingly seems to allocate significant powers, duties, and functions to local government (Ivey et al., 2004; Smith et al., 2009). This is because there is still some confusion and uncertainty as to where the responsibilities lie for certain environmental functions within municipalities (Measham et al., 2011; du Plessis, 2015). This is exacerbated by two facts. Firstly, the internal institutional composition of the municipalities is different from one municipality to the other, and secondly, there are different departments or sections within municipalities that deal with different aspects of environmental management and governance (Critchley & Scott, 2005; Kotze et al., 2007). These further causes problems for the developers of national or provincial law or policy that regulates the roles and responsibilities granted to local government (Adger, 2003; Naess et al., 2005; Smith et al., 2009; du Plessis, 2009). Consequently, the lack of attention to mainstreaming at national and provincial spheres of government could potentially lead to the lack of attention at the local government sphere (Amundsen et al., 2010; Measham et al., 2011).

SPLUMA was formulated based on constitutional rights, such as, the right to environment, food, and water, and it promotes sustainability in terms of spatial planning, land-use management, and land development through alignment and integration (Schoeman, 2015; Snyman, 2017). Section 7(b)(3) of SPLUMA – "uphold consistency of land use measures in accordance with environmental management instruments", infers that SLUMA takes into cognisance the importance of the consideration of bioregional and biodiversity sector plans during decision-making (Snyman, 2017).

There are a number of crucial themes that SPLUMA addresses, one of those concerning the question - who is responsible for what? The national, provincial and municipal spheres of government have spatial planning and land use management mandates, and this tends to complicate the planning system (van Wyk, 2010). SPLUMA delineated the roles and responsibilities between and within the three government spheres, and the devolution of planning powers to local government making it the most important sphere of government, as it is closest to the people and communities in terms of delivery (de Visser & Poswa, 2019). The national and provincial government roles in spatial planning and land use management have been significantly reduced, and, consequently, municipalities must adopt and implement

planning by-laws in addition to the already complex planning framework (de Visser & Poswa, 2019).

SPLUMA was expected to make provision for sustainable, functional, and efficient land uses, through the alignment and integration of land-use planning with environmental management instruments (South African Cities Network (SACN), 2015). This is mainly achieved through the SDFs. According to SPLUMA, the SDFs should not only be an integration or coordination mechanism between development principles and implementation, or between national, provincial and local spheres of government, but should also be a link between different sector plans and sector requirement, budgeting, and investment (SACN, 2015).

There remains a need within South Africa to reform the manner in which environmental and planning legislation is implemented, in order to deal with the fragmentations and create an avenue for integration (Kotze, 2006; Kihato, 2012). Listed below are examples of where and how amendments could possibly be made to existing legislation or the development of new legislation:

- Schedule 4A of the Constitution could list "environment" as a function of local government, this would formalise the role of the local government in environmental governance. It was made very clear by the Le Sueur vs eThekwini Municipality case (2013). The High Court stated that "municipal planning" as set out in Schedule 4B, interpreted in light of Section 24 of the Constitution and Section 152(1)(d) which provides for "local government to promote a safe and healthy environment" clearly proved that the "municipal planning" functional area includes the responsibility over the environment (Freedman, 2014).
- NEM:PAA also provides obligations for the local government to fulfil. Schedule 5B of the Constitution provides for "municipal parks and recreation" but it is not clear whether this includes protected areas. Sometimes protected areas transcend municipal boundaries and this could cause problems with implementing obligation. It would, therefore, be important to have the municipal functions and duties clarified, where there is a shared responsibility between local and district municipalities (du Plessis, 2009).

- SPLUMA provides for the development of the land-use Scheme, and classifies all land within the municipality, including land that was not part of the scheme historically. The classification of all land is done according to Schedule 2 categories. “Conservation purposes” is one of the categories. There is a mismatch in authority between the Scheme, which is clearly municipal council, and all land classified in the scheme including protected areas and traditional council land. However, the SDP and IDP, which also classifies land use is unclear whether the authority rests with the municipality or province, as it is signed off by the Municipal Executive Council.
- SPLUMA provides a platform for land-use planning to be a multi-disciplinary process but several municipal departments are still handling planning, economic development, and environmental sectors separately (Sowman & Brown, 2006; Wilhelm-Rechmann & Cowling, 2013). This results in municipal officials struggling with the concept of integration across sectors, and could, ultimately, limit opportunities for integrating cross sectoral issues such as environment (Ziervogel & Parnell, 2012). This shows that there needs to be better alignment of legislation and policy in different sectors and the roles and responsibilities for mandates need to be clearly set out in the Constitution, NEMA and SPLUMA.

The Constitution, SPLUMA, and NEM:BA legislations, taken collectively, allow for the devolution of power to local government, and also for the integration of biodiversity concerns into development planning respectively (Pierce et al., 2005). However, challenges within the country's municipalities, including the lack of skills amongst municipal officials, contribute to the struggle or failure to implement these legislations (CoGTA, 2009). This shows that collaboration and coordination at a policy level is not sufficient for mainstreaming implementation outcomes, and hinders the success of biodiversity mainstreaming into local-land-use planning (Adams et al., 2018). Studies have shown that the integration of biodiversity plans into municipal plans has been adequate in areas where there has been a tradition of biodiversity planning even before the promulgation of NEM:BA (Kihato, 2012). In as much as legislation is supposed to be the main driving force for biodiversity mainstreaming, municipalities with a conservation-minded mentality can enforce conservation measures even without legislation or mandates (Stokes et al., 2010).

Despite local government authority and the tools available at their disposal, biodiversity conservation is rarely a priority for local government, and tends to be poorly addressed in the IDP/SDF process (Press et al., 1996). On the contrary, the findings of this research reveal that there is strong evidence to show that biodiversity is being mainstreamed into SDFs, and that there are certain factors that facilitate this process. The involvement of the MTPA's biodiversity planner in the SDF review process, and stakeholder meetings, facilitated the inclusion of the best available biodiversity data into the SDFs, as planning departments usually rely on local experts, and state agencies, for such biodiversity information (Michalak & Lerner, 2007). All the provided biodiversity data are freely available and accessible to the general public online, but the presence of a dedicated official increases the possibility of its inclusion into the planning tools (Miller et al., 2008; Broberg, 2003; Wilhelm-Rechmann & Cowling, 2013). If conservation planners are serious about integrating biodiversity concerns or conservation plans in local planning, it is essential that they become involved in the process of land-use planning (Miller et al., 2008). The availability, or lack thereof, of a dedicated individual to see the process through, makes integration a success or failure (Broberg, 2003).

Although an official from the biodiversity sector was involved in the review of the planning tool (SDF), it would be equally beneficial for the land-use planners that will ultimately inherit and use the conservation plan to be part of the next conservation plan review process (Knight et al., 2003; Adams et al., 2018). The involvement of these stakeholders cannot be over emphasized, since it allows them to influence the outputs of the conservation plan to suite their planning needs when there is still an opportunity to do so, and, ultimately, gives them a sense of ownership of the final product (Amler et al., 1999; Pierce et al., 2005; Michalak & Lerner, 2007). This collaboration reduces the potential of conflicts arising due to the difference between the design and content of conservation assessments, and the requirements for land-use planning (Eggenberger & Partidário, 2000; Theobald et al., 2000; Pierce et al., 2005). Such partnerships between plan developers and potential plan implementers are important at all phases of the planning process (Snyman, 2017). For example, the first attempt at creating a network of marine protected areas in California failed. The failure was reported to have been a result of insufficient public engagements and lack of support. A requirement for stakeholder involvement in the follow-up attempt for a more participatory process at creating the marine protected are network was a success (Fox et al., 2012).

The fact that some municipalities had not timeously started reviewing their SDFs is a cause for concern. Firstly, this could mean that the SDFs were not viewed as a priority, or given their "superior status" as proposed by SPLUMA (2013), in their municipalities. Essentially, this demonstrates the lack of understanding of the value and importance of the SDF, and of spatial planning in general, by the municipal officials concerned (du Plessis, 2010). This highlights the fact that the integration of biodiversity priorities in the SDF alone, may not be able to assist sufficiently with biodiversity conservation. It would be important for biodiversity priorities to be considered in the IDP for proactive planning, and also in the Land Use Schemes or land use zones for reactive decision-making. The IDP is produced to guide development over a five-year period, but it is reviewed annually, as opposed to the SDF that must be reviewed every five years (Pierce et al., 2005). The importance of using the best and current available biodiversity information and data cannot be over emphasized. The delay in SDF review could result in the proposed developments within the IDP being aligned to the older versions of the systematic conservation plans, as opposed to the current ones, which could lead to biodiversity loss, degradation, or fragmentation, ultimately defeating the purpose of mainstreaming.

Secondly, one of the challenges that the local government has experienced with integrating spatial planning with biodiversity plans in terms of NEM:BA, emanates from the problem of human resource capacity (Pierce et al., 2005). The lack of human resource capacity is not confined to local government, but also extends to the provincial and national spheres of government (Nunan et al., 2012).

Thirdly, the delay in the review process could be as a result of financial constraints within the municipalities (e.g., Dipaleseng LM). Many local municipalities face financial limitations because they have many responsibilities to carry out, and, also, they are legally constrained to function on revenue that they receive from rates and taxes (Measham et al., 2011; Ziervogel & Parnell, 2012; Manyaka, 2014). The land-use planning officials within the municipalities often lack the human capacity to integrate biodiversity into their planning tools, and also to review their tools (SDFs) in-house (Wells & Brandon, 1993; Groves, 2003; Pasquini & Shearing, 2014). This causes the municipalities to resort to outsourcing consultants to assist

with these constraints at a cost (Pierce et al., 2005), which may not be budgeted as a result of financial constraints.

The employment of consultants is all well and good, but there are other challenges that are associated with this approach, that were revealed by this study. Local municipalities within the same district did not employ the same consultants to assist with the SDF review and the biodiversity integration into the SDFs. Different consultants will use different methods in getting the job done, which makes it difficult to replicate, which results in inconsistent documentation across sectors of government. There should be one adopted document in government, that is used across sectors and across levels to standardize the output. This document should be free, and easily accessible by the general public, i.e. by potential consultants for such work.

It is not mandatory for climate change or other environmental programmes to be included within municipal SDFs, but in the spirit and intent of sustainable development, including them would have been best practice. Since local government is responsible for planning and management at a local scale, we would assume that they have a vital role in addressing climate change and other environmental challenges (Huq et al., 2007; Pasquini et al., 2013). However, the lack of attention to climate change within the SDFs suggests that it is not one of the primary considerations in the proactive strategies of municipalities across South Africa (Pasquini et al., 2013). This study did not investigate the barriers hindering climate change adaptation or mitigation strategies from being mainstreamed into SDFs, and these should be investigated in the future.

The environmental sector has a variety of projects and programmes that can include mechanisms for ensuring protection of biodiversity and wise management of CBAs and ESAs. Examples of these include Working on Fire, Working for Water, and Working for Wetlands (MTPA, 2014). None of these were mentioned in the SDFs. Most projects in the SDFs were aligned to housing and providing or improving the state of human basic needs. The reason most municipalities are inclined to economic and social success at the expense of the environment is that there are many competing policy priorities that need to be realised in the face of limited resources, and that the IDP fails to adequately consider and prioritize the

environment in which the economic and social projects are to occur (Nunan et al., 2012; Kihato, 2012). This can be further substantiated by the results of a study done in the Western Cape Province in 2008. The study found that out of the 25 municipal SDF's that were reviewed, there was a general trend noticed where planning was orientated with a slant towards social and developmental issues, with very little consideration of how these plans are sustained or supported by the environment (Naiker et al., 2014).

Another reason is that there is a general lack of awareness about the importance of biodiversity for both social and economic sustainability (Pierce et al., 2005). Biodiversity is not a priority, and, as other studies have indicated, planners are still treating biodiversity conservation/the environment as a different sector altogether (Sowman & Brown, 2006; Pasquini et al., 2015). This results in municipal officials not understanding integration across sectors and undermines opportunities for biodiversity mainstreaming (Ziervogel & Parnell, 2012).

This study revealed that there were some inconsistencies with the use of biodiversity data in different municipalities. For example - different feature layers were used to inform the terrestrial/environmental layer differently across municipalities. One municipality included the MBSP terrestrial and freshwater, gullies, high potential agricultural land, and high hills and ridges to create the environmental layer, while the other municipality did not. This shows that general agreements of how the biodiversity data should be used during the SDF review process should be documented, and made available to the general public. This will allow for better comparisons and replication, and will establish good practice.

2.6 Conclusion

The assessment of the SDFs has shown that biophysical conditions and the biodiversity priorities were well described, mapped, and integrated with other spatial planning elements within municipal jurisdictions. For the completed SDF reviews, the biodiversity priorities were carried through to the final SDFs, and this will hopefully ensure that development is steered away from these biodiversity sensitive areas during reactive implementation The fact that not all municipalities have the SDFs reviewed on time is of great concern, and shows that

the consideration of biodiversity priorities and the integration of CBA areas in the SDF alone might be insufficient in conserving biodiversity. The results of this study generally indicate that capacity constraints in terms of human resources, skills/expertise, and financial resources can hinder biodiversity mainstreaming into land-use planning. This conclusion was also echoed by other authors (e.g. Paquini et al., 2015; Gwedla & Shackleton, 2015). On the other end, legislative mandates, the availability and accessibility of the biodiversity sector plans that are created with implementation in mind, a dedicated staff to champion the integration within land-use planning and in the biodiversity sector, together facilitate the integration process, and help to decrease the assessment-implementation gap.

2.7 References

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CHAPTER 3: THE USE AND EFFECTIVENESS OF SYSTEMATIC CONSERVATION PLANS IN REACTIVE DECISION-MAKING IN LAND-USE PLANNING (PAPER 2)

3.1 Abstract

There has been considerable progress in bridging the gap between systematic conservation planning (hereafter called conservation plans) and land-use planning. However, the extent to which systematic conservation plans have influenced biodiversity conservation through proactive forward planning, and reactive decision-making is unclear. We interviewed land-use planners within the Gert Sibande District Municipality, South Africa, with an aim to assess understanding, use, and effectiveness of the conservation plans by land-use planners, and to identify factors that facilitated or hindered the consideration of biodiversity priorities in performance-based implementation. Most of the land-use planners knew about the Mpumalanga Biodiversity Sector Plan (MBSP), and possessed its products. The land-use planners that had the MBSP integrated into their Spatial Development Framework (SDF) used it for project authorization application reviews. Legislative mandates, the quality of plans, enforcement approach, awareness building, and staff capacity are variables that influence plan implementation. The performance-based implementation method is used by the municipalities during the authorization application review processes. Our findings will build on the limited literature on the performance-based implementation of conservation plans by being an example of how conservation plans can be used in local government.

Keywords: conservation planning, biodiversity, conformity, performance, implementation, land-use planning

3.2 Introduction

The irreversible and substantial loss in the diversity of life on earth over the past 50 years has been from habitat degradation and loss, as a consequence of land-use change (Pimm & Raven, 2000). Habitat degradation, land cover conversions, and deforestation, are driven by intricate geographic and political factors (Aukema et al., 2017). Shifting markets, commodity prices, poverty, policies and governance, and population growth, are examples of the underlying causes of habitat degradation and loss (Dale, 1997; Lambin et al., 2001; Geist & Lambin, 2002). Increasing human populations exert pressure on ecosystems that humans need for survival, such as food, freshwater, timber, and fuel (MEA, 2005).

While there has been a perception that we will always "grow out of" global problems, this is not possible with the problem of biodiversity loss (Dietz & Adger, 2002). Reason being that the extinction crisis is extensive, and the species cannot be replenished at the same rate at which they are being lost, that is, if they can still be replenished (Groves et al., 2002; Dietz & Adger, 2002). Rockstrom et al. (2009) developed the "planetary boundaries", in which they identified boundaries within the Earth's system whose measurements could identify parameters within which humanity could safely operate. Among those boundaries, three have already been transgressed by humanity, namely climate change (Intergovernmental Panel on Climate Change (IPCC), 2013), nitrogen accumulation (de Vries et al., 2013), and biodiversity loss (Steffen et al., 2007). Humanity might have already entered into a zone where undesired system change cannot be excluded with regards to biodiversity loss, simply meaning that we may have already passed the tipping point (Steffen et al., 2015).

In 2012, seventeen Sustainable Development Goals (SDG) were created as an extension to the Millennium Development Goals (MDG). However, Griggs et al., (2013) argues that the SDGs should not be just an extension of the MDGs because humans are transforming the planet in ways that could threaten the development gains envisioned by the SDGs. The definition of sustainable development is also suggested to be changed to "development that meets the needs of the present while safeguarding Earth's life-support system, on which the welfare of current and future generations depends" (Griggs et al., 2013). Therefore, the protection of Earth's life-support system, and poverty reduction, must be prioritized for SDGs, in order to improve human livelihoods and wellbeing (Griggs et al., 2013).

Nonetheless, there have been many efforts aimed at shaping the course of change that allows for natural systems to be preserved and protected in the face of rapid environmental change (Theobald et al., 2000). One such effort would be systematic conservation planning (SCP) (Margules & Pressey, 2000). The goal of conservation planning is "to maintain or enhance biodiversity, ecosystem function, and ecosystem structure, while accommodating human-oriented land uses that may be detrimental to that goal" (Craighead & Convis, 2013). In simple terms, SCP is a scientific, systematic method, that identifies geographic areas of biodiversity importance (Margules & Pressey, 2000; Groves, 2003), and creates maps and land-use guidelines that minimise land-use conflicts, and support integration of biodiversity into land-use planning (Eggenberger & Partidário, 2000).

SCP has been done successfully for more than three decades and the experience gained through the process has provided good theory and practice for the advancement of conservation planning globally (Pressey, 2002; Knight et al., 2006). Many conservation assessment products have been developed, including maps of irreplaceability (e.g. Pressey, 1999), and local and landscape corridors for species movement (e.g. Rouget et al., 2003) through systematic conservation planning (Pierce et al., 2005). However, much of the available literature focuses on the systematic conservation assessments, with far less emphasis on the implementation of the SCP products (Pierce et al., 2005; Schultz, 2011; Álvarez-Romero et al., 2018). This can be attributed to the fact that conservation planning assessments have mainly focussed on identifying priority areas for biodiversity conservation, and less on the required avenues for the implementation process (Knight & Cowling, 2003; Knight et al., 2006). Attempts to bridge the "assessment-implementation" gap (Knight et al., 2011), have been done through the land-use planning field by a number of conservation scientists and practitioners (Pressey, 1999; Theobald et al., 2000; Pierce et al., 2005; Berke et al., 2006; Knight et al., 2011; Sinclair et al., 2018; Botts et al., 2019). Despite the attempts to bridge the gap, our ability to identify best practices is limited, as documentation mainly addressed the assessment phase of the planning process, and not the implementation and monitoring stages (Schultz, 2011; Adams et al., 2018).

The usefulness and value of plans has been questioned, when the issues raised by the plans are not implemented (Berke et al., 2006). In a review of investigations of local plan implementation, Talen (1996:248) concluded "While implementation research consumes the activities of a good number of scholars from the fields of political science, public administration, and management science, there has been a curious lack of parallel inquiry into the implementation process involved in the planning field."

According to Berke et al., (2006), there are four sequential phases of plan implementation:

a) Development management – is based on regulatory, incentive, and public-investment techniques, and involves the translation of plans into guidelines that intend to influence the location, type, rate, amount, and design, of a development project.
b) Project permit review (also known as authorization application) – entails plan administration through development management techniques during a process of direct interaction between planners and applicants.
c) Outcomes – the physical, economic, and social conditions generated through land-use change and development.
d) Monitoring and evaluation – the continuous tracking and assessment of the actual and intended/planned outcomes. The outcomes are used to assess the effectiveness of plan policies.

The measure of implementation success, and the extent of the assessment-implementation gap existence, depends on how plan implementation is defined and measured (Adams et al., 2018). The practitioners and scientists within land-use planning and environmental planning have struggled with defining and evaluating plan implementation, in order to provide useful guidance for conservation planners (Talen, 1996, Laurian et al., 2004, Laurian et al., 2010). There are two types of methods for measuring the extent to which a plan is implemented, namely, conformance-based and performance-based implementation (Laurian et al., 2004). The terms conformance and performance have not always been used consistently by scholars over the years, hence they are defined in various ways (Kinzen, 2016).

Conformance-based implementation emphasizes a direct relationship between plan goals and plan outcomes, and considers implementation to be successful if development conforms to the policies and objectives of the conservation assessment (Alexander & Faludi, 1989; Laurian et al., 2004; Loh, 2011). This evaluation assumes that the conservation assessment is a blue print from which land-use decisions are made, and that it is completely unequivocal to the extent that quantitative and qualitative future actions can be measured against it (Laurian et al., 2004). An example of the conformance-based implementation and evaluation within land-use planning is when the policy for plan integration is executed, and the outcomes of the integrated plans on the ground correspond to the provisions of the plans (Alexander & Faludi, 1989; Laurian et al., 2010).

Performance-based implementation focuses on planning as a process that guides future decisions, as opposed to prescribing them. Therefore, conservation assessments are successfully implemented when they are consulted during the decision-making process in order to influence the development action (Mastop & Faludi, 1997; Laurian et al., 2004). An example of the performance-based implementation and evaluation within land-use planning is when the conservation plans and products are consulted, and are useful in supporting authorization application review decisions (Berke et al., 2006).

The successful implementation of conservation assessments is dependent on effective enforcement (Gunningham, 2017). There are numerous enforcement styles that can be used to achieve implementation, these include, for example, deterrence, facilitation, compliance, and the use of incentives and informational techniques (Balch, 1980; Burby et al, 1998; Kagan, 1994; Scholz, 1994; Berke et al., 2006, Gunningham, 2017). The deterrence and facilitation enforcement styles have been found to be complete opposites. Deterrence is very strict on policy implementation and relies on legalistic and punitive rules, while facilitation allows for flexibility in in policy interpretation and relies on technical assistance (Berke et al., 2006).

Given the ongoing academic debate concerning implementation of SCP, for the rest of this study, I refer to conformance when assessing whether policies included in the SCP are carried out, and whether the provisions of the SCP correspond to the outcomes on the ground, and

performance to address the usefulness of SCP during reactive decision-making (authorization application review) (Rudolf & Gradinaru, 2017).

For our case study, we focus mainly on the 'project permit review' implementation phase, and the 'performance-based implementation' method. A few studies have focused on the project permit review implementation phase and on the performance based implementation method, and, therefore, there is limited guidance from literature (Berke, et al., 2006). This lack of documentation could be causing or exacerbating the assessment-implementation gap (Adams et al., 2018). Many benefits of the assessment phase may go unrecognized by not taking the outcomes of the performance-based evaluation into consideration (Bottrill & Pressey, 2012).

South Africa is very rich in biodiversity in comparison to other temperate regions (Reyers et al., 2007). It contains three biodiversity hotspots: the Succulent Karoo, Cape Floristic Region, and Maputoland-Pondoland-Albany hotspots (Mittermeier et al., 2005), is home to seven biomes, and approximately 80% of the country is covered with natural or semi-natural vegetation (Fairbanks et al., 2000). South Africa is a developing country, and its human population is expanding, which is consequently resulting in significant habitat degradation (Scholes & Biggs, 2004). In addition to habitat degradation, the space for the existence of both people and nature is becoming increasingly scarce, and this results in land-use conflicts (Venter et al., 2016). One of the major challenges of ecologically sustainable land-use and management involves reconciling conflicting goals and uses of the land (Dale et al., 2000). These goals include resource extractive activities; infrastructure for human settlement; recreational activities; services provided by ecological systems; support of aesthetic, cultural, and religious values; and sustaining the compositional and structural complexity of ecological systems (Dale et al., 2000). However, these conflicts can be partly resolved and avoided by using SCP (Margules & Pressey, 2000; McIntosh et al., 2017).

With over three decades of involvement in systematic conservation planning (Adams et al., 2018), South Africa has gained recognition as a global leader in this field (Knight et al., 2006; Kukkala & Moilanen, 2013, Sinclair et al., 2018). In the 1990s, systematic conservation planning was done as academic exercises to develop new methods and has since evolved to a well-developed practice within the public sector (Botts et al., 2019). South Africa is used as a

case study to assess the performance-based implementation of the Mpumalanga Biodiversity Sector Plan (MBSP) during the authorization application review[1] phase, by the local land-use planners within the Gert Sibande District Municipality.

South Africa recently promulgated an important piece of legislation that has a significant impact on applications for a change in land-use. This legislation is called the Spatial Planning Land Use Management Act (SPLUMA) (No. 16 of 2013). In addition to the proactive provisions of SPLUMA which allow for sector plans, such as the MBSP, to be considered during the Spatial Development Framework (SDF) preparation stage, Broberg (2003) recognises that there are three reactive points within the land-use planning process that create an opportunity for ecological input into the land-use planning process. These can be associated with reactive decision-making processes, which has been shown to provide least potential for biodiversity conservation (day to day planning activities) (Michalak & Lerner, 2007). The first opportunity would be when land-use change applications are advertised in the local newspapers for public comment before the final decision is made. Secondly, during site visits where the staff members meet with the applicant to discuss the proposed project and mitigation measures. And lastly, during planning tribunals, were individuals and groups are invited to testify about the merits or demerits of a proposed ordinance or development (Broberg, 2003).

The land-use planners have to make decisions daily to either permit or reject applications for development, while trying to balance economic growth, socially equitable growth, and protecting the environment (Brownlie et al., 2005). This process is made easier if they have the best available information, which is understandable, accessible, and user friendly, at their disposal. An example from the environmental sector would be the biodiversity sector plans (Reyers et al., 2007).

[1] 'Authorization application review' refers to EIA applications under review by the DARDLEA / DEA for authorization. From a local government perspective, such EIA applications are reviewed by the local municipality in their capacity as a 'commenting authority' to ensure alignment with the development priorities and environmental attributes in their area of jurisdiction.

The first SCP for Mpumalanga province was developed in 2006, and was updated in 2014. The 2006 version was known as the Mpumalanga Biodiversity Conservation Plan (MBCP), while the 2014 version is known as the MBSP and represents the province's current biodiversity sector's inputs into various planning processes. The combination of changes in physical landscape, technological advancement in biodiversity planning, and new and improved data sets, made it necessary for the MBCP to be revised and improved. The MBSP takes precedence over the MBCP as it replaces it and is the recommended version to be used by land-use planners and decision makers, as reference for biodiversity priority areas in the province (Mpumalanga Tourism and Parks Agency (MTPA), 2014). The MBSP also includes land-use guidelines. Most of the MBSP biodiversity map categories which are the basis for the land-use guidelines are similar to the zonation definitions of the planning schemes. This was done to allow for easy and adequate representation of biodiversity priorities in spatial planning systems, including SPLUMA (MTPA, 2014).

Subsequent to the finalisation of the MBSP and associated products, the Gert Sibande District Municipality bioregional plan was developed. This bioregional plan was based on the MBSP, but was created at a district scale, and contained information and categories relevant to the district only. The National Environmental Management Biodiversity Act (No. 10 of 2004) (NEM:BA) makes provision for the bioregional plan to be published in the Government Gazette for it have legal standing. During the consultation process required for the publishing of a bioregional plan, the Gert Sibande DM and local municipality officials were consulted and trained on how to use the MBSP for proactive forward planning, and in reactive decision-making by the MTPA biodiversity planners, i.e. conformance-based and performance-based implementation respectively. The Gert Sibande bioregional plan was peer reviewed and endorsed by the Bioregional Plan Review Panel, and it was ready to gazette for public comment in 2014/2015. However, updates from the revised National Biodiversity Assessment 2018, made it necessary for the draft bioregional plan wetland layers to be updated. This caused a delay in the gazetting process.

The aim of this study was to evaluate whether the performance-based implementation method was effective in reducing the planning-implementation gap during the authorization

application review phase of plan implementation. Furthermore, to assess whether systematic conservation planning translates into best practice implementation by local government officials. The objective of this study was to assess the use and effectiveness of the MBSP by land-use planners within the Gert Sibande DM, and to identify factors that facilitate or hinder the consideration of biodiversity priorities in daily land-use planning processes. The results from this study will assist in understanding, generally, how the transition of evidence into practice could be enhanced. Also the results will be helpful for future training that will be given to the other two district municipalities and will assist the MTPA to know how they can make the MBSP more useful to the land-use planners.

3.3 Methods

There are different types of interviews - namely, semi-structured, structured and unstructured interviews (Fox et al., 2000). For this research, qualitative, semi-structured, face-to-face interviews were conducted. Qualitative research involves open-ended questions that aim to get the perception of the interviewees' world and gives the interviewee a voice (McMillan & Schumacher, 1993). Face-to-face interviews are linked to the expectation that the interviewee will be more expressive than they would in a non-face-to-face questionnaire resulting in high quality data collection (Flick, 1998). The rationale for qualitative research was based on the nature of the research objective – the land-use planners' perception, use and effectiveness of the conservation plan within their municipality. Semi-structured interviews allowed for the land-use planners to be asked the same questions, but also gave the interviewer the freedom to probe the interviewee when there was a need for further elaboration (Fox et al., 2000).

Due to the fact that qualitative, semi-structured, face-to-face interviews were to be conducted for this research, the theoretical sampling method was used. This method allowed for the interviewees to be chosen in order to maximize diversity and for a widest range of responses from the land-use planners to be uncovered (Fox et al., 2000). The 13 municipal officials that were interviewed were composed of 12 town and regional planners and one environmental manager. The officials had different years of experience, held employment positions that offered exposure to different municipal planning instruments and processed/reviewed different land-use change applications. The senior land-use planner within GSDM was

approached for a list of all town planners who processed/reviewed land-use change applications within the local municipalities. Sixteen land-use planners were on the list, all of them were approached to request an interview but only 13 consented.

Apart from the environmental discipline route to enforce biodiversity conservation, land-use planning has also become a fundamental prerequisite for any spatial development that aims at social, ecological, and economic sustainability (Amler et al., 1999). Both the planning and environment sectors have a series of proactive plans that can be integrated. The former are reflected in the Integrated Development Plans (IDP), SDF, and zonal schemes, which, collectively, have many elements, such as urban edges and open space zoning, which have a strong environmental rationale (Sowman & Brown, 2006). The environment sector has Environmental Authorizations, Environmental Management Frameworks (EMF), Environmental Management Plans (EMP), Strategic Development Plans (SEA), biodiversity, air quality, and coastal management plans, that are usually represented spatially (Kotze, 2006).

The MTPA has created various products to support the implementation of the MBSP, such as; 1) Wall map, 2) MBSP Handbook, 3) Digital spatial tools (MBSP GIS viewer, MBSP web map application, mobile phone app), and, 4) Information data CD (MTPA, 2014). The MBSP is developed on a scale of 1:10000 to 1:250000. The MBSP Handbook, with interpretive material and land-use guidelines was produced to be used in conjunction with the map, especially to assist municipal-level decision-makers to integrate biodiversity into land-use decisions (Pierce et al., 2005). The MBSP map and handbook are both available for use to the general public online, and is easily accessible (http://bgis.sanbi.org/mbsp/project.asp). These guide forward planning and reactive decision-making, and help steer developments away from biodiversity sensitive areas (Pierce et al., 2005).

GSDM is one of three district municipalities in Mpumalanga Province. The other two are known as Ehlanzeni and Nkangala district municipalities. The GSDM is divided into seven local municipalities, namely Chief Albert Luthuli, Dipaleseng, Govan Mbeki, Lekwa, Mkhondo, Msukaligwa, and Dr Pixley ka Isaka Seme (GSDM, 2018).

3.3.1 Interviews

A schedule of questions (Appendix D) was used to conduct semi-structured interviews to gather information from appropriate individuals within Gert Sibande DM, and its local municipalities, respectively. The questionnaire was divided into four sections.

1) Background information: Land-use planners concerned with applications for land-use change in municipal administration, qualifications, job descriptions/responsibilities, number of applications assessed per month.
2) The land-use planning processes: Functionality of the land-use planning systems, working together of various departments within the municipality, key role players to decision making.
3) The MBSP/conservation maps: Any other environmental maps considered, indicating biodiversity sensitivity.
4) How the MBSP can be integrated into the municipal Spatial Development Frameworks.

The use of the schedule of questions added value to this study, and generated a set of relatively standardized responses that simplified the task of statistical analysis. In order to reduce social desirability bias, pilot interviews were conducted with colleagues, and with a town planner similar to the ones in this research sampling frame, but from another district municipality. This process ensured that the interview questions were clear and easy to understand.

Thirteen officials from the GSDM and its local municipalities involved in the assessment and commenting of land-use change/development applications in their respective municipalities were interviewed. These officials included 12 town and regional planners and one environmental manager. Hereafter all officials will be referred to as land-use planners for the purpose of this study.

The interviews were conducted in English between January 2016 and September 2017 at the respondents' offices. Depending on the willingness of the interviewee to divulge information, the length of the interviews varied from 30 to 60 minutes. All the interviewees signed an informed consent form for participation in the research interview, and all interviews were

voice recorded. The interviewees were also assured that all the responses/data collect for this research will remain confidential. The interviewees were given sufficient opportunity to answer the questions. All personal details, information, and responses were anonymised to protect confidentiality. The data from the questionnaires were typed by the interviewer immediately after the interviews per municipality, into separate data sheets using Excel.

3.3.2 Assessment of the MBSP implementation success

Based on the concepts presented in the introduction and the interview results (indicators), the following questions were formulated by the researcher as a guideline to assess the factors affecting the implementation performance of the MBSP within local municipalities in Gert Sibande district municipality (Table 3.2).

- Plan quality – Is the high quality conservation plan useful during the authorization application review process? We assumed that the MBSP and its products are of high quality.
- Awareness building – Has the training that was offered on the MBSP and its products been useful?
- Staff capacity – Would it be useful to increase the number of local planners dealing with the authorization application reviews in your municipality?
- Enforcement style – What kind of enforcement style was employed and was it useful during the authorization application review process?
- Used as part of the SDF or separately – During the authorization application review process was the MBSP consulted as part of the SDF or as a separate tool and how useful was it in guiding decisions?

A Likert scale consisting of four-point scale ranging from very useful to not useful was used to determine the extent of usefulness of the four areas of assessment during implementation.

It is important to mention that an inductive analysis was carried out for this research. The literature review of the concepts presented in the introduction of this paper, and the interview

results, were used to gather data. Thereafter, the researcher analyzed the data and looked for patterns that were used to develop theories that could be used to explain the patterns.

3.4 Results

Background information of the people concerned with land-use change applications

It was important to get insight of the staff performing the land-use planning function within the municipalities. The positions held by the land-use planners ranged from young professionals to management. The time they had been in the land-use planning field varied from one year to a maximum of 20 years. All the officials had tertiary level training, and 85% of them said that land-use planning was a profession of their dreams, as opposed to it being a profession of choice or circumstance. Seventy percent of the land-use planners were registered as candidates, and 30% as professionals, with their respective town planning/scientific boards. The land-use planners generally had similar responsibilities across local and district municipalities. All of the land-use planners assessed land-use change (authorization) applications, and 92% of the interviewees were/are involved in the SDF review process. There was no difference between the qualifications held by the land-use planners in the district and local municipalities.

There were capacity constraints within all the local municipalities. Five of the eight municipalities had vacant posts, and staff either took on heavier workloads, or employed interns to assist with the shortage. However, the land-use planners in two of the three municipalities without vacancies also mentioned that they experienced capacity constraints, and resorted to either getting an official from another division within the municipality, or hiring an intern, to assist with the land-use planning function. Two of the land-use planners in one municipality were Municipal Infrastructure Support Agents (MISA), which were officials employed by Provincial Cooperative Governance and Traditional Affairs (CoGTA), and placed in understaffed municipalities to provide technical support to the municipalities.

The land-use planning process

The type of land-use change applications that the land-use planners collectively assessed included: subdivision or consolidation for established townships and farm lands, rezoning, township establishments, telecommunication masts, consent use, removal of restrictions,

mining and prospecting, and Environment Impact Assessments (EIA)[2] triggered listed activities. Township establishments, subdivision or consolidation, rezoning, and others, were the most frequently mentioned types of applications received and assessed, while mining/prospecting, telecommunication masts, and EIA triggered listed activities were the least frequently mentioned (Figure 3.1).

When assessing applications, the process followed differed according to the type of land-use change application, and it was guided by the timeframes. SPLUMA divides application types into two categories. Category one applications include: township establishment or extension, amendment of existing scheme or land use scheme (LUS) by rezoning, removal, amendment or suspension of a restrictive or obsolete condition, servitude or reservation registered against the title of the land, amendment or cancellation of general township plan, subdivision and consolidation of land, permanent closure of public space, consent or approval required in terms of a condition of title, establishment of township, existing scheme, and consent or approval provided for in a provincial law. All category 1 applications and all opposed category 2 applications are referred to the Municipal Planning Tribunal.

Category two applications include: subdivision of any land where such subdivision is expressly provided for in a LUS, consolidation of any land, consent of the municipality for any land-use purpose or departure or deviation in terms of a LUS or existing scheme which does not constitute a land development application, and removal, amendment, or suspension of a restrictive title condition relating to the density of residential development on a specific erf where the residential density is regulated by a LUS in operation. All unopposed category 2 applications are considered and determined by the authorized official.

However, the general process was as follows for category two applications:

[2] The planners assessed the EIA applications, mining, and prospecting right applications as commenting authorities, not as the competent authorities, in order to ensure alignment with the development priorities and environmental attributes in their respective jurisdictions.

The administrative phase (12 months) - the application was received and a reference number was allocated to it. It was then checked for compliance according to the land-use planning minimum standards, as guided by the processes and procedures stipulated in the planning commissions, governing bodies, local ordinances, municipal by-laws, and state law (Broberg, 2003). If it met the minimum standards, it was accepted for further review and comments by municipal staff, and an acknowledgement letter was sent to the applicant. The letter advised the applicant to advertise their application in the local press, on site, and to notify neighbours (Forbes, 2011). The application was then circulated to the other internal departments for comments for a period of 60 days.

The consideration phase (Maximum of 3 months) - The land-use planner then assessed the application, taking into account the other internal comments received. The decision phase (30 days) - The land-use planner gave a recommendation, and forwarded it to the assistant manager or council for approval or rejection. The land-use planner could reject the application at any stage, even before forwarding the application to the assistant manager. The grounds of rejection were stipulated in the response issued to the applicant. The applicant, thereafter, decides whether to resubmit a failed application or not.

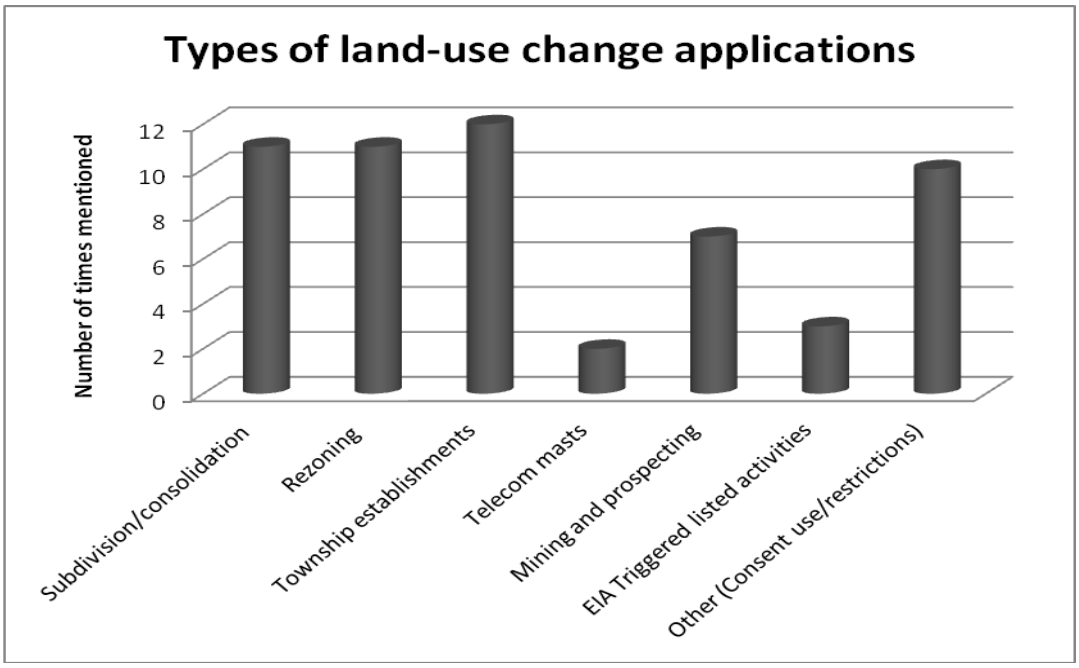

Figure 3. 1 Types of land-use change applications assessed by municipal planners.

The number of land-use change applications that land-use planners assessed were determined by the development within their jurisdiction. Gert Sibande District Municipality is a rural district, and, as such, there are a few land-use change applications to assess. Most of these land-use change applications were assessed by the local municipalities, and only escalated to the district level when the local municipality was incapable of assessing the application before its deadline. The amount of time the land-use planners spent on evaluating development applications was also determined by the type of applications, and the number of applications they received/pending review and/or decision. The more applications pending, the less time they spent per application. The time the land-use planners spent to review applications and give final comments varied on average from a minimum of four days to about six weeks.

Tools such as the Environmental Management Framework, the municipal by-laws, the MBSP and its products, and the environmental studies undertaken for the application, were used in making planning decisions regarding the environment/biodiversity conservation. Should the land-use planners have encountered difficulties with environmental or biodiversity issues when assessing applications, the most frequently mentioned source of advice was sought from a) the district municipality environmental section, b) other government departments, including the national Department of Environment, Fisheries and Forestry, or c) the MBSP maps integrated in their SDFs (Figure 3.2). The land-use planners mentioned that they did not approve any developments that triggered the EIA listed activities unless an Environmental Authorization was already granted. This is a condition that is stipulated within the GSDM by-laws and complies with SPLUMA.

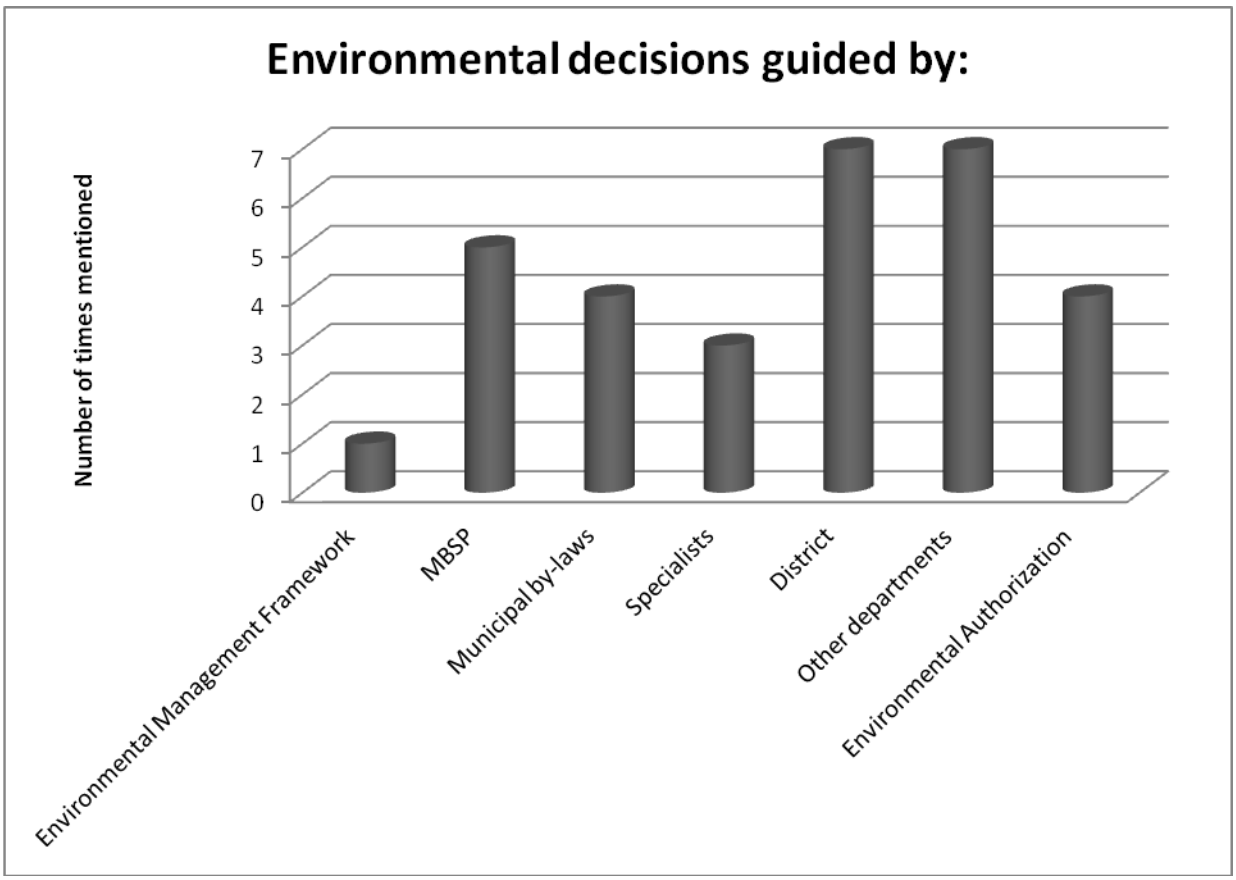

Figure 3. 2: Sources of environmental information used by land-use planners to guide environmental related decisions

None of the land-use planners had consented to applications that were proposed on sensitive environment/biodiversity areas. Any objections that were made by land-use planners or council were based on town planning merits, town planning regulations, and the SDF, as opposed to the MBSP and its products. The three municipalities (Lekwa LM, Chief Albert Luthuli LM, AND Govan Mbeki LM) that did have the MBSP layer integrated into their SDF environmental layer, mentioned that all areas of sensitivity identified in the MBSP had been excluded from future development planning, i.e. the MBSP sensitivity areas effectively becomes the planners' decision to not approve the development, when proposed in areas of biodiversity or environmental sensitivity.

The land-use planners mentioned that, sometimes, there were contradictions with the comments that a land-use change applicant might receive from the district, local, or the

environmental management sections, within the municipalities. This contradiction normally arose when the applicant submitted their application to the district and not the local municipality, or to both municipal levels, in the hope of getting a quicker response from either one of the two parties. The district municipality land-use planners indicated that all approvals were granted at the local municipalities, as their role at the district level was only of a commenting authority, i.e. the decision-making was delegated to the local municipality.

The use of SCP maps

All the land-use planners considered biodiversity to be relevant to their work/profession, on the basis that it is partly their responsibility to protect the environment, and that they have biodiversity sensitive areas within their respective municipal boundaries. About 88% of the land-use planners within municipalities that included the MBSP in their SDF knew about the MBSP and its other products. There were mixed feelings about the MBSP and its products from those who knew about it (Table 3.1).

Table 3. 1: Positive and negative perceptions of the MBSP from the interviewees

Positive perception statements	Negative perception statements
"The current MBSP is most welcome. It breached the gap with planning and environment as it has similar criteria in land-use guidelines. It is very innovative".	"Not that comfortable to use it, the reality is that there is a direct conflict between conservation and development. It is important but I think that it is exaggerated and does not face up to reality".
"It is the easiest tool to use. We requested for the local municipality to use the MBSP to inform their SDF environmental layer. It appears to be well researched and has a good level of detail. It makes life easy, all the information is accessible".	"Not sure how long it takes to update the maps".
"It makes life easier as one can easily identify the biodiversity sensitive areas".	"It is easy to understand but not so easy to interrogate".
"It is a broad concept".	
"It is very useful, a tool accessible by all officials".	

The district municipality and the four local municipalities have the different MBSP products at their disposal. These products include the wall map, handbook, mobile app with the map, and the CD software with the map that does not require GIS enabled computers (Figure 3.3). About half of the 75% who knew about the MBSP indicated that they used the MBSP. Those who used it often, found it very useful, because it informed them about the sensitive biodiversity areas when assessing land-use change applications, and it reduced the amount of time the officials spent doing site visits. The land-use planners had not identified any mistakes on the MBSP or its products, as most of them were still getting familiar with them, and, also, because they are not specialists when it comes to systematic conservation planning. Approximately 22% of those who use the MBSP and its products indicated that the MBSP and its products can be improved by updating it regularly, so that it can always be a true representation of what is happening on the ground. It is viewed that the lag time between the developments and the updating of the MBSP could cause potential conflict.

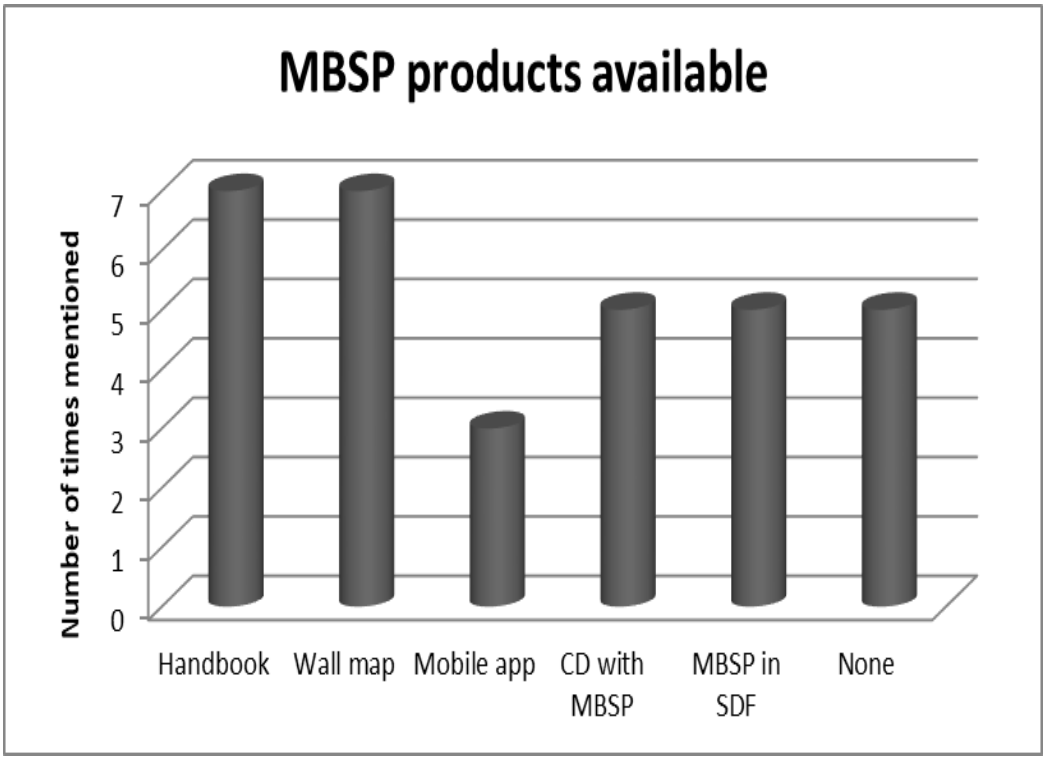

Figure 3. 3: Types of MBSP products that land-use planners have available to support decisions

The 25% of land-use planners who did not know about the MBSP indicated that they would like to get exposure so that they can also use the products. The district land-use planners

thought that the MBSP should inform the SDF environmental layer, so that all land-use planners are acquainted with it, and can use it.

Integration of the SCP maps into the SDFs

All the land-use planners agreed that the SDF was the "principal strategic planning instrument which guides and informs all planning and development". This is because it provided the spatial vision of the municipality and all other municipal plans must align to the vision. The SDFs are to be revised every five years. The interviews revealed that the district municipality SDF, and two of the local municipalities SDF were revised during 2014-2016. Only two of the SDFs were being reviewed during the time of the interview. Three of the other local municipalities SDFs were due for revision during the 2015/2016 financial year. The delay was due to slow administrative issues relating to budget allocations. One of the local municipalities mentioned that the SDF review was not included in the 2015/2016 financial year budget, and, therefore, will only be reviewed in the next financial year.

The SDFs are not necessarily started afresh, but they are revised in order to address the shortcomings of the previous one, and to include emerging developments. All of the land-use planners were involved, or will be involved, in the SDF review process. At the time of the interview, there was a lack of capacity within the municipalities to drive the SDF review process from start to end. Consequently, service providers were outsourced to drive the process. The involvement of the land-use planners was, therefore, limited to data collection from internal and external stakeholders, and to ensuring that the final SDF was a correct spatial representation of the municipal areas.

About 54% of the land-use planners believed that the SDF was developed or reviewed because the municipalities understood the importance and value of the SDF, as opposed to 23% who believed that it was developed in compliance to legislation. The remaining 13% believed that the SDF was developed as a result of both aspects. However, the land-use planners indicated that the IDP was considered of greater importance than the SDF, and that financial constraints also prevented the importance of the SDF from being fully realized within the municipalities. Sixty-nine percent of the land-use planners found it difficult to get

support from internal departments with regards to the SDF review and implementation process. One municipality indicated that "the planning element is neglected, the SDF is neglected, and that the final product is vague" within their municipality, because of lack of support. Those municipalities which are getting support, reported that they did a lot of awareness raising in order to sensitize their colleagues in other internal departments about the SDF, and of its importance.

When asked what they think needs to be done for the MBSP to be included in the municipal SDFs, the district municipality and two of the local municipalities proudly acclaimed that this was already done with respect to their municipalities. Some of the land-use planners suggested that the MTPA should be part of the SDF review process in order to ensure that their product is included in the SDFs. One land-use planner was concerned that the difference in the years that the SDFs and the MBSP are reviewed should be aligned, so that the best available MBSP information is included in the SDFs.

An assessment of the factors affecting the implementation performance of the MBSP was done (Table 3.2) and the following was noted. The high quality status of the conservation plan was generally very useful within municipalities, as it allowed for perfect integration into the proactive planning tool and also assisted in outlining all the areas of biodiversity sensitivity that had to be excluded from development during the authorization application review. The training was useful, and exposed and encouraged the land-use planners to use the conservation plan and products during proactive and reactive decision-making planning processes. An increase in the number of land-use planners dealing with authorization application reviews was found to have the potential to result in more time and attention being given to each authorization application. The deterrence enforcement option is aligned to the prescribed method in the SPLUMA (2013). Land-used planners use the conservation plan that was integrated into the SDF both for proactive planning and reactive decision-making. Most land-use planners do not consult the MBSP and its products as separate tools from the SDF to inform decision-making.

Table 3. 2: Assessment of factors affecting implementation performance of the MBSP within Gert Sibande LMs

	Plan quality (Integration)	**Awareness building (Training)**	**Staff capacity (Human resources)**	**Enforcement style**	**Use as part of SDF**	**Use separate from SDF**
Lekwa LM	Very useful	Useful	Moderately useful	The general process followed by the land-use planners during authorization application review is more inclined to the deterrence style than the facilitation style. This style is very useful for plan implementation as it is prescribed by law.	Very useful	Useful
Chief Albert Luthuli LM	Very useful	Useful	Moderately useful		Very useful	Not useful
Govan Mbeki LM	Very useful	Useful	Not useful		Very useful	Useful
Mkhondo LM	Very useful	No use	Useful		Very useful	Not useful
Msukaligwa LM	Useful	Useful	Moderately Useful		Not useful	Useful
Dr Pixley ka Isaka Seme LM	Useful	Not useful	Useful		Not useful	Not useful
Dipaleseng LM	Useful	Not useful	Useful		Not useful	Not useful

3.5 Discussion

In recent years, numerous authors have called for increased coordination between land-use planners and ecologists, and, therefore, for greater integration of conservation assessments and land-use planning strategies and products (Theobald et al., 2000; Dale et al., 2000; Michalak & Lerner, 2007; Stokes et al., 2009). However, there is still an information gap that remains. Over time and with experience gained, SCPs seemingly become increasingly precise; but research on the implementation of these products by local government decision-makers is almost non-existent (Theobald et al., 2000; Wilhelm-Rechmann & Cowling, 2013). A similar problem was realised within the planning sector, where the government has been criticized for spending a lot of resources making plans without them being implemented (Norton, 2005; Berke et al., 2006). Contrary to the findings and conclusions of others (Michalak & Lerner, 2007; Stokes et al., 2009; Wilhelm-Rechmann & Cowling, 2013), the findings of this study indicate that there is an extensive usage of conservation planning products, and of the proactive plans, by local land-use planners during the reactive decision-making process to conserve biodiversity, resulting in the implementation of the SCP.

For almost two decades, planners have continued to evaluate what happens to plans after they are adopted, and they have tried to identify factors that seemingly facilitate implementation and effectiveness (Alexander & Faludi, 1989; Talen, 1996; Laurian et al., 2004). The existence of national planning legislation and mandates, is one of the variables that have been found to often lead to the success of conservation planning, and to plan implementation (Berke & French, 1994; Dalton & Burby, 1994; Pendall, 2001, Berke et al., 2006; Bottrill & Pressey, 2012). This is the case in our study and was also similar to findings of the mainstreaming process in Costa Rico (Huntley, 2014). However, in instances where there is no legal framework to facilitate the integration of conservation plans into other sectors or in decision-making, developing conservation plans in the absence of such frameworks will assist in showing the usefulness of the plans, and will, therefore, prompt amendments to existing legislation or development of new legislation to accommodate the conservation plans (Botts et al., 2019). This will definitely assist in narrowing the assessment-implementation gap.

Plans have been found to affect the probability of a specific development taking place, and probability is based on the policies and politics of local government (Feitelson et al., 2017). For example, section 22(1) of SPLUMA restricts decision-makers from taking land-use change/development decisions that are inconsistent with the SDF (Nel, 2016). None of the land-use planners in this study had consented to development applications that were proposed on sensitive environment/biodiversity areas, and these decisions were based on town planning merits, town planning regulations, and the SDF.

Overall, the land-use planners had positive perceptions of the benefits of using the SCP or MBSP maps. However, the land-use planners admitted to using the SDF map because the MBSP was included in the environmental layer of their SDFs. This shows that there is benefit in mainstreaming SCP and products into the proactive tools of land-use planning for performance-based implementation (Michalak & Lerner, 2007).

Good quality plans have been found to encourage and enhance communication and understanding, and provide clear guidelines to assist in both conformance-based and performance-based implementation (Berke et al., 2006; Feitelson et al., 2016; Rudolf & Gradinaru, 2017). Other studies have found the quality of plans to have more influence on conformance-based implementation success than on performance-based implementation success (Berke et al., 2006). In our study, we assumed that the conservation plan is of high quality, given that it was developed based on the best available biodiversity data, it was suitable at the required scale of implementation (1:10 000 to 1: 250 000), it was well aligned to the municipal administrative jurisdiction, it was well integrated into the local planning proactive plans and, was not in conflict with these plans (Kullberg & Moilanen, 2014; Botts et al., 2019). In addition, land-use guidelines for authorization application reviews were provided together with the conservation plan, and end-use products, such as the handbook and wall map, were developed. These end-user products have been found to encourage the implementation of conservation plans (Botts et al., 2019). Based on feedback (Table 3.2), the conservation plan and its associated products were also considered by land-use planners to be of high quality, and were generally very useful and adequate for performance implementation. This was a similar finding to Rudolf & Gradunaru, (2017:13), who found that "The quality of the plans was significantly correlated with their performance, i.e. their perceived usefulness

for steering municipal development in day-to-day planning practice, when measured according to both the communication- and action-oriented dimensions of the plans. "

The SCP products are created with implementation in mind, but, because they are designed by conservation scientists, they usually require to be simplified, explained, and interpreted for land-use planners to be able to effectively use and implement them (Prendergast et al., 1999; Theobald et al., 2000; Driver et al., 2003; Pierce et al., 2005). This study showed that learning fosters a better understanding of plans, the goals they aim to achieve, and the policies that regulate them (Berke et al., 2006). Also, through the learning process, local government got new ideas about how to integrate and implement conservation plans into the authorization application review process (Burby, 2003). Building the capacity of conservation plan implementers allowed them to meaningfully engage with the SCP products, in order for informed comments and decisions during the authorisation application review process, and, therefore, facilitates the performance implementation of the SCP (du Plessis, 2008).

It was suggested by most of the land-use planners that training on different SCP/MBSP products, and the use thereof, be conducted again. A once off training session was not enough as there is a high turnover of staff within the municipalities. Others have recommended that multiple training sessions should be scheduled for municipal planning staff, so that the multiple exposures to SCP/MBSP may have a lasting impact on changes in behaviour (Wilhelm-Rechmann & Cowling, 2013). The continued contact between the conservation planners and the land-use planners would also influence partnerships and collaborations between the two sectors (Pasquini & Cowling, 2015).

Considerable capacity in terms of human resources and skills or expertise is required to adequately produce conservation plans, integrate them into proactive planning tools, and to process the project authorization applications (Berke et al., 2006; Dalal-Clayton & Bass, 2009; Nel, 2016). Ideally, government agencies should have in-house staff to perform these duties, as it fosters knowledge retention, consistency, and would ensure timeous revision and reviews of the plans (Roux & Nel, 2013). However, as our study shows, when there is a lack of internal capacity, consultants can be procured to assist the local government land-use planners with the technical expertise and knowledge required to produce plans (Botts et al.,

2019). Unfortunately, the credit for the iterative usage of the conservation plans and products is with the consultants who review the proactive planning tools (Wilhelm-Rechmann & Cowling, 2013). Our results show, and concur, that biodiversity conservation can be a success, when biological information is strategically crafted and integrated into the decision-making frameworks of the planning process (Duerkson et al., 1996). However, deferring the responsibility of using the conservation plan products to consultants is not beneficial to the land-use planners, who make land-use change decisions on a daily basis during project authorization application review. This limits the use of the conservation plan in an iterative manner, and defeats the purpose of building long-term national or regional networks (Huntley, 2014). This further limits the practical implementation of the conservation plans by government officials in non-environmental land-use roles, which is normally facilitated through learning by doing (Sinclair et al., 2018).

Staff capacity has an important influence on plan implementation success (Berke et al, 1999; Burby, 2003; Dalton & Burby, 1994). If more local planners are available to process project authorization applications, more time and attention is given to the project authorization application review, plan policies and regulations are better explained, and more consultation and coordination with other government or non-government agencies responsible for authorization application review is also done (Berke et al., 2006). Our assessment shows that more staff would be useful for the implementation of SCP products during the authorization application review processes. This finding is inconsistent with the findings of Berke et al., (2006) which showed that increased staff capacity had no significant effect on performance of councils in implementation.

Different enforcement styles are used to achieve implementation, these include, for example, deterrence, facilitation, and the use of incentives and informational techniques (Balch, 1980; Burby et al, 1998; Kagan, 1994; Scholz, 1994; Berke et al., 2006). The general process followed by land-use planners in our case study is more inclined to the deterrence enforcement style. This is because, by definition, the deterrence style "emphasizes a strict interpretation of plan policies, a reliance on legalistic and punitive rules, a minimal provision of technical information and assistance, and written rather than verbal modes of communication in processing authorization applications" (Berke et al., 2006:595). The

findings of Berke et al., (2006) from the plans, permits, and district-council planning agencies in New Zealand show that councils that used the deterrence style with authorization applicants were more likely to advance the performance-based implementation success of the SCP.

The advantage of integrating the conservation plan into the proactive planning tools is that future development is steered away from the biodiversity sensitive areas (Pierce et al., 2005). In our case study, the land-use planners tend not to consult the conservation plan as a separate product during reactive decision-making, because they know that it is already included in the proactive SDF planning tool. This is good, because it limits different interpretations or subjectivity on biodiversity priority areas when using the performance-based implementation method. Nevertheless, whether a decision was made from the conservation plan integrated into the SDF or from the separate use of the conservation plan, is not important for performance-based implementation. This is simply because "if the plan is consulted as part of the decision-making process, it is being implemented" (Loh, 2011:273), ultimately, reducing the assessment-implementation gap, and conserving biodiversity.

Implementing the SCP as part of the proactive planning tools and separately during performance-based implementation may influence the planners' perceptions of the importance of biodiversity. The planners' personal perception of their responsibility to conserve biodiversity ultimately influences the information used and prioritized in the decisions of the land-use change applications that they receive (Miller et al., 2008; Stokes et al., 2009). The stronger the perception, the more likely it will be for the land-use planners to follow their plans to the letter, even though this could result in them turning down projects that would be beneficial to the municipality (Loh, 2011).

The MBSP and its products will need be to be reviewed and updated every five years, in order to keep up and contribute to the growing body of evaluation, and as best practice for conservation (Reyers et al., 2007). The use and implementation of the conservation plan, and its products during the authorization application review process, will help identify any shortfalls of the data and information so, that they can be addressed before or during the review process (Knight et al., 2006; Reyers et al., 2007).

Most of the land-use planners were struggling to get internal support during the SDF review process, showing a lack of intersectoral engagement within the municipality, poor intra-governmental relations, and institutional constraints (Pasquini et al., 2013; Ruwanza & Shackleton, 2016). These institutional 'silos' that inhibit collaboration among departments and individuals within a municipality is a long standing problem (Critchley & Scott, 2005). The presence of silos causes the municipal officials to struggle with the notion of biodiversity mainstreaming, which further reduces the implementation of SCP and products within different sectors (Ziervogel & Parnell, 2012; Ruwanza & Schackleton, 2016). Alternatively, the presence of silos could be advantageous to the municipal officials. Once the officials from other departments within the municipality see value of using conservation plans to conserve biodiversity and to inform decisions within the land-use planning department, they will most likely take ownership of the conservation plans themselves (Botts et al., 2019). Each municipal internal department could also take more responsibility for biodiversity/environmental decisions themselves, without relying on other municipal internal departments. This would broaden the context for the implementation of the SCP within their sectors.

If municipal officials are struggling to work together for the production of a tool that is within their mandate, it could be even more difficult for them to accept working together regarding biodiversity or environmental issues, which could be regarded as a responsibility of another department (Sowman & Brown, 2006). Understandably, generating support for biodiversity or environmental related issues/tools can be challenging, more especially from local government stakeholders mandated to drive development (Postel & Thompson, 2005). This is because most of these stakeholders think that the implementation of these tools limits growth and development (Snyman, 2017). In such instances, a financial quantification of the economic value of the ecosystem services provided by protecting biodiversity can be used to persuade the stakeholders of the importance of integrating and implementing the biodiversity or environmental focused tools (Pagiola & Platais, 2007).

Our research indicated that the land-use planning function within the municipalities was being performed by qualified personnel, which is in contrast to the problem of inappropriate appointments within municipalities, as identified by the Department of Co-operative

Governance and Traditional Affairs (CoGTA, 2009). The land-use planners that were interviewed all had the responsibility of reviewing the SDFs and assessing land-use change applications, which reinforces their relevance to this study. The fact that most of the land-use planners were young professionals, with candidate registration in professional boards, showed that the older planners are being replaced by younger ones. This change could be beneficial to facilitate the transition from assessment to implementation of conservation plans. Older planners could be used to the old way of decision-making based on past experience, outdated laws and regulations, and could be resistant to change and learning new things, such as such biodiversity mainstreaming (Sitas et al., 2014).

Most of the land-use planners indicated that they are in the profession of their dreams, which means that they have a sense of satisfaction and fulfillment in their jobs given that they are doing what they love. The satisfaction and fulfillment in their jobs might be thwarted by the human resource capacity constraints that the land-use planners face. These capacity constraints could consequently cause the land-use planners to be overworked, and less likely to appreciate further training and information, or to keep abreast with new products or tools (Wilhelm-Rechmann & Cowling, 2013).

Many South African district and local municipalities lack environmental management departments or environmental managers internally (Pasquini et al., 2015). GSDM is fortunate enough to have such a unit to advise local municipalities on environmental related matters, including biodiversity. In-house biodiversity specialists have been shown to influence greater involvement of local municipalities in conservation planning (Miller et al., 2008). The expansion of such departments to local municipalities would improve the usage of conservation plans, and, therefore, enhance biodiversity conservation. Without more human and financial resources dedicated to biodiversity conservation, many municipalities will have less effective planning tools that address biodiversity loss (Stokes et al., 2009).

Some municipalities (Dipaleseng LM, Dr Pixley ka Isaka Seme LM, and Msukaligwa LM) did not yet have the MBSP informing their SDF environmental layer, because the SDFs were behind their review schedule as a result of budget constraints. The results suggest that there

could be a connection between overall funding and conservation, or at least in the use of conservation maps (Miller et al., 2008; Stokes et al., 2009).

With regards to the negative perceptions of some land-use planners about the MBSP (e.g. "…exaggerated and does not face up to reality" and "it is easy to understand but not so easy to interrogate"), it is assumed that these perceptions could be related to the issue of scale. The MBSP was developed at a scale of 1:100000 to 1:250000, which, for example, using a scale of 1:250000 means 1cm on the map is equal to 2.5 km on the ground. The inability to understand the scale could lead to mistrust of the tool entirely (Brownlie et al., 2005). Other project level integrated environmental management tools such as the EIA and the EMFs that are able to sufficiently deal with this limitation are needed (Brownlie et al., 2005).

3.6 Conclusion

Overall, we have shown that the land-use planners have sufficient planning tools and conservation planning products, that are compatible to assist in the routine consideration of biodiversity in their project authorization application review processes. Concluding purely on the conceptual definitions of performance-based and conformance-based implementation, and from the performance implementation assessment above, the following can be said about plan implementation success. The performance implementation focused on the performance of the SCP and its products – that is, on the degree to which the plan is actually used during the project authorization application review process by local land-use planners to inform decision (Mastop & Faludi, 1997). Our study showed that the conservation plan is being consulted sufficiently during the authorization approval process, and, therefore, the performance-based implementation method seems successful in bridging the assessment-implementation gap. High plan quality, awareness building, staff capacity, and the deterrence enforcement style, affected affect implementation performance.

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3.8 References

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CHAPTER 4: GENERAL DISCUSSION, RECOMMENDATIONS FOR FURTHER RESEARCH AND CONCLUSIONS

4.1 Introduction

The land-use planning sector continues to present an avenue for mainstreaming biodiversity conservation plans and local land-use planning (Dalal-Clayton & Bass, 2009), and the results of this study show that this opportunity is used sufficiently although there is room for improvement. This research, as well as results from other studies, both within the developing and developed countries, show that there are factors that facilitate the mainstreaming process and the transition process within the land-use planning sector (Huntley, 2014; Adams et al., 2018; Botts et al., 2019). Such factors include: the presence of spatial planning tools in land-use planning, and of conservation planning products within the environmental sector, coupled with the underlying legislative frameworks within both sectors to enable integration and implementation, high quality conservation plans and end-user products, best available biodiversity data, capacity building, and dedicated officials (Pendall, 2001; Berke et al., 2006; Feitelson et al., 2016; Rudolf & Gradinaru, 2017; Botts et al., 2019). However, even with these factors, "every planning context is unique, and there will be no "one size fits all" strategy for moving from assessment to implementation" (Adams et al., 2018:9).

4.2 Aims, objectives and general discussion

This study has sought to use conservation and land-use planning in South Africa as a case study to understand the complexity and challenges to mainstreaming biodiversity and to assess whether systematic conservation planning translates into best practice implementation by government officials in non-environmental land-use roles. To achieve these aims, four main activities were undertaken. The first was to review and discuss the legislative and policy frameworks of relevance to the relationship between environmental management/biodiversity management issues and planning, with particular reference to the SDF processes in South Africa. The second activity was to assess the SDF documents, and conduct geographic information systems (GIS) analysis with the SDF GIS data to assess integration. The third

activity was to conduct interviews with the land-use planners at the district and local government level in Gert Sibande to evaluate their understanding, use and effectiveness of the conservation plans. And the fourth activity was to identify factors that facilitate or hinder the consideration of biodiversity priorities in daily land-use planning processes. The GIS analysis, the assessment of the SDF documents, and the interviews, fed into the analysis phase, from which emerged the various points for discussion in this document. From the analysis and discussion, a number of key conclusions can be drawn.

Planning is a continuous, ongoing process, and, as such, it is difficult to really know whether planning has succeeded (Talen, 1997). But, through implementation and plan assessment, we can tell whether planning is succeeding or not (Loh, 2011). In the last ten years, the conservation planning field in South Africa has transitioned into an operational/implementation phase. This phase is characterized by government-led plans, which were created with the intention of informing spatial planning and decision-making in different sectors (Botts et al., 2019). As shown in this case study, and briefly outlined below, this is the stage in which the Mpumalanga Biodiversity Sector Plan (MBSP) is in.

One important factor that helps the integration and implementation of biodiversity priorities and conservation plans is rooted in the requirements of laws and regulations, such as the Constitution, the Spatial Planning Land Use Management Act (SPLUMA) (2013), and National Environmental Management Biodiversity Act (NEM:BA) (2004). The SPLUMA calls for environmental sustainability, and a multi-discipline land-use planning process which considers other sector plans. The NEM:BA allows for the development of biodiversity sector and bioregional plans, and the integration of such plans into the SDFs. Besides the institutional limitations, both within local, provincial, and national spheres of government, the provisions and requirements of these legal frameworks are being implemented, and, hence, the improvement of the conservation plan implementation in South Africa (Knight, et al., 2006).

The spatial relationship between proactive planning tools (e.g. SDFs) and the conservation plans provide an avenue for the integration of biodiversity priorities and conservation plans into land-use planning at a spatial level. Our findings show that the availability of useful, credible, and up-to-date biodiversity data/information and conservation plans, at the relevant

scale, supported their implementation (Pierce et al., 2005; Amundsen et al., 2010). This provides a "one-stop-shop" (Brownlie et al., 2005:220) and allows for local government to easily integrate the biodiversity data/information and conservation plans into the provincial and local government spatial planning tools, such as SDFs. The increased integration of conservation plans into other sectors beyond Biodiversity, indicates that the conservation plans are being consulted during reactive decision-making processes (Adams et al., 2018).

Our findings emphasise the importance of having dedicated staff both within the biodiversity sector and local government, to ensure that the conservation plans are integrated and implemented through the best available land-use planning tools. These staff can assume an environmental leadership role across a wide range of levels within the local government - from junior staff to senior executives, and elected representatives (Brown, 2005).

In addition to the legislative mandates and dedicated officials, plan quality, awareness building, staff capacity, and deterrence enforcement style, are other variables that encourage Systematic Conservation Planning (SCP) uptake and implementation (Berke et al., 2006). The results from the interviews, and analysis of the performance implementation of the conservation plan (MBSP), showed that the performance-based implemented methods were employed and used by the land-use planners to guide decisions during the project authorization application review process. The land-use planners hardly used/implemented the conservation plan, and its associated products, separately from the proactive municipal planning tool during the reactive planning process. This shows that the "upstream" integration of biodiversity in land-use planning tools "has significant advantages over piecemeal consideration of biodiversity at mandatory, project level" (Brownlie et al., 2005:224).

The three main barriers recognised in mainstreaming literature relating to capacity constraints – lack of human resource, lack of skills or expertise, and lack of financial resources - were also evident in this research, as these barriers hampered the consideration of the environment on decision making processes. In terms of human resource, the planning agenda is usually always full in any given local government (Measham et al., 2011). Although some local governments have vacant posts, the need for biodiversity mainstreaming into local land-use planning competes for time with other pressing or highly prioritized needs, such as water

provision or infrastructure. Consequently, the highly prioritized needs will be addressed first, which shows that the issue of competing priorities within local government is inherently related to the issue of resources and basic needs (Critchley & Scott, 2005). This can be explained better through the Maslow's Hierarchy of Needs (Gordon, 1965).

In 1943, Abraham Maslow developed a theory in psychology known as the Maslow's hierarchy of needs, that can be applied to organisations and their employees (Gordon, 1965). This hierarchy is comprised of five needs which are: (1) Physiological needs (food, water, warmth), (2) Safety needs (security), (3) The need to belong and love (intimate relationships, friendships), (4) Esteem needs (prestige and feeling of accomplishment, and (5) Self-actualization (achieving one's full potential). Basically, this theory holds that one does not feel the second need until the first need is satisfied and so on (Nyameh, 2013). Therefore, for example, the land-use planners will not feel the need for biodiversity mainstreaming until water has been provided for the whole municipality.

Our findings show that, at the time of this study, the planning departments were not adequately staffed. As a result, the local land-use planners lacked the time and human capacity to review their proactive planning tools such as the SDF, and also to meaningfully integrate the conservation plans into the proactive planning tools. They resorted to hiring consultants to assist with this process. In the end, the legislative requirement of integration is fulfilled, but, unfortunately the local land-use planners miss out on the opportunity to use the conservation plans in an iterative manner, and to build their own capacity to sustainably add value to enhance efficient service delivery.

It is very common for municipalities to be highly constrained financially (Pini et al., 2007). Partly, this is because there are a wide range of activities that they are engaged in (Measham et al., 2011), but also from the fact that they are only allowed to derive revenue from rates and taxes or from national government allocations (Pasquini et al., 2013, Manyaka, 2014). The lack of funding disables the municipality from hiring consultants to review their proactive plans on time (i.e. if funding is not available this financial year, they will have to wait for funds to be available in the coming financial year), and this ultimately hinders biodiversity mainstreaming.

The manner in which the consultants used the conservation plan, and the biodiversity data that were available to them, to inform the environmental layers of the proactive planning tool during the integration process, was inconsistent among municipalities. There is no formal document that guides consultants on how, and which layer files, to merge in order to create the best environmental layer for integration into the proactive planning tool. This opens room for subjectivity and it is not best practice. At the initial stages of this study (2016/2017) such a document was not available, but it was subsequently developed by the South African National Biodiversity Institute (SANBI) (SANBI, 2019). Therefore, this gap has subsequently been addressed.

It is important for plans to retain a degree of stability by not changing drastically with each review (Nel, 2016). The on-time review of the proactive plans, as prescribed in legislation, and the standardized document to guide consultants in the use of biodiversity data, could help to deal with any instability.

The approach that I used to assess the performance implementation success is by no means perfect, as it is not based on direct measurements (actual proportion of implemented policies, or assessment of changes in land-use patterns on the ground), but it is based on the perception of the interviewed local land-use planners. The tendency of local land-use planners to provide desirable answers during interviews may have introduced some bias into the analysis. This study was also conducted by someone from the biodiversity conservation sector, and, therefore, the study might be biased towards the subject of biodiversity. The interviews were conducted during 2016-2017, and the landscape within the local and district municipalities has changed, as more posts have been filled and three local municipalities are developing their own land use schemes in-house. These can be viewed as weaknesses of our case studies.

An important implication of this study is to promote conservation planning assessments that are founded on biodiversity information, and data that are accurate, easy to interpret, and freely accessible to all government and non-government individuals, to enable them to fulfil their legal and moral responsibility for the environment, as stipulated in Section 24 of the Constitution "24. Everyone has the right – (a) to an environment that is not harmful to their

health or wellbeing; and (b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that – (i) prevent pollution and ecological degradation; (ii) promote conservation; and (iii) secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development" (The Constitution of the Republic of South Africa, 1996). Our findings will also contribute to the limited literature on project authorization application review implementation phase, and to the ongoing discussion about what constitutes plan implementation success.

4.3 Recommendations

The municipal SDF is one instrument that has been identified to implement conservation maps, and, as such, it should not be neglected (Knight et al., 2006). The provincial government should fund the Department of Co-operative Governance and Traditional Affairs (CoGTA) to support the local government SDF review process. The presence of, and access to, sufficient funding is important to ensure that the SDFs are reviewed and updated regularly. The regular reviews of the SDF will result in the municipalities using the best available biodiversity information to inform their environmental layer on an ongoing basis, and will ensure that there are less drastic sudden changes to the plans, that may affect consistency in, and credibility of, decision-making.

Another viable option would be for capacitating the land-use planners to review their own SDFs without outsourcing to a consultant, as this would reduce the costs associated with the SDF review process, and would result in the SDF being reviewed on time. The training of land-use planners and other municipal staff that are responsible for biodiversity conservation should be done on a regular basis, as once off training is not sufficient. This training could be offered as an Environmental Management short course, that includes training on other environmental issues that are within the mandates and functions of the local government, including waste management and pollution.

To address the issue of the lack of human resources and funding within municipalities, CoGTA could increase the number of Municipal Infrastructure Support Agents (MISA) in the understaffed municipalities.

Local government could be required to monitor and report on planning outcomes every five years concurrently with the review of the proactive planning tools. This would address the lack of post-adoption plan evaluation and the 'new plan syndrome' within local government (Calkins, 1979).

Integration of biodiversity priorities should also be extended to other fields of town planning, such as land-use schemes and land-use zones to ensure that it is considered during the reactive decision-making processes, even if it was not integrated into the proactive planning tools.

4.4 Future possibilities

Findings of this study indicate several avenues for future investigation. Fortunately, both the biodiversity conservation and land-use planning are evolving sectors, and there is still a chance to make significant improvements. Therefore, all the lessons learned through this study, and the experience gained, will help improve the integration process for local municipalities that still need to integrate the two disciplines. This study had shortfalls which highlight future research areas that need attention:

- The same study could be conducted in the other district municipalities within the Mpumalanga Province, or in other provinces, to allow for comparisons of a larger sample size.
- The extent to which integration achieves targets based on biodiversity conservation can be assessed.
- Assessing the extent to which Critical Biodiversity Areas (CBA) and Ecological Support Areas (ESA) have been transformed relative to other MBSP categories.
- The research can be extended to assess the implication of not integrating biodiversity conservation plans in land-use planning tools, and in decision making in selected developments.
- A more nuanced exploration of co-operative governance and co-management across varying municipal settings (from smaller, under resourced local municipalities to larger metros), and other stakeholder groups, could be done.
- Furthermore, future studies need to make the connection between proactive planning tools and implementation thereof. Researchers may need to strengthen the connection

between conservation plans and plan implementation within the land-use planning discipline, through examination of legally-binding policies such as local zoning ordinances and subdivision regulations, to see if the conservation plans are effectively being implemented.

- Other important avenues for research include investigation of the differences between consultant-driven and locally-driven planning processes, and the effect of each on local plan quality.

4.5 Final comments and summary conclusions

The use of MBSP maps by land-use planners does appear to assist in biodiversity conservation when they are integrated into the long-term comprehensive planning tools for proactive future planning, and, also, when they are consulted during the reactive decision making process through performance-based implementation. This research will be useful to the other state agencies, multi-level municipal authorities and, academics and students of the environmental management/sciences and planning disciplines. Mainstreaming biodiversity conservation plans into the proactive planning tools of land-use planning has been successful, but with room for improvement. Because the conservation plans have been well integrated into the planning tools, and are being considered during the reactive decision-making process through the performance-based implementation method, I can assume that assessment-implementation gap is being closed to a certain extent, and that biodiversity conservation is being enhanced.

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APPENDIX A: SDF Assessment Questionnaire

1. Is there a general description of the biophysical conditions (topography, climate, ecosystems, vegetation, natural habitats, corridors, etc.) of the area?

1	Poor	No mention or limited mention is made of the biophysical conditions or aspects for the area. The significance of such features in terms of biodiversity and conservation were not explored.
3	Adequate	An adequate description of the biophysical details of the area is made in the text, but there is limited or no indication of the relevance of such details with respect to planning for biodiversity and conservation.
5	Good	Biophysical details are given and / or are linked to a map, the significance is discussed in terms of planning for biodiversity and conservation.

2. Does the SDF (including maps) refer to latest terrestrial and freshwater conservation plans (Critical Biodiversity maps, Biodiversity Assessments) with spatial outputs / implications that are relevant to the municipality?

1	Poor	No reference is made to any plan relevant to the area.
3	Adequate	Some reference is made to terrestrial and freshwater conservation plans or assessment; however, this information is not shown spatially. OR Reference is made to either the terrestrial or freshwater conservation plan only. OR Reference is made to both spatially but it is not referenced in the text or the rest of the SDF.
5	Good	The relevant and appropriate terrestrial and freshwater conservation plans are assessed, referenced, mapped and its implications incorporated into the SDF.

3. Are the municipal vegetation types and their accompanying ecosystems status distinctly defined and spatially represented in terms of the latest, relevant vegetation map of South Africa.

1	Poor	There is no definition or description of ecosystems or vegetation types within the municipal area.
3	Adequate	The ecosystems and vegetation types present within the municipal area are mentioned but either no description is given or they are poorly described.
5	Good	The ecosystems and vegetation types within the municipal area are clearly defined and / or spatially represented.

4. Have the CBAs (irreplaceable and optimal) been integrated /carried through to the final SDF map?

1	Poor	No apparent integration
3	Adequate	Some CBAs have not been integrated into the final SDF map but have been justified as to why not.
5	Good	All CBAs have been integrated into the final SDF map. (*not all have been assigned CBA irreplaceable/optimal status but change in status has been motivated by specialist and accepted by the MTPA)

5. Have the ESAs been integrated /carried through to the final SDF map?

1	Poor	No apparent integration
3	Adequate	Some ESAs have not been integrated into the final SDF map but have been justified as to

		why not.
5	Good	All ESAs have been integrated into the final SDF map. OR ESAs have not been integrated into the SDF and this exclusion has been motivated by specialist and accepted by the MTPA .

6. Have CBA's informed the proposed spatial form and medium term urban edge?

1	Poor	There is no or limited identification of CBA's, conservation areas and corridors. These have not been considered in the spatial planning process.
3	Adequate	CBA's, conservation areas and corridors have informed the proposed spatial form and medium term urban edge, to a certain degree.
5	Good	The proposed spatial form and medium term urban edge reflect the CBA's, conservation areas and corridors identified in the municipal area. These may be represented spatially and the proposed medium term urban edge is overlaid on a map; thereby showing how the CBA's etc. have influenced the spatial form of the municipality.

7. Are there composite maps integrating / overlaying mapped biodiversity features and other spatial planning elements?

1	Poor	There are no such maps or composite maps do not indicate CBA's.
3	Adequate	There are maps overlaying limited biodiversity features / CBA's with spatial planning elements.
5	Good	Excellent maps are provided, showing the overlay of spatial elements on CBA's and / Biodiversity priorities.

8. Overall, is biodiversity appropriately integrated throughout the SDF, particularly with regards to other spatial priorities expressed in the SDF? Is integration meaningful, appropriate and feasible?

1	Poor	Biodiversity is addressed (certain elements or studies are provided) but there is no attempt at integrating such concerns into spatial planning in the SDF.
3	Adequate	Biodiversity is considered in detail as appendix or specialist study, but there is only a limited attempt to integrate the information throughout the SDF.
5	Good	Biodiversity priorities are considered as integral to spatial planning and are considered throughout the SDF.

9. Is there a description of the envisaged climate change, climate change corridors and the possible implications of climate change for the municipality considered in the SDF?

1	Poor	No description of Climate Change or mention of the implications.
3	Adequate	There is a description of implications i.t.o. Climate change but no strategy for adaption or mitigation measures.
5	Good	A clear description of envisaged climate change as well as implications and proposed strategies for adaption and mitigation.

10. Are identified priority conservation actions reflected in each municipal SDF, both spatially and reported on? (e.g. Environmental Management Frameworks, Mpumalanga Protected Areas Expansion Strategy, Environmental Projects - wetland rehabilitation, gully erosion control, invasive alien vegetation)

1	Poor	No priority conservation actions are reflected in the SDF.
3	Adequate	One or two of priority conservation actions are identified and there is some indication of action plans for certain of these priorities.

5	Good	More than two of priority conservation actions relevant to the area are identified and there are practical, implementable action plans identified for these priorities, and/or these plans are linked to a map.

APPENDIX B: Legislative framework guiding biodiversity mainstreaming in spatial planning

Constitution/Act/Strategy	Provisions/relevant aspects	Area of responsibility	Level of delegation of authority
Constitution of RSA No 108 of 1996	Section 156 (1) - all land-use decision making (a) local government matters, and any matters assigned to it by national and provincial legislation. Part B of Schedule 4 and Part B of Schedule 5 of 6 refer to a list of functional areas mandated to local government, which include issues that relate to health and safety, environmental protection, municipal planning, and services.	Land-use Planning	Municipality
	Section 24 - "Every person has the right to an environment that is not harmful to health or well-being; and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other means that – prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development" Municipal powers in the environmental legislation are limited, with air pollution, waste water and sewage disposal systems, solid waste disposal, and noise pollution being the closest issues related to the environment, as allocated in Part B of schedule 4 of the Constitution (Kihato, 2012).	Conservation and Land-use planning	National (Department of Environment, Forestry and Fisheries (DEFF) & SANBI), Provincial (Department and Conservation Agencies e.g. CapeNature, MTPA) and Municipal spheres of government
Development Facilitation Act No 67 of 1995 (DFA)	Three key objectives: a) Provide a coherent policy framework for land development and planning; b) speed up and facilitate the approval of land development applications; and c) provide for the overhaul of the existing planning and land development framework.	Land-use Planning	National government
Municipal Systems Act No	Chapter 5 of the Municipal Systems Act 2000, stipulates requirement to compile	Land-use Planning	Municipalities but enforced and co-

32 of 2000	an IDP for its area of jurisdiction. Section 26 (e) of the Municipal Systems Act further states that a SDF, which must include the provision of basic guidelines for a land-use management system for the municipality, must be developed as a core component of the IDP.		ordinated by provincial Department of Cooperative Governance and Traditional Affairs (CoGTA).
Spatial Planning and Land Use Management Act No 16 of 2013	Section 12 (1) of SPLUMA (2013) sets out provisions which are applicable to the preparation of SDFs at all scales of government. The provisions relevant to this study state that SDFs must: a) Represent the integration and trade-off of all relevant sector policies and plans; b) Guide planning and development decisions across all sectors of government; c) Take cognizance of any environmental management instrument adopted by the relevant environmental management authority. Various sections of SPLUMA state the following relating to the environmental sector and the environmental instruments mainly with regards to national, regional, and municipal SDFs respectively: • Section 14(f) – The national SDF must consider any environmental management instrument adopted by the relevant environmental management authority. • Section 19(g) – The regional SDF must comply with environmental legislation. • Section 21(j) – A municipal SDF must include a strategic assessment of the environmental pressures and opportunities within the municipal	Land-use Planning	Custodian of SPLUMA is the Department of Rural Development and Land Reform (DRDLR), Co-ordinated by the provincial CoGTA. SDFs done from Provincial to local municipal level.

	area, including the spatial location of environmental sensitivities, high potential agricultural land and coastal access strips where applicable.		
IDP	It is statutory plan required in terms of Chapter 5 of the Municipal Systems Act, 2000 encompassing all the functions undertaken by the Council within a 5 year time horizon guided by long term objectives and strategies (Harrison, 2003; Todes, 2004). The IDP is required to be updated annually. This strategic plan for the development of the municipality should link, integrate, and coordinate, various sector plans, taking into account development proposals within the municipality (Sowman & Brown, 2006), align the resources and capacity of the municipality for the implementation of the plan, form the policy framework and general basis on which annual budgets are set, and, in addition, must be compatible with both national and provincial development plans (Robinson et al., 2003; Kihato, 2012). The IDP has been adopted as the principle proactive planning tool at the local government level (Robinson et al., 2003; Sowman & Brown, 2006).	Land-use Planning	Created by the district and local municipality, and signed by provincial CoGTA MEC.
SDF	The SDF is also known as Spatial Plan, Development Plan, Master Plan, Comprehensive Plan, Structure Plan, Precinct Plan, or Urban Development Frameworks (du Plessis, 2010). The SDF is a spatial depiction of the IDP as required in terms of Section 26 (e) of the Municipal Systems Act, 2000 and Chapter 2 of the Local Government: Municipal Planning and Performance Management Regulations, 2001. It must include the provision of basic guidelines for a land use management system (LUMS) (Forbes, 2011; Kihato, 2012).	Land-use Planning	Co-ordinated by the Provincial CoGTA. SDFs done from Provincial to local municipal level.
Land Use Scheme	The scheme is normally prepared in terms of a provincial Ordinance or	Land-use Planning	District and local municipalities.

	Act. This plan, or series of plans, with its zoning maps and controls, forms the basis on which the day-to-day development administration duties within a municipality are performed. The scheme designates the zones and what activities may, or may not, be carried out in the respective zones whether by free entry or by (special) consent. The administration of the scheme, when not initiated by the municipality, usually involves the consideration of rezoning and (special) consent applications brought by the public.		Co-ordinated by the provincial CoGTA.
National Environment Management Act No 107 of 1998 (NEMA)	Provides the framework that sets out principles and procedures for environmental management, assessment, and governance.	Conservation	National and Provincial government. National DEFF. Department of Agriculture, and the Department of Water and Sanitation, may also be involved in environmental management.
NEM: Biodiversity Act, No. 10 of 2004 as amended	Section 48 (2) read together with Section 54 of the NEM:BA provides that a municipality that must adopt an IDP in terms of the Local Government: Municipal Systems Act, 2000, and must- a) align its plan with the national biodiversity framework and any applicable bioregional plan; b) incorporate into that plan those provisions of the national biodiversity framework or a bioregional plan that specifically apply to it; and c) demonstrate in its plan how the national biodiversity framework and any applicable bioregional plan may be implemented by that organ of state or municipality.	Conservation And Land-use Planning	National (DEFF & SANBI), Provincial (Department and Conservation Agencies e.g. CapeNature, MTPA) and Municipal spheres of government IDPs by district and local municipalities.

NEM: Protected Areas Act, No. 57 of 2003	Provides for the protection and conservation of ecologically viable areas, such as the natural landscapes and seascapes, which represent the biodiversity of South Africa; for the establishment and management of a national register of all protected areas within the three spheres of government (i.e., national, provincial, and local); for intergovernmental collaboration and public participation in matters concerning protected areas; for the insurance of continued existence, governance, and functionality of South African National Parks; and for matters in connection therewith. Specific obligations imposed on the local government: take into account any NEM:PAA norms or standards that apply in a local protected area within the municipal jurisdiction; must participate in all consultation processes regarding the declaration of a protected environment; must fulfil any management or co-management obligations assigned to municipality; must assist with the development of the protected area management plan; must monitor a protected area against set indicators where applicable; and must draft by-laws for activity restrictions in local protected areas (du Plessis, 2009).	Conservation	National, Provincial and local government, South African National Parks, Conservation Agencies e.g. MTPA, Ezemvelo KZN Wildlife

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APPENDIX C: SDF MBSP Tiff images

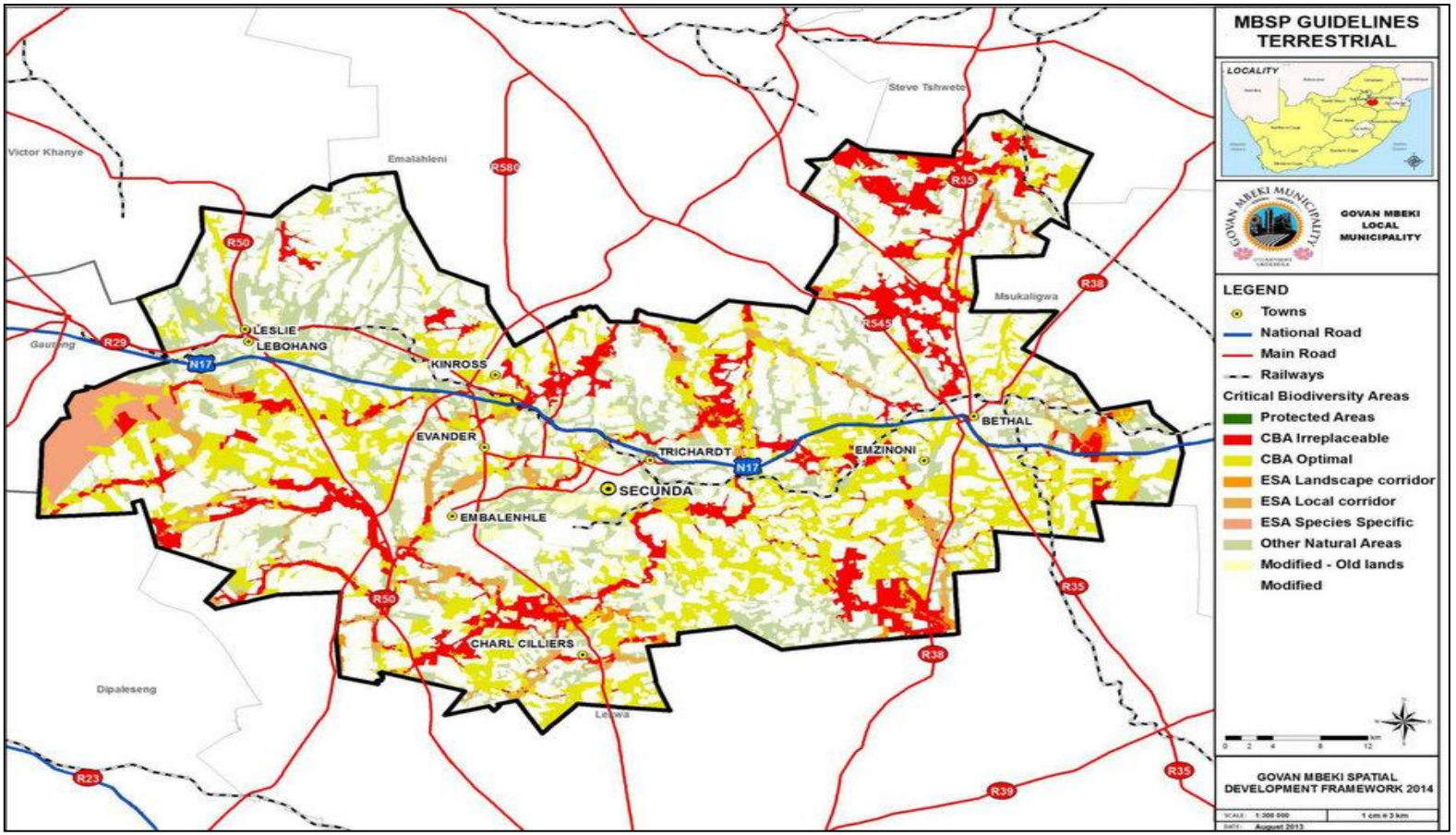

Figure A. 1: Govan Mbeki LM terrestrial MBSP Map

Source: Govan Mbeki SDF 2017

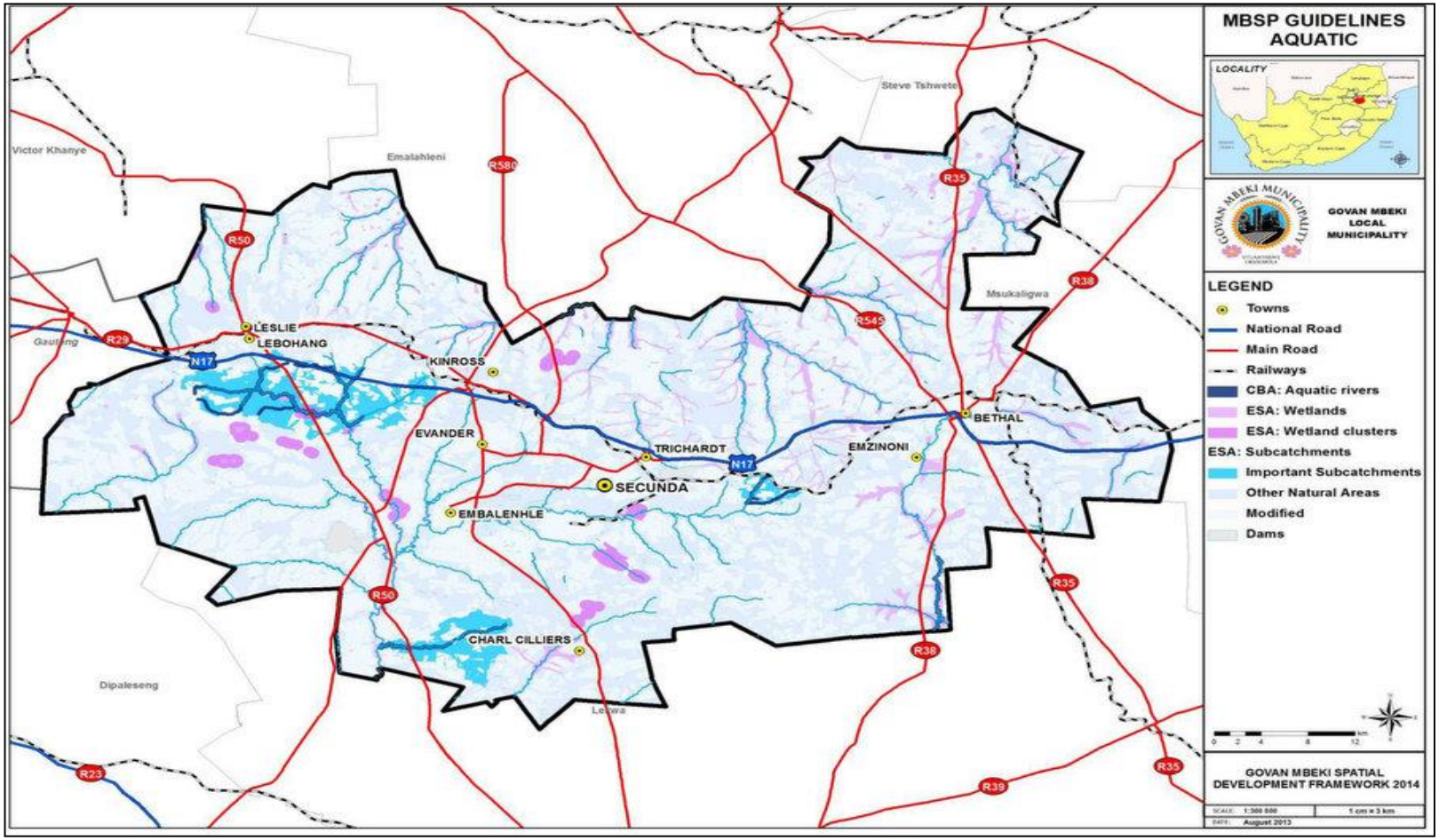

Figure A. 2: Govan Mbeki LM freshwater MBSP Map

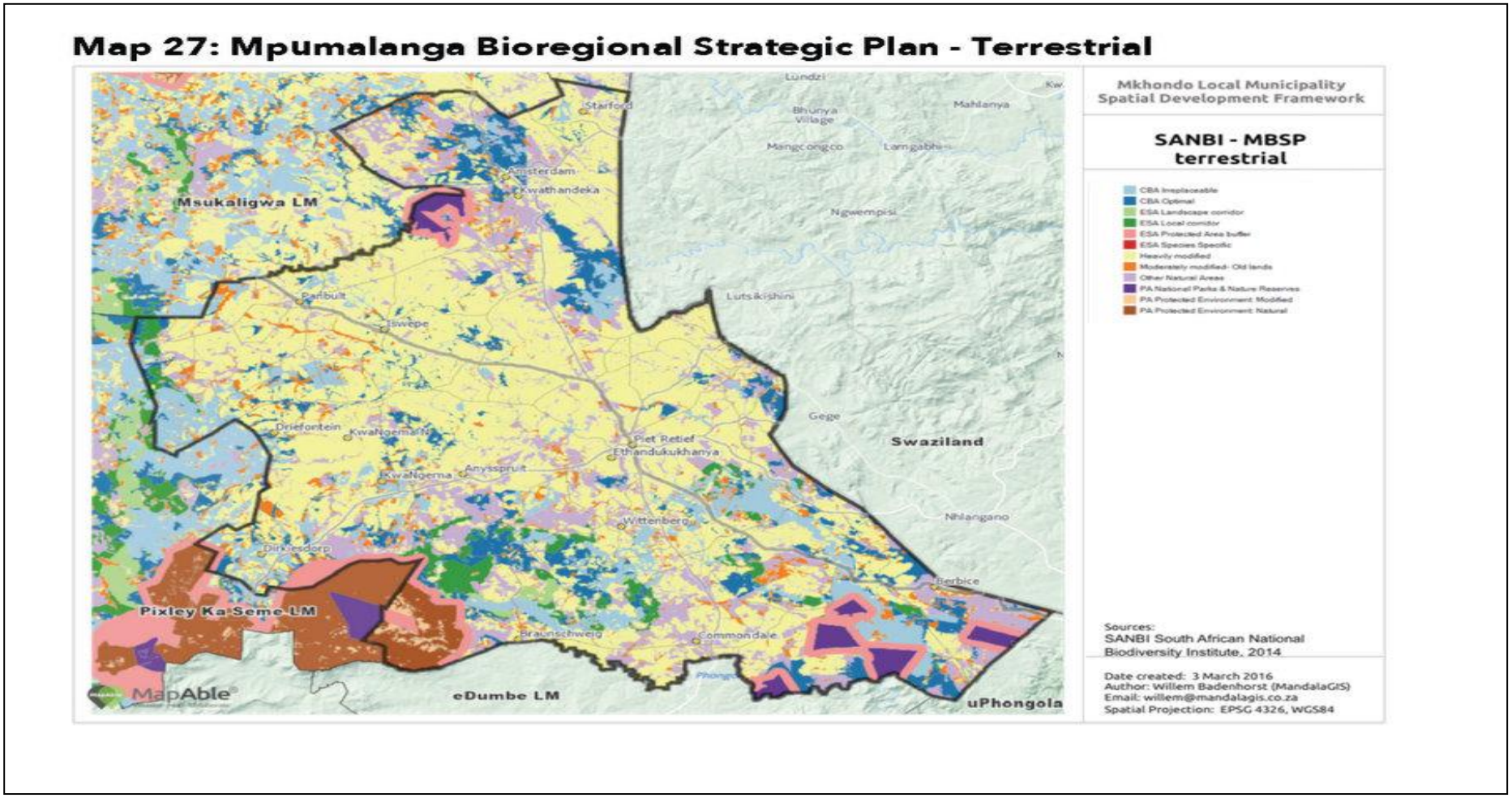

Figure A. 3: Mkhondo LM terrestrial MBSP map

Source: Mkhondo SDF (2017)

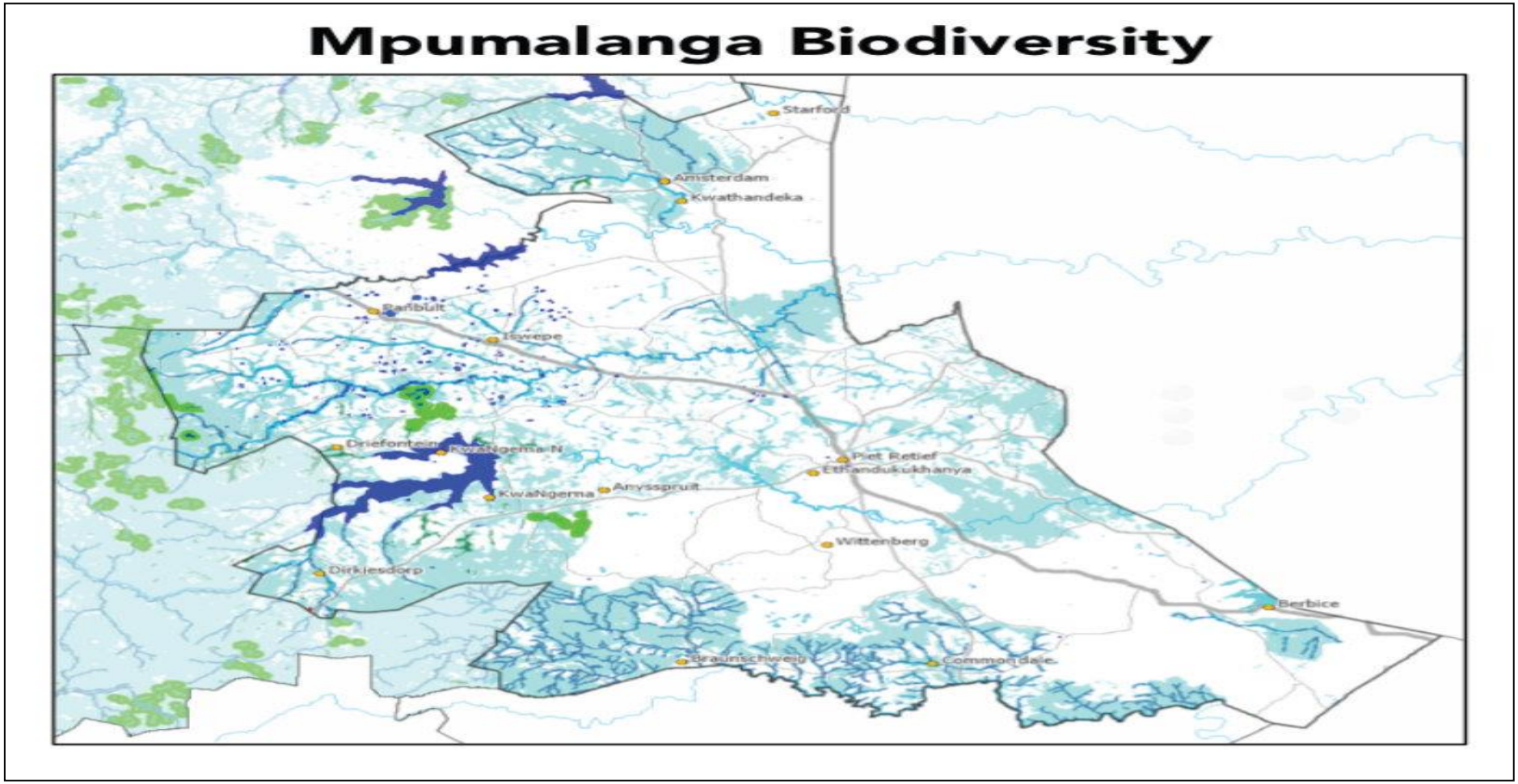

Figure A. 4: Mkhondo freshwater MBSP Map

Source: Mkhondo SDF (2017)

APPENDIX D: Interview Questionnaire

Questionnaire #: _____	Date: _____
Interviewee ID: _____	Municipality: _____

Section 1: Background Information

1.1 What position do you currently hold?

1.2 How long have you been on this position?

1.3 Is this the profession of your dreams?

1.4 What is your level of education?

1.5 Are you a registered professional planner/scientist?

1.6 What is your job description/responsibilities?

1.7 Are there any town planner/environmental officer vacant posts within the municipality?

Section 2: The land-use planning processes

2.1 What kind of land-use applications do you assess?

2.2 Would you please describe the process that you follow when assessing land-use applications?

2.3 Taking into account all activities that make up your job description, how much time do you spend on evaluating development applications in a month?

2.4 When encountering difficulties in assessing applications, especially with environmental or biodiversity issues, who/where do you seek advice from?

2.5 What sources of information are used in making planning decisions regarding the environment/biodiversity conservation?

2.6 When you approve an application within sensitive biodiversity what kind of conditions/mitigation measures are attached to that municipal planning approval/review comment?

2.7 Have you ever objected to any application on the basis of sensitive environment/biodiversity? If yes,

a) How many in the last year?

b) What process do you follow to deal with the objections?

c) Who makes the final decision?

d) What is the likelihood of your objection to be overruled?

Section 3: The MBSP/Conservation maps

3.1 Is biodiversity relevant to your work? Yes No (Why?)

3.2 Do you use any environmental/biodiversity maps to assess all land-use applications? Can you name them?

3.3 Do you know of the Mpumalanga Biodiversity Sector Plan?

3.4 What is your view or perception of the MBSP?

3.5 How useful is it to you?

3.6 What products of the MBSP do you have at your disposal?

a) How often do you use these products?

b) How do you use them?

c) What do you use them for?

d) Have you identified any mistakes/gaps in the MBSP as you were using it?

e) How do you think it can be improved?

3.7 If none,

a) What do you think needs to be done for you to be acquainted to the MBSP products and for you to use them?

Section 4: Integrating the MBSP into SDF's, etc

4.1 By law the SDF is the "principal strategic planning instrument which guides and informs all planning and development", do you agree or not?

4.2 When was the last SDF done?

4.3 What process followed to do the SDF?

4.4 Were you involved in the process?

4.5 What do you think needs to be done for the MBSP to be included in the SDF?